MINUTES

32nd Meeting of the Academic Council

Dated: 23/04/2021 at 11:00 A.M.

(Through Video Conference)

The 32nd meeting of the Academic Council of the University of Haryana was held on April 23, 2021 at 11:00 A.M. through Video Conferencing in Central University of Haryana

The following members attended the meeting:

1. **Prof. R.C. Kuhad, Vice Chancellor - Chairperson**
2. Prof. Raj Kumar
3. Prof. Sathans
4. Prof. Suresh Kumar
5. Dr. Ashwani Mahajan
6. Dr. (Mrs.) Shimla
7. Dr. P.K. Khurana
8. Prof. Sanjiv Kumar
9. Prof. Sarika Sharma
10. Prof. Rajesh Kumar Malik
11. Prof. Deepak Pant
12. Prof. Satish Kumar
13. Prof. Neelam Sangwan
14. Prof. Dinesh Kumar Gupta
15. Prof. Ravinder Pal Ahlawat
16. Prof. Rajbir Singh Dalal
17. Dr. Anand Sharma
18. Dr. Parmod Kumar
19. Dr. Ajay Kumar Bansal
20. Dr. Dinesh Kumar
21. Dr. Ranjan Aneja
22. Dr. Vishwanand Yadav
23. Dr. Ranbir Singh
24. Dr. Suneel Kumar
25. Dr. Gunjan Goel
26. Dr. Vikas Garg
27. Dr. Rajesh Kumar Gupta
28. Dr. Rakesh Kumar
29. Dr. Bijender Singh
30. Dr. Vinod Kumar

31. Dr. Ajai Pal Sharma
32. Dr. Anju Beniwal
33. Dr. Santosh C. Hulagabali, Librarian
34. Prof. Ranvir Singh (Special Invitee)
35. Dr. Vipul Yadav, COE (Special Invitee)
36. **Dr. J.P. Bhukar, Registrar (In-Charge)** - **Secretary**

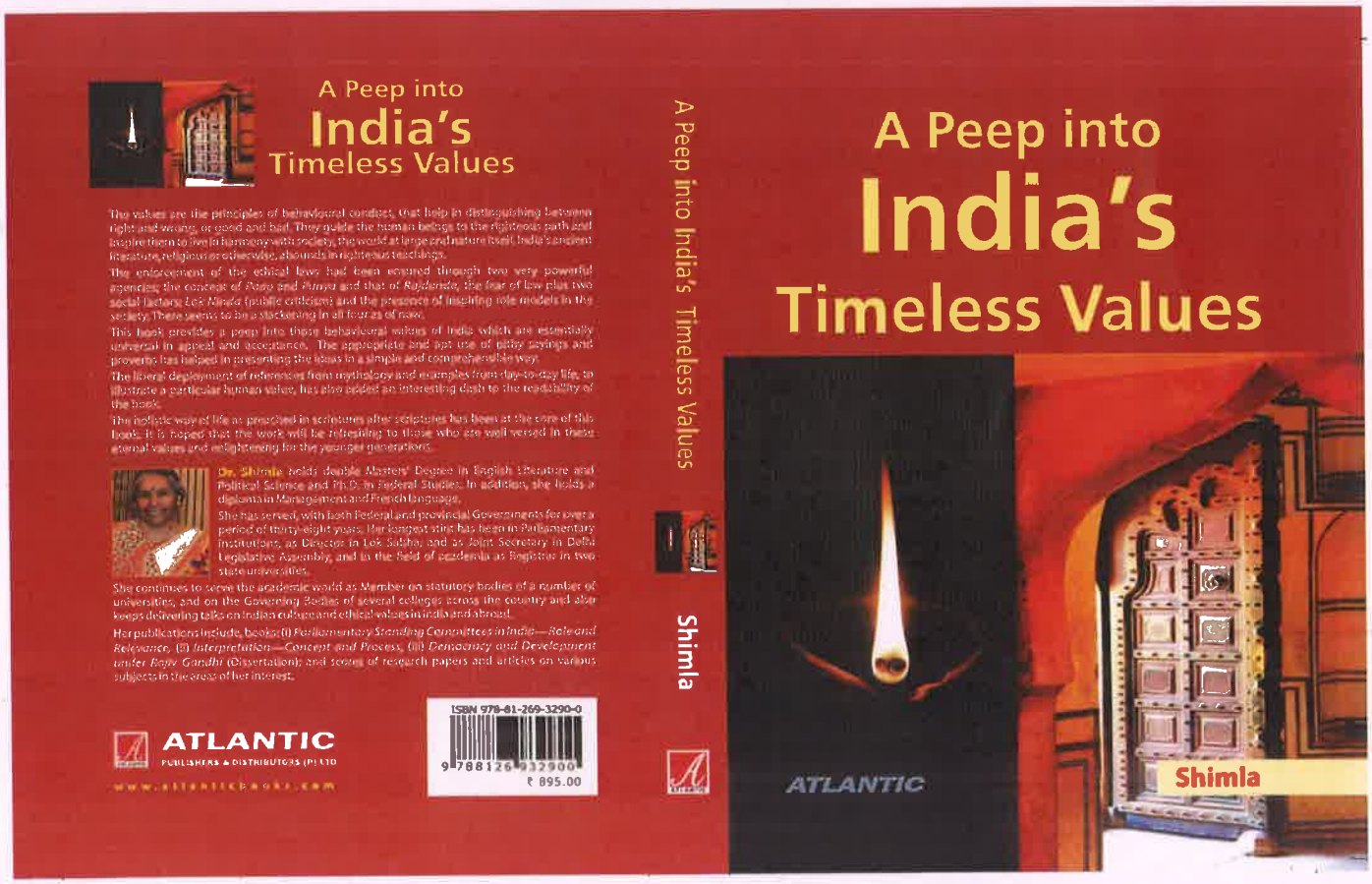
The following members could not attend the meeting: -

1. Prof. Deepak Gaur
2. Prof. Ram Singh
3. Mr. Manas Chandra Fuloria
4. Dr. (Prof.) Param Jeet Singh
5. Prof. P.C. Pattnaik
6. Dr. Markanday Ahuja

At the outset, the Vice-Chancellor welcomed all the members of the Academic Council. The members were informed about the demise of Prof. (Dr.) P.L. Chaturvedi, Hon'ble Chancellor, Central University of Haryana. The Council remembered his contribution and paid tribute to him. The Council members were also informed about the sudden demise of Dr. Kadloor Savitri, Member, Academic Council, Central University of Haryana & Professor, Dept. of Political Science, Jamia Millia Islamia, New Delhi due to COVID-19. The Council members paid tribute to her by a two-minute silence.

Thereafter, the Vice-Chancellor inaugurated the Book "**A Peep into India's Timeless Values**" written by Dr. (Mrs.) Shimla, Member, Academic Council of the University. All the members of the Council congratulated Dr. (Mrs.) Shimla.

Glimpse of Book Cover



The Vice-Chancellor briefed the progress made by the University in recent times. Thereafter, the Agenda Items were taken up for consideration.

<table>
<tr><th>R.No.</th><th>Resolution Passed</th></tr>
<tr><td>1.</td><td>The Minutes of the 31st meeting of the Academic Council held on 08-10-2020, were confirmed.
(Minutes already circulated)</td></tr>
<tr><td>2.</td><td>The action taken on the resolutions of the 31st meeting of the Academic Council held on 08.10.2020, were reported, recorded and confirmed.
(Annexure-I, Page No- 8 to 13)</td></tr>
<tr><td colspan="2">ITEMS FOR CONSIDERATION</td></tr>
<tr><td>3.</td><td>Resolved that the New Education Policy-2020 notified by the Ministry of Education, Government of India, be adopted.
(Annexure-II, Page No- 14 to 79)</td></tr>
<tr><td>4.</td><td>Resolved that the implementation plan for National Education Policy-2020, be approved.
(Annexure-III, Page No- 80 to 174)</td></tr>
<tr><td>5.</td><td>Resolved that the following amendments to Ordinance-II (A) Degree of Doctor of Philosophy (Ph.D.) of the University, in light of the comments received from Ministry of Education vide letter F.No. 58-6/2018-CU.III dated 17.03.2021, be approved and recommended to Executive Council for consideration: (Annexure-IV, Page No- 175 to 176)
<table>
<tr><th>Amendments approved by AC & EC</th><th>Proposed Amendments</th></tr>
<tr><td>Clause-2.4: The candidates who have qualified the UGC/CSIR-JRF/NET/SLET, or are Teacher Fellowship-holders or have passed M. Phil. programme with course work recognised by the U.G.C., as per the UGC Regulations (Minimum Standards and Procedure for award of M.Phil./Ph.D. Degree, 2009), shall be exempted from appearing at the written test.</td><td>Clause 2.4: The candidates who have qualified the UGC-NET (including JRF)/ UGC-CSIR-NET (including JRF)/SLET/GATE, or are Teacher Fellowship-holders or have passed M. Phil. programme with course work recognised by the U.G.C., as per the UGC (Minimum Standards and Procedure for award of M.Phil./Ph.D. Degree) Regulations 2016, shall be exempted from appearing at the written test.</td></tr>
</table></td></tr>
<tr><td>6.</td><td>Resolved that the recommendations of the Board of Studies of the Department of Mathematics dated 09.09.2020 & 19.11.2020 and School Board of School of Basic Sciences dated 14.12.2020, for the scheme and syllabi of course work for Ph.D. programme in the Department of Mathematics, w.e.f. the Academic Session-2020-21, be approved.
(Annexure-V, Page No- 177 to 189)</td></tr>
<tr><td>7.</td><td>Resolved that the recommendations of the Board of Studies of the Department of Computer Science and Information Technology dated 02.09.2020 and School Board of School of Basic Sciences dated 14.12.2020, for the scheme and syllabi of course work for Master of Computer Applications (MCA) programme in the Department of Computer Science and Information Technology, w.e.f. the Academic Session-2020-21, be approved.
(Annexure-VI, Page No- 190 to 268)</td></tr>
</table>

8.	Resolved that the recommendations of Board of Studies, School of Education dated 18.02.2021 and School Board of School of Education dated 09.03.2021, for the Scheme and Syllabus of Semester-II, M.Ed. Programme in the School of Education, w.e.f. Academic Session 2020-2021, be approved. **(Annexure-VII, Page No- 269 to 318)**
9.	Resolved that the recommendations of Board of Studies, School of Education dated 18.02.2021 and School Board of School of Education dated 09.03.2021, for the Scheme and Syllabus of Semester-II, B.Ed. Programme in the School of Education, w.e.f. Academic Session 2020-2021, be approved. **(Annexure-VIII, Page No- 319 to 385)**
10.	Resolved that the recommendations of Board of Studies of the Department of Vocational Studies and Skill Development dated 13-10-2020, for the Scheme and Syllabus of B.Voc. Biomedical Sciences Programme in the Department of Vocational Studies and Skill Development, w.e.f. Academic Session 2021-2022, be approved. **(Annexure-IX, Page No- 386 to 425)**
11.	The Council considered the application of Mr Anil Kumar (Roll No-180648) a student of M.Sc. (Statistics) regarding Mercy/Special Chance to appear in Examination of Course "Distribution Theory" of 1st Semester and resolved that he may be given a Mercy/ Special Chance taking into consideration the internet connectivity issues and present COVID-19 pandemic situation. **(Annexure-X, Page No- 426)**
12.	The Council considered the application of Ms. Chetna Singh Meena (Roll No-180617) a student of M.Sc. (Physics) regarding Mercy/Special Chance to appear in Examination of Course "Electronics" and resolved that he may be given a Mercy/ Special Chance taking into consideration the internet connectivity issues and present COVID-19 pandemic situation. **(Annexure-XI, Page No- 427)**
	REPORTING ITEMS
13.	The receipt of letter F.No. 58-6/2018-CU.III dated 17.03.2021 received from Under Secretary, Ministry of Education, GoI regarding comments of UGC on the amendments in Ordinances/ Statutes of the University, was reported and recorded. **(Annexure-IV, Page No- 175 to 176)**
14.	The action taken by the Vice-Chancellor on 23.11.2020, in approving the scheme and syllabi of Master of Physical Education and Sports (MPES) programme in the Department of Physical Education and Sports w.e.f. Academic Session 2020-21, was reported recorded and confirmed. **(Annexure-XII, Page No- 428 to 486)**
15.	The action taken by the Vice-Chancellor on 15-03-2021, in approving the recommendations of the Board of Studies of the Department of Sanskrit dated 25-01-2021 and School Board of School of Humanities and Social Sciences dated 17.02.2021, for the scheme and syllabi of M.A. Sanskrit (III Semester and IV Semester), w.e.f. Academic Session 2020-21, was reported recorded and confirmed. **(Annexure-XIII, Page No- 487 to 517)**
16.	The action taken by the Vice-Chancellor in approving the recommendations of the Board of Studies of the Department of Yoga dated 03-11-2020 and School Board of School of Interdisciplinary and Applied Sciences dated 30-11-2020, for the scheme and syllabi of Ph.D. programme in the Department of Yoga, w.e.f. Academic Session 2020-21, was reported recorded and confirmed. **(Annexure-XIV, Page No- 518 to 526)**
17.	The action taken by the Vice-Chancellor in approving the recommendations of the Board of Studies of the Department of Yoga dated 03-11-2020 and School Board of School of Interdisciplinary and

	Applied Sciences dated 30-11-2020, for the scheme and syllabi of M.Sc. Yoga (Semester I to IV), w.e.f. Academic Session 2020-21, was reported recorded and confirmed. **(Annexure-XV, Page No- 527 to 572)**
Items referred back by the Academic Council in its 31st meeting held on 08-10-2020 to the Standing Committee on Academic Matters for examination and review. **Note: The Vice-Chancellor is authorised to approved the recommendations of the Standing Committee**	
18.	The action taken by the Vice-Chancellor on 04-02-2021 in approving the recommendations of the Board of Studies of the Department of Tourism and Hotel Management dated 29.04.2020, for the scheme and syllabi of course work for Ph.D. programme in the Department of Tourism and Hotel Management, w.e.f. the Academic Session-2020-21, was reported recorded and confirmed. **(Annexure-XVI, Page No- 573 to 579)**
19.	The action taken by the Vice-Chancellor on 04-02-2021 in approving the recommendations of the Board of Studies of the Department of Chemistry dated 25.11.2019 and School Board of School of Chemical Sciences 25.11.2019, for the scheme and syllabi of course work for Ph.D. programme in the Department of Chemistry, w.e.f. the Academic Session-2020-21, was reported recorded and confirmed. **(Annexure-XVII, Page No- 580 to 591)**
20.	The action taken by the Vice-Chancellor on 04-02-2021 in approving the recommendations of the Board of Studies of the Department of Chemistry dated 25.11.2019 and School Board of School of Chemical Sciences dated 25.11.2019, for revision of the scheme and syllabi of M.Sc. Chemistry (Semesters I to IV), w.e.f. the Academic Session-2020-21, was reported recorded and confirmed. **(Annexure-XVIII, Page No- 592 to 704)**
21.	The action taken by the Vice-Chancellor on 04-02-2021 in approving the recommendations of the Board of Studies of the Department of Civil Engineering dated 30.04.2020 and School Board of School of Engineering and Technology dated 30.04.2020, for the scheme and syllabi of course work for Ph.D. programme in the Department of Civil Engineering, w.e.f. the Academic Session-2020-21, was reported recorded and confirmed. **(Annexure-XIX, Page No- 705 to 716)**
22.	The action taken by the Vice-Chancellor on 04-02-2021 in approving the recommendations of the Board of Studies of the Department of Electrical Engineering dated 29.04.2020 and School Board of School of Engineering and Technology dated 30.04.2020, for the scheme and syllabi of course work for Ph.D. programme in the Department of Electrical Engineering, w.e.f. the Academic Session-2020-21, was reported recorded and confirmed. **(Annexure-XX, Page No- 717 to 727)**
23.	The action taken by the Vice-Chancellor on 04-02-2021 in approving the recommendations of the Board of Studies of the Department of Computer Science and Engineering dated 03.03.2020 and School Board of School of Engineering and Technology dated 30.04.2020, for the scheme and syllabi of course work for Ph.D. programme in the Department of Computer Science and Engineering, w.e.f. the Academic Session-2020-21, was reported recorded and confirmed. **(Annexure-XXI, Page No- 728 to 738)**
24.	The action taken by the Vice-Chancellor on 04-02-2021 in approving the recommendations of Board of Studies, School of Education held on 17.07.2020 and School Board of School of Education dated 18.07.2020, for the Scheme and Syllabus of Course work of M.Phil. and Ph.D. Programme in the School of Education, w.e.f. Academic Session 2020-2021, was reported recorded and confirmed. **(Annexure-XXII, Page No- 739 to 757)**

25.	The action taken by the Vice-Chancellor on 04-02-2021 in approving the recommendations of Board of Studies, School of Education held on 17.07.2020 and School Board of School of Education dated 18.07.2020, for the Scheme and Syllabus of Semester-I, M.Ed. Programme in the School of Education, w.e.f. Academic Session 2020-2021, was reported recorded and confirmed. **(Annexure-XXIII, Page No- 758 to 791)**
26.	The action taken by the Vice-Chancellor on 04-02-2021 in approving the recommendations of Board of Studies, School of Education held on 17.07.2020 and School Board of School of Education dated 18.07.2020, for the Scheme and Syllabus of Semester-I, B.Ed. Programme in the School of Education, w.e.f. Academic Session 2020-2021, was reported recorded and confirmed. **(Annexure-XXIV, Page No- 792 to 822)**
27.	The action taken by the Vice-Chancellor on 04-02-2021 in approving the recommendations of Board of Studies, Department of Physical Education and Sports held on 16.07.2020 and School Board of School of Education dated 18.07.2020, for the Scheme and Syllabus of Course work of Doctor of Philosophy Programme (Ph.D.) in Department of Physical Education and Sports, w.e.f. the Academic Session 2020-2021, was reported recorded and confirmed. **(Annexure-XXV, Page No- 823 to 840)**
28.	The action taken by the Vice-Chancellor on 04-02-2021 in approving the recommendations of Board of Studies, Department of Psychology dated 15.07.2020 and School Board of School of Humanities and Social Sciences dated 23.07.2020, for scheme of course work for Ph.D. (Psychology), w.e.f. the Academic Session 2020-2021, was reported recorded and confirmed. **(Annexure-XXVI, Page No- 841 to 851)**
29.	The action taken by the Vice-Chancellor in approving the signing of Memorandum of Understanding (MoU) between National Institute of Food Technology Entrepreneurship and Management (NIFTEM), Sonipat and Central University of Haryana, was reported recorded and confirmed. **(Annexure-XXVII, Page No- 852 to 855)**
	Under Any other Item
30.	Resolved that the following amendments to Statute-13 of the Statutes of the University relating to the constitution of the Academic Council and the term of office of its members, be approved and recommended to Executive Council for consideration:

Existing Clause	Proposed Clause
viii. Three members of the Court when constituted, elected from amongst the elected members, none of whom shall be an employee or student of the University or an Institution recognized by or associated with the University;	**viii.** Three members of the Court nominated by the Court.

Note: The Court of the University in its 4th meeting held on 22-04-2021, recommended that Clause-viii of the Statute-13 of the Statutes of the University relating to the constitution of the Academic Council and Term of office of its members should be amended.

31.	Resolved that the recommendations of the Board of Studies of the Department of Psychology dated 03.03.2021 and School Board of School of Humanities and Social Sciences dated 18.03.2021, for the scheme and syllabi of M.A. Psychology (Semester-II) programme in the Department of Psychology, w.e.f. the Academic Session-2021-22, be approved. **(Annexure-XXVIII, Page No- 856 to 895)**
32.	The Council recommended the starting of B.A.LL.B. (5 Year) Hons Integrated programme in the Department of Law and resolved that the programme be started after taking approval of all the concerned Regulatory Authorities and exploring feasibility. **Note:** The start of B.A.LL.B. (5 Year) Hons Integrated programme has already been recommended by the Committee constituted vide Notification No. CUH/2018/A&C/87 dated 07-09-2018 and subsequently recommended by the Board of Studies of the Department of Law.
33.	Resolved that the M.Phil. Programme be discontinued from the next Academic Session i.e. 2021-22 in all the Departments of the University as recommended in the New Education Policy-2020.
34.	Resolved that one credit (over and above the credits already prescribed) be given to the students who recites the National Anthem, National Song and University Kulgeet.

Sd/-
VICE-CHANCELLOR
(Chairperson)

27.4.21
REGISTRAR (I/c)
(Secretary)

Annexure-I

ACTION TAKEN REPORT

31st Meeting of the Academic Council held on 08/10/2020

R.No.	Resolution Passed	Action Taken
1.	The Minutes of the 30th meeting of the Academic Council held on 04.05.2020, were confirmed.	Noted
2.	The action taken on the resolutions of the 30th meeting of the Academic Council held on 04.05.2020, were reported, recorded and confirmed.	Noted
	ITEMS FOR CONSIDERATION	
3.	Resolved that the following Agenda Items be referred back to the Standing Committee on Academic matters of the Academic Council for examination and review: XXXX XXXX XXXX XXXX	The Agenda items referred to the standing Committee were considered by the Standing Committee in its meeting held on 04-01-2021. The approved syllabi are being reported in the present meeting.
4.	Resolved that the recommendations of the Board of Studies of the Department of Civil Engineering dated 30.04.2020 and School Board of School of Engineering and Technology dated 30.04.2020, for revision of the scheme and syllabi of B.Tech. Civil Engineering (Semester V & VI), w.e.f. Academic Session-2020-21, as recommended with minor modifications by the Standing Committee on Academic matters of the Academic Council in its meeting held on 31.07.2020, be approved.	Implemented
5.	Resolved that the recommendations of the Board of Studies of the Department of Electrical Engineering dated 29.04.2020 and School Board of School of Engineering and Technology dated 30.04.2020, for revision of the scheme and syllabi of B.Tech. Electrical Engineering (Semester V & VI), w.e.f. Academic Session-2020-21, as recommended with minor modifications by the Standing Committee on Academic matters of the Academic Council in its meeting held on 31.07.2020, be approved.	Implemented
6.	Resolved that the recommendations of the Board of Studies of the Department of Computer Science and Engineering dated 03.03.2020 and School Board of School of Engineering and Technology dated 30.04.2020, for revision of the scheme and syllabi of B.Tech. Computer Science and Engineering (Semester V & VI), w.e.f. Academic Session-2020-21, as recommended with minor modifications by the Standing Committee on Academic	Implemented

	matters of the Academic Council in its meeting held on 31.07.2020, be approved.	
7.	Resolved that the recommendations of the Board of Studies of the Department of Printing and Packaging Technology dated 11.09.2019 and School Board of School of Engineering and Technology dated 30.04.2020, for revision of the scheme and syllabi of B.Tech. Printing and Packaging Technology (Semester V & VI), w.e.f. Academic Session-2020-21, as recommended with minor modifications by the Standing Committee on Academic matters of the Academic Council in its meeting held on 31.07.2020, be approved.	Implemented
8.	Resolved that the following amendments to the Statute-13 of the Statutes of the University relating to the constitution of the Academic Council and term of office of its members, be approved and recommended to the Executive Council for consideration: **XXXX XXXX XXXX XXXX**	The amendments were approved by the Executive Council in its 47th meeting held on 29-12-2020 and were forwarded to Ministry of Education for submission to the Visitor of the University for his Assent, vide letter No. CUH/ A&C/2021/396 dated 22/02/2021.
9.	Resolved that the following amendments to Ordinance-XVII (Assignment of Departments to The Schools), consequent upon the creation of Department of Vocational Studies and Skill Development, be approved and recommended to the Executive Council for consideration: **XXXX XXXX XXXX XXXX**	The amendments were approved by the Executive Council in its 47th meeting held on 29-12-2020 and forwarded to Ministry of Education for submission to the Visitor of the University for his Assent, vide letter No. CUH/ A&C/2021/397 dated 22/02/2021.
10.	Resolved that the following amendments to the Ordinances of the University, be approved and recommended to the Executive Council for consideration: Addition of the following Ordinance after Ordinance XXXI **Ordinance XXXII** **PROGRAMMES LEADING TO THE AWARD OF THE BACHELOR OF LAWS** **(3-YEAR) PROFESSIONAL DEGREE** **XXXX XXXX XXXX XXXX**	The amendments were approved by the Executive Council in its 47th meeting held on 29-12-2020 and forwarded to Ministry of Education for submission to the Visitor of the University for his Assent, vide letter No. CUH/ A&C/2021/397 dated 22/02/2021.

11.	Resolved that the following amendments to the Ordinances of the University, be approved and recommended to the Executive Council for consideration: Addition of the following Ordinance after Ordinance XXXII **<u>Ordinance XXXIII</u>** **PROGRAMMES LEADING TO THE AWARD OF THE MASTER OF PHARMACY** **XXXX XXXX XXXX XXXX**	The amendments were approved by the Executive Council in its 47th meeting held on 29-12-2020 and forwarded to Ministry of Education for submission to the Visitor of the University for his Assent, vide letter No. CUH/ A&C/2021/397 dated 22/02/2021.
12.	Resolved that the following amendments to Ordinance-XXIX (PROGRAMMES LEADING TO THE AWARD OF BACHELOR OF TECHNOLOGY (B.Tech.) DEGREE), as recommended by the School Board of School of Engineering and Technology in its meeting held on 10-09-2020, be approved and recommended to the Executive Council for consideration: **XXXX XXXX XXXX XXXX**	The amendments were approved by the Executive Council in its 47th meeting held on 29-12-2020 and forwarded to Ministry of Education for submission to the Visitor of the University for his Assent, vide letter No. CUH/ A&C/2021/397 dated 22/02/2021.
13.	Resolved that the following amendments to the Admission Rules of the University, be approved: **XXXX XXXX XXXX XXXX**	Implemented
14.	Resolved that the following recommendations of Standing Committee (Admission) for the Academic Session 2020-21, regarding implementation of PwD reservation in Admissions, be approved: a. In case of admission in UG and PG programmes, 5% seats already has been reserved for PwD candidates. However, horizontal reservation (reservation within quota) should be decided at the departmental level as per the availability of candidates. A record in this regard should be maintained at Departmental level by each department. b. In case of research programmes (M.Phil./Ph.D.), it is difficult to implement PwD reservation at Departmental level due to availability of a small number of seats. In view of this, PwD seats in research programmes may be reserved by treating University as a single unit. A total of 5% seats may be allotted department-wise in alphabetical order. Horizontal reservation (reservation within quota) should be decided at the departmental level as per the availability of candidates. A record in this regard should be maintained at Departmental level by each department.	Implemented

15.	Resolved that the recommendations of the Board of Studies of the Department of Geography dated 25.11.2019 and School Board of School of Basic Sciences dated 18.07.2020, for the scheme and syllabi of course work for Ph.D. programme in the Department of Geography, w.e.f. the Academic Session-2020-21, as recommended by the Standing Committee on Academic matters of the Academic Council in its meeting held on 31.07.2020, be approved.	Implemented
16.	Resolved that the recommendations of Board of Studies, Department of Physical Education and Sports held on 16.07.2020 and School Board of School of Education dated 18.07.2020, for the Scheme and Syllabus of Master of Physical Education (2-year) Professional Programme in Department of Physical Education and Sports, w.e.f. the Academic Session 2020-2021, as recommended by the Standing Committee on Academic matters of the Academic Council in its meeting held on 31.07.2020, be approved.	Implemented
17.	Resolved that the recommendations of Board of Studies, Department of Law held on 03.07.2020 and School Board of School of Law dated 20.07.2020, for the Scheme and Syllabus of LL.B. (3 Year) Professional Course w.e.f. the Academic Session 2020-2021, as recommended by the Standing Committee on Academic matters of the Academic Council in its meeting held on 31.07.2020, be approved.	Implemented
18.	Resolved that the recommendations of Board of Studies, Department of Pharmaceutical Sciences held on 23.07.2020, regarding adoption of the course structure, course curriculum, syllabus and scheme of examinations, etc. for the Master of Pharmacy (Pharmacology) programme prescribed by the Pharmacy Council of India, as recommended by the Standing Committee on Academic matters of the Academic Council in its meeting held on 31.07.2020, be adopted. **XXXX XXXX XXXX XXXX**	Implemented
19.	Resolved that the recommendations of Board of Studies, Department of Psychology dated 15.07.2020 and School Board of School of Humanities and Social Sciences dated 23.07.2020, for the Scheme and Syllabi (Semester-I) of M.A. (Psychology), w.e.f. the Academic Session 2020-2021, as recommended by the Standing Committee on Academic matters of the Academic Council in its meeting held on 31.07.2020, be approved.	Implemented
20.	Resolved that the recommendations of Board of Studies, Department of Sanskrit dated 15.10.2019 and School Board of School of Humanities and Social Sciences dated 31.08.2020, for the Syllabi (Semester-III) of M.A. (Sanskrit), w.e.f. the Academic	Implemented

	Session 2020-2021, as recommended by the Standing Committee on Academic matters of the Academic Council in its meeting held on 31.07.2020, be approved.	
21.	Resolved that the recommendations of Board of Studies, Department of Psychology dated 15.07.2020 and School Board of School of Humanities and Social Sciences dated 23.07.2020, for introduction of **Advance PG Diploma in Child Guidance and Counselling**, in Department of Psychology w.e.f. Academic Session 2021-22, be approved in principle. **Note: -** The Department of Psychology shall start process for approval from Rehabilitation Council of India.	Noted
22.	Resolved that the recommendations of Board of Studies, Department of Psychology dated 15.07.2020 and School Board of School of Humanities and Social Sciences dated 23.07.2020, for introduction of **PG Diploma in Rehabilitation Psychology**, in Department of Psychology w.e.f. Academic Session 2021-22, be approved in principle. **Note: -** The Department of Psychology shall start process for approval from Rehabilitation Council of India.	Noted
23.	Resolved that the Guidelines for bringing quality improvement in the Ph.D./M.Phil. programmes in order to monitor the progress of the scholars as per UGC (Minimum Standards and Procedure for Award of M.Phil/Ph.D Degrees) Regulations, 2018, recommended by duly constituted Committee, be approved.	Implemented
24.	Resolved that the proposal of the Central Library of the University to offer UGC approved two-credits course entitled "Research and Publication Ethics", a compulsory course for PhD students for pre-registration of course work undertaken in the University, be approved.	Implemented
25.	Resolved that the "*UGC Revised Guidelines on Examinations and Academic Calendar for the Universities in view of COVID-19 Pandemic*" received via UGC letter D.O.No.F.1-1/2020 (Secy) dated 06.07.2020, be adopted.	Implemented
26.	Resolved that the "*UGC Guidelines on Academic Calendar for the First Year of Under-Graduate and Post-Graduate Students of the Universities for the Session 2020-21 in view of COVID-19 Pandemic*" received via UGC letter D.O.No.F.1-1/2020 (Secy) dated 22.09.2020, be adopted.	Implemented
27.	Resolved that the proposal of starting of online short-term course of three-credits entitled "Practical Skills for Librarianship" for the students of SAARC countries studying Library and Information Science and allied subjects, be approved.	Implemented

REPORTING ITEMS		
28-37	Reporting Items	No action needed.
Under Any other Item		
38	The Council Considered the Recommendeation of the Board of Studies dated 17.10.2016 of the Department of Management Studies to treat first semester as zero semester, in respect of Ms. Nupur Sharma D/o Sh. Mool Krishna Sharma, Roll No-5440, a student of MBA 2014-15 batch, on medical grounds and grant *post-facto* approval as a special case, keeping in view career of Student. The Council took a serious view of the negligence commited by the Department of Management Studies and advise to be careful in future.	Resolution sent to concerned Department for further necessary action.



National Education Policy 2020

Ministry of Human Resource Development

Government of India

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Introduction

Education is fundamental for achieving full human potential, developing an equitable and just society, and promoting national development. Providing universal access to quality education is the key to India's continued ascent, and leadership on the global stage in terms of economic growth, social justice and equality, scientific advancement, national integration, and cultural preservation. Universal high-quality education is the best way forward for developing and maximizing our country's rich talents and resources for the good of the individual, the society, the country, and the world. India will have the highest population of young people in the world over the next decade, and our ability to provide high-quality educational opportunities to them will determine the future of our country.

The global education development agenda reflected in the Goal 4 (SDG4) of the 2030 Agenda for Sustainable Development, adopted by India in 2015 - seeks to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" by 2030. Such a lofty goal will require the entire education system to be reconfigured to support and foster learning, so that all of the critical targets and goals (SDGs) of the 2030 Agenda for Sustainable Development can be achieved.

The world is undergoing rapid changes in the knowledge landscape. With various dramatic scientific and technological advances, such as the rise of big data, machine learning, and artificial intelligence, many unskilled jobs worldwide may be taken over by machines, while the need for a skilled workforce, particularly involving mathematics, computer science, and data science, in conjunction with multidisciplinary abilities across the sciences, social sciences, and humanities, will be increasingly in greater demand. With climate change, increasing pollution, and depleting natural resources, there will be a sizeable shift in how we meet the world's energy, water, food, and sanitation needs, again resulting in the need for new skilled labour, particularly in biology, chemistry, physics, agriculture, climate science, and social science. The growing emergence of epidemics and pandemics will also call for collaborative research in infectious disease management and development of vaccines and the resultant social issues heightens the need for multidisciplinary learning. There will be a growing demand for humanities and art, as India moves towards becoming a developed country as well as among the three largest economies in the world.

Indeed, with the quickly changing employment landscape and global ecosystem, it is becoming increasingly critical that children not only learn, but more importantly learn how to learn. Education thus, must move towards less content, and more towards learning about how to think critically and solve problems, how to be creative and multidisciplinary, and how to innovate, adapt, and absorb new material in novel and changing fields. Pedagogy must evolve to make education more experiential, holistic, integrated, inquiry-driven, discovery-oriented, learner-centred, discussion-based, flexible, and, of course, enjoyable. The curriculum must include basic arts, crafts, humanities, games, sports and fitness, languages, literature, culture, and values, in addition to science and mathematics, to develop all aspects and capabilities of learners; and make education more well-rounded, useful, and fulfilling to the learner. Education must build character, enable learners to be ethical, rational, compassionate, and caring, while at the same time prepare them for gainful, fulfilling employment.

The gap between the current state of learning outcomes and what is required must be bridged through undertaking major reforms that bring the highest quality, equity, and integrity into the system, from early childhood care and education through higher education.

The aim must be for India to have an education system by 2040 that is second to none, with equitable access to the highest-quality education for all learners regardless of social or economic background.

This National Education Policy 2020 is the first education policy of the 21st century and aims to address the many growing developmental imperatives of our country. This Policy proposes the revision and revamping of all aspects of the education structure, including its regulation and governance, to create a new system that is aligned with the aspirational goals of 21st century education, including SDG4, while building upon India's traditions and value systems. The National

Education Policy lays particular emphasis on the development of the creative potential of each individual. It is based on the principle that education must develop not only cognitive capacities - both the 'foundational capacities 'of literacy and numeracy and 'higher-order' cognitive capacities, such as critical thinking and problem solving – but also social, ethical, and emotional capacities and dispositions.

The rich heritage of ancient and eternal Indian knowledge and thought has been a guiding light for this Policy. The pursuit of knowledge (*Jnan*), wisdom (*Pragyaa*), and truth (*Satya*) was always considered in Indian thought and philosophy as the highest human goal. The aim of education in ancient India was not just the acquisition of knowledge as preparation for life in this world, or life beyond schooling, but for the complete realization and liberation of the self. World-class institutions of ancient India such as Takshashila, Nalanda,Vikramshila, Vallabhi, set the highest standards of multidisciplinary teaching and research and hosted scholars and students from across backgrounds and countries. The Indian education system produced great scholars such as Charaka, Susruta, Aryabhata, Varahamihira, Bhaskaracharya, Brahmagupta, Chanakya, Chakrapani Datta, Madhava, Panini, Patanjali, Nagarjuna, Gautama, Pingala, Sankardev, Maitreyi, Gargi and Thiruvalluvar, among numerous others, who made seminal contributions to world knowledge in diverse fields such as mathematics, astronomy, metallurgy, medical science and surgery, civil engineering, architecture, shipbuilding and navigation, yoga, fine arts, chess, and more. Indian culture and philosophy have had a strong influence on the world. These rich legacies to world heritage must not only be nurtured and preserved for posterity but also researched, enhanced, and put to new uses through our education system.

The teacher must be at the centre of the fundamental reforms in the education system. The new education policy must help re-establish teachers, at all levels, as the most respected and essential members of our society, because they truly shape our next generation of citizens. It must do everything to empower teachers and help them to do their job as effectively as possible. The new education policy must help recruit the very best and brightest to enter the teaching profession at all levels, by ensuring livelihood, respect, dignity, and autonomy, while also instilling in the system basic methods of quality control and accountability.

The new education policy must provide to all students, irrespective of their place of residence, a quality education system, with particular focus on historically marginalized, disadvantaged, and underrepresented groups. Education is a great leveler and is the best tool for achieving economic and social mobility, inclusion, and equality. Initiatives must be in place to ensure that all students from such groups, despite inherent obstacles, are provided various targeted opportunities to enter and excel in the educational system.

These elements must be incorporated taking into account the local and global needs of the country, and with a respect for and deference to its rich diversity and culture. Instilling knowledge of India and its varied social, cultural, and technological needs, its inimitable artistic, language, and knowledge traditions, and its strong ethics in India's young people is considered critical for purposes of national pride, self-confidence, self-knowledge, cooperation, and integration.

Previous Policies

The implementation of previous policies on education has focused largely on issues of access and equity. The unfinished agenda of the National Policy on Education 1986, modified in 1992 (NPE 1986/92), is appropriately dealt with in this Policy. A major development since the last Policy of 1986/92 has been the Right of Children to Free and Compulsory Education Act 2009 which laid down legal underpinnings for achieving universal elementary education.

Principles of this Policy

The purpose of the education system is to develop good human beings capable of rational thought and action, possessing compassion and empathy, courage and resilience, scientific temper and

creative imagination, with sound ethical moorings and values. It aims at producing engaged, productive, and contributing citizens for building an equitable, inclusive, and plural society as envisaged by our Constitution.

A good education institution is one in which every student feels welcomed and cared for, where a safe and stimulating learning environment exists, where a wide range of learning experiences are offered, and where good physical infrastructure and appropriate resources conducive to learning are available to all students. Attaining these qualities must be the goal of every educational institution. However, at the same time, there must also be seamless integration and coordination across institutions and across all stages of education.

The fundamental principles that will guide both the education system at large, as well as the individual institutions within it are:

- **recognizing, identifying,** and **fostering the unique capabilities of each student,** by sensitizing teachers as well as parents to promote each student's holistic development in both academic and non-academic spheres;
- **according the** highest priority **to achieving Foundational Literacy and Numeracy** by all students by Grade 3;
- **flexibility**, so that learners have the ability to choose their learning trajectories and programmes, and thereby choose their own paths in life according to their talents and interests;
- **no hard separations** between arts and sciences, between curricular and extra-curricular activities, between vocational and academic streams, etc. in order to eliminate harmful hierarchies among, and silos between different areas of learning;
- **multidisciplinarity** and a **holistic education** across the sciences, social sciences, arts, humanities, and sports for a multidisciplinary world in order to ensure the unity and integrity of all knowledge;
- **emphasis on conceptual understanding** rather than rote learning and learning-for-exams;
- **creativity and critical thinking** to encourage logical decision-making and innovation;
- **ethics and human & Constitutional values** like empathy, respect for others, cleanliness, courtesy, democratic spirit, spirit of service, respect for public property, scientific temper, liberty, responsibility, pluralism, equality, and justice;
- **promoting multilingualism and the power of language** in teaching and learning;
- **life skills** such as communication, cooperation, teamwork, and resilience;
- **focus on regular formative assessment for learning** rather than the summative assessment that encourages today's 'coaching culture';
- **extensive use of technology** in teaching and learning, removing language barriers, increasing access for *Divyang* students, and educational planning and management;
- **respect for diversity** and **respect for the local context** in all curriculum, pedagogy, and policy, always keeping in mind that education is a concurrent subject;
- **full equity and inclusion** as the cornerstone of all educational decisions to ensure that all students are able to thrive in the education system;
- **synergy in curriculum across all levels of education** from early childhood care and education to school education to higher education;
- **teachers and faculty as the heart of the learning process** – their recruitment, continuous professional development, positive working environments and service conditions;

- a **'light but tight' regulatory framework** to ensure **integrity, transparency**, and **resource efficiency** of the educational system through audit and public disclosure while encouraging innovation and out-of-the-box ideas through **autonomy, good governance, and empowerment**;
- **outstanding research** as a corequisite for outstanding education and development;
- **continuous review** of progress based on sustained research and regular assessment by educational experts;

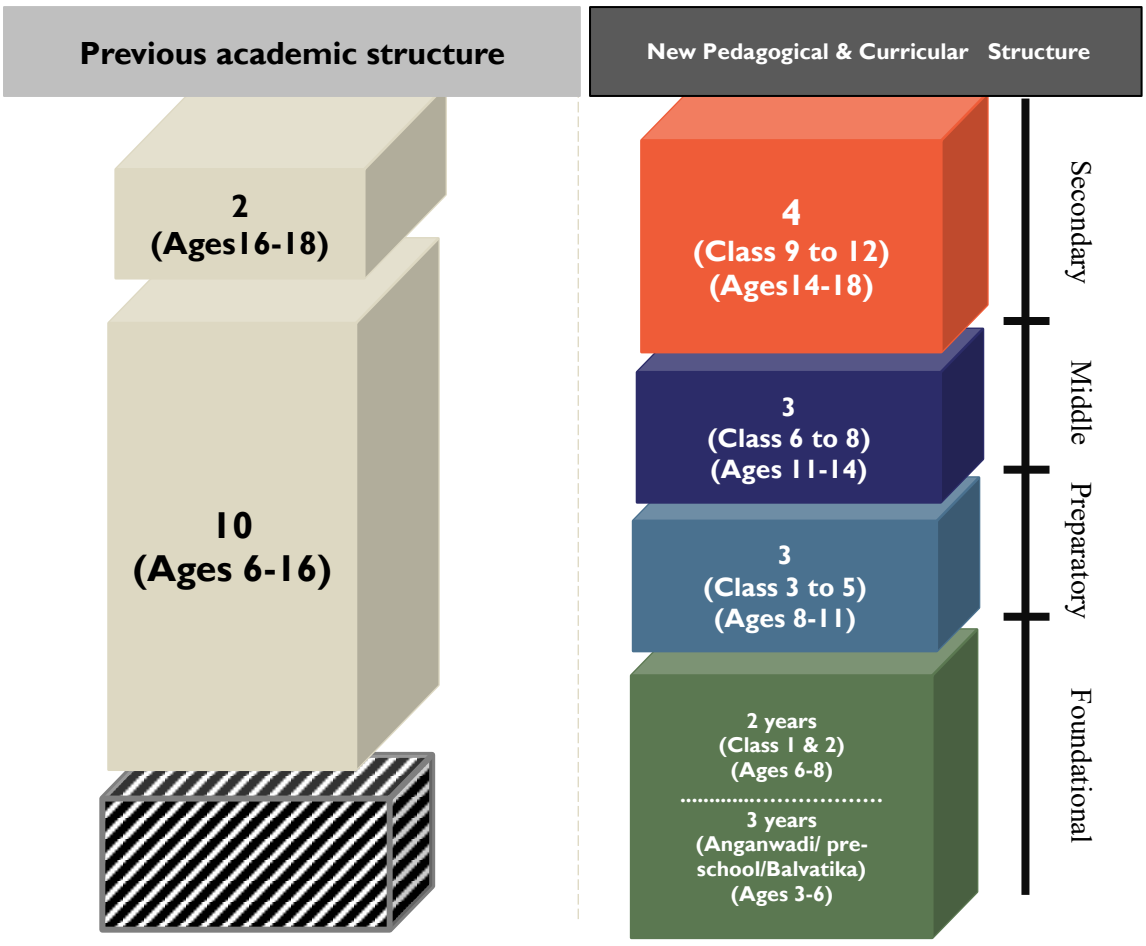
- **a rootedness and pride in India**, and its rich, diverse, ancient and modern culture and knowledge systems and traditions;
- **education is a public service**; access to quality education must be considered a basic right of every child;
- **substantial investment in a strong, vibrant public education system** as well as the encouragement and facilitation of true philanthropic private and community participation.

The Vision of this Policy

This National Education Policy envisions an education system rooted in Indian ethos that contributes directly to transforming India, that is Bharat, sustainably into an equitable and vibrant knowledge society, by providing high-quality education to all, and thereby making India a global knowledge superpower. The Policy envisages that the curriculum and pedagogy of our institutions must develop among the students a deep sense of respect towards the Fundamental Duties and Constitutional values, bonding with one's country, and a conscious awareness of one's roles and responsibilities in a changing world. The vision of the Policy is to instill among the learners a deep-rooted pride in being Indian, not only in thought, but also in spirit, intellect, and deeds, as well as to develop knowledge, skills, values, and dispositions that support responsible commitment to human rights, sustainable development and living, and global well-being, thereby reflecting a truly global citizen.

Part I. SCHOOL EDUCATION

This policy envisages that the extant 10+2 structure in school education will be modified with a new pedagogical and curricular restructuring of 5+3+3+4 covering ages 3-18 as shown in the representative figure and elaborated in detail later under Chapter 4.



Currently, children in the age group of 3-6 are not covered in the 10+2 structure as Class 1 begins at age 6. In the new 5+3+3+4 structure, a strong base of Early Childhood Care and Education (ECCE) from age 3 is also included, which is aimed at promoting better overall learning, development, and well-being.

1. Early Childhood Care and Education: The Foundation of Learning

1.1. Over 85% of a child's cumulative brain development occurs prior to the age of 6, indicating the critical importance of appropriate care and stimulation of the brain in the early years in order to ensure healthy brain development and growth. Presently, quality ECCE is not available to crores of young children, particularly children from socio-economically disadvantaged backgrounds. Strong investment in ECCE has the potential to give all young children such access, enabling them to participate and flourish in the educational system throughout their lives. Universal provisioning of quality early childhood development, care, and education must thus be achieved as soon as possible, and no later than 2030, to ensure that all students entering Grade 1 are school ready.

1.2. ECCE ideally consists of flexible, multi-faceted, multi-level, play-based, activity-based, and inquiry-based learning, comprising of alphabets, languages, numbers, counting, colours, shapes, indoor and outdoor play, puzzles and logical thinking, problem-solving, drawing, painting and other visual art, craft, drama and puppetry, music and movement. It also includes a focus on developing social capacities, sensitivity, good behaviour, courtesy, ethics, personal and public cleanliness, teamwork, and cooperation. The overall aim of ECCE will be to attain optimal outcomes in the domains of: physical and motor development, cognitive development, socio-emotional-ethical development, cultural/artistic development, and the development of communication and early language, literacy, and numeracy.

1.3. A National Curricular and Pedagogical Framework for Early Childhood Care and Education (NCPFECCE) for children up to the age of 8 will be developed by NCERT in two parts, namely, a sub-framework for 0-3 year-olds, and a sub-framework for 3-8 year-olds, aligned with the above guidelines, the latest research on ECCE, and national and international best practices. In particular, the numerous rich local traditions of India developed over millennia in ECCE involving art, stories, poetry, games, songs, and more, will also be suitably incorporated. The framework will serve as a guide both for parents and for early childhood care and education institutions.

1.4. The overarching goal will be to ensure universal access to high-quality ECCE across the country in a phased manner. Special attention and priority will be given to districts and locations that are particularly socio-economically disadvantaged. ECCE shall be delivered through a significantly expanded and strengthened system of early-childhood education institutions consisting of (a) stand-alone Anganwadis; (b) Anganwadis co-located with primary schools; (c) pre-primary schools/sections covering at least age 5 to 6 years co-located with existing primary schools; and (d) stand-alone pre-schools - all of which would recruit workers/teachers specially trained in the curriculum and pedagogy of ECCE.

1.5. For universal access to ECCE, Anganwadi Centres will be strengthened with high-quality infrastructure, play equipment, and well-trained Anganwadi workers/teachers. Every Anganwadi will have a well-ventilated, well-designed, child-friendly and well-constructed building with an enriched learning environment. Children in Anganwadi Centres shall take activity-filled tours - and meet the teachers and students of their local primary schools, in order to make the transition from Anganwadi Centres to primary schools a smooth one. Anganwadis shall be fully integrated into school complexes/clusters, and Anganwadi children, parents, and teachers will be invited to attend and participate in school/school complex programmes and vice versa.

1.6. It is envisaged that prior to the age of 5 every child will move to a "Preparatory Class" or "Balavatika" (that is, before Class 1), which has an ECCE-qualified teacher. The learning in the Preparatory Class shall be based primarily on play-based learning with a focus on developing cognitive, affective, and psychomotor abilities and early literacy and numeracy. The mid-

day meal programme shall also be extended to the Preparatory Classes in primary schools. Health check-ups and growth monitoring that are available in the Anganwadi system shall also be made available to Preparatory Class students of Anganwadi as well as of primary schools.

1.7. To prepare an initial cadre of high-quality ECCE teachers in Anganwadis, current Anganwadi workers/teachers will be trained through a systematic effort in accordance with the curricular/pedagogical framework developed by NCERT. Anganwadi workers/teachers with qualifications of 10+2 and above shall be given a 6-month certificate programme in ECCE; and those with lower educational qualifications shall be given a one-year diploma programme covering early literacy, numeracy, and other relevant aspects of ECCE. These programmes may be run through digital/distance mode using DTH channels as well as smartphones, allowing teachers to acquire ECCE qualifications with minimal disruption to their current work. The ECCE training of Anganwadi workers/teachers will be mentored by the Cluster Resource Centres of the School Education Department which shall hold at least one monthly contact class for continuous assessment. In the longer term, State Governments shall prepare cadres of professionally qualified educators for early childhood care and education, through stage-specific professional training, mentoring mechanisms, and career mapping. Necessary facilities will also be created for the initial professional preparation of these educators and their Continuous Professional Development (CPD).

1.8. ECCE will also be introduced in Ashramshalas in tribal-dominated areas and in all formats of alternative schooling in a phased manner. The process for integration and implementation of ECCE in Ashramshalas and alternative schooling will be similar to that detailed above.

1.9. The responsibility for ECCE curriculum and pedagogy will lie with MHRD to ensure its continuity from pre-primary school through primary school, and to ensure due attention to the foundational aspects of education. The planning and implementation of early childhood care and education curriculum will be carried out jointly by the Ministries of HRD, Women and Child Development (WCD), Health and Family Welfare (HFW), and Tribal Affairs. A special joint task force will be constituted for continuous guidance of the smooth integration of early childhood care and education into school education.

2. Foundational Literacy and Numeracy: An Urgent & Necessary Prerequisite to Learning

2.1. The ability to read and write, and perform basic operations with numbers, is a necessary foundation and an indispensable prerequisite for all future schooling and lifelong learning. However, various governmental, as well as non-governmental surveys, indicate that we are currently in a learning crisis: a large proportion of students currently in elementary school - estimated to be over 5 crore in number - have not attained foundational literacy and numeracy, i.e., the ability to read and comprehend basic text and the ability to carry out basic addition and subtraction with Indian numerals.

2.2. Attaining foundational literacy and numeracy for all children will thus become an urgent national mission, with immediate measures to be taken on many fronts and with clear goals that will be attained in the short term (including that every student will attain foundational literacy and numeracy by Grade 3). The highest priority of the education system will be to achieve universal foundational literacy and numeracy in primary school by 2025. The rest of this Policy will become relevant for our students only if this most basic learning requirement (i.e., reading, writing, and arithmetic at the foundational level) is first achieved. To this end, a National Mission on Foundational Literacy and Numeracy will be set up by the Ministry of Human Resource Development (MHRD) on priority. Accordingly, all State/UT governments will immediately prepare an implementation plan for attaining universal foundational literacy and numeracy in all primary schools, identifying stage-wise targets and goals to be achieved by 2025, and closely tracking and monitoring progress of the same.

2.3. First, teacher vacancies will be filled at the earliest, in a time-bound manner - especially in disadvantaged areas and areas with large pupil-to-teacher ratios or high rates of illiteracy. Special

attention will be given to employing local teachers or those with familiarity with local languages. A pupil-teacher ratio (PTR) of under 30:1 will be ensured at the level of each school; areas having large numbers of socio-economically disadvantaged students will aim for a PTR of under 25:1. Teachers will be trained, encouraged, and supported - with continuous professional development - to impart foundational literacy and numeracy.

2.4. On the curricular side, there will be an increased focus on foundational literacy and numeracy - and generally, on reading, writing, speaking, counting, arithmetic, and mathematical thinking - throughout the preparatory and middle school curriculum, with a robust system of continuous formative/adaptive assessment to track and thereby individualize and ensure each student's learning. Specific hours daily - and regular events over the year-on activities involving these subjects will be dedicated to encourage and enthuse students. Teacher education and the early grade curriculum will be redesigned to have a renewed emphasis on foundational literacy and numeracy.

2.5. Currently, with the lack of universal access to ECCE, a large proportion of children already fall behind within the first few weeks of Grade 1. Thus, to ensure that all students are school ready, an interim 3-month play-based 'school preparation module' for all Grade 1 students, consisting of activities and workbooks around the learning of alphabets, sounds, words, colours, shapes, and numbers, and involving collaborations with peers and parents, will be developed by NCERT and SCERTs.

2.6. A national repository of high-quality resources on foundational literacy and numeracy will be made available on the Digital Infrastructure for Knowledge Sharing (DIKSHA). Technological interventions to serve as aids to teachers and to help bridge any language barriers that may exist between teachers and students, will be piloted and implemented

2.7. Due to the scale of the current learning crisis, all viable methods will be explored to support teachers in the mission of attaining universal foundational literacy and numeracy. Studies around the world show one-on-one peer tutoring to be extremely effective for learning not just for the learner, but also for the tutor. Thus, peer tutoring can be taken up as a voluntary and joyful activity for fellow students under the supervision of trained teachers and by taking due care of safety aspects. Additionally, it will also be made far easier for trained volunteers - from both the local community and beyond - to participate in this large-scale mission. Every literate member of the community could commit to teaching one student/person how to read, it would change the country's landscape very quickly. States may consider establishing innovative models to foster such peer-tutoring and volunteer activities, as well as launch other programmes to support learners, in this nationwide mission to promote foundational literacy and numeracy.

2.8. Enjoyable and inspirational books for students at all levels will be developed, including through high-quality translation (technology assisted as needed) in all local and Indian languages, and will be made available extensively in both school and local public libraries. Public and school libraries will be significantly expanded to build a culture of reading across the country. Digital libraries will also be established. School libraries will be set up - particularly in villages - to serve the community during non-school hours, and book clubs may meet in public/school libraries to further facilitate and promote widespread reading. A National Book Promotion Policy will be formulated, and extensive initiatives will be undertaken to ensure the availability, accessibility, quality, and readership of books across geographies, languages, levels, and genres.

2.9. Children are unable to learn optimally when they are undernourished or unwell. Hence, the nutrition and health (including mental health) of children will be addressed, through healthy meals and the introduction of well-trained social workers, counsellors, and community involvement into the schooling system. Furthermore, research shows that the morning hours after a nutritious breakfast can be particularly productive for the study of cognitively more demanding subjects and hence these hours may be leveraged by providing a simple but energizing breakfast in addition to midday meals. In locations where hot meals are not possible, a simple but nutritious meal, e.g., groundnuts/chana mixed with jaggery and/or local fruits may be provided. All school children shall undergo regular

health check-ups especially for 100% immunization in schools and health cards will be issued to monitor the same.

3. Curtailing Dropout Rates and Ensuring Universal Access to Education at All Levels

3.1. One of the primary goals of the schooling system must be to ensure that children are enrolled in and are attending school. Through initiatives such as the Sarva Shiksha Abhiyan (now the Samagra Shiksha) and the Right to Education Act, India has made remarkable strides in recent years in attaining near-universal enrolment in elementary education. However, the data for later grades indicates some serious issues in retaining children in the schooling system. The GER for Grades 6-8 was 90.9%, while for Grades 9-10 and 11-12 it was only 79.3% and 56.5%, respectively - indicating that a significant proportion of enrolled students drop out after Grade 5 and especially after Grade 8. As per the 75th round household survey by NSSO in 2017-18, the number of out of school children in the age group of 6 to 17 years is 3.22 crore. It will be a top priority to bring these children back into the educational fold as early as possible, and to prevent further students from dropping out, with a goal to achieve 100% Gross Enrolment Ratio in preschool to secondary level by 2030. A concerted national effort will be made to ensure universal access and afford opportunity to all children of the country to obtain quality holistic education–including vocational education - from pre-school to Grade 12.

3.2. There are two overall initiatives that will be undertaken to bring children who have dropped out back to school and to prevent further children from dropping out. The first is to provide effective and sufficient infrastructure so that all students have access to safe and engaging school education at all levels from pre-primary school to Grade 12. Besides providing regular trained teachers at each stage, special care shall be taken to ensure that no school remains deficient on infrastructure support. The credibility of Government schools shall be re-established and this will be attained by upgrading and enlarging the schools that already exist, building additional quality schools in areas where they do not exist, and providing safe and practical conveyances and/or hostels, especially for the girl children, so that all children have the opportunity to attend a quality school and learn at the appropriate level. Alternative and innovative education centres will be put in place in cooperation with civil society to ensure that children of migrant labourers, and other children who are dropping out of school due to various circumstances are brought back into mainstream education.

3.3. The second is to achieve universal participation in school by carefully tracking students, as well as their learning levels, in order to ensure that they (a) are enrolled in and attending school, and (b) have suitable opportunities to catch up and re-enter school in case they have fallen behind or dropped out. For providing equitable and quality education from the Foundational Stage through Grade 12 to all children up to the age of 18, suitable facilitating systems shall be put in place. Counsellors or well-trained social workers connected to schools/school complexes and teachers will continuously work with students and their parents and will travel through and engage with communities to ensure that all school-age children are attending and learning in school. Trained and qualified social workers from civil society organizations/departments of Social Justice and Empowerment and government functionaries dealing with empowerment of Persons with Disabilities at the State and district level, could be connected to schools, through various innovative mechanisms adopted by State/UT Governments, to help in carrying out this important work.

3.4. Once infrastructure and participation are in place, ensuring quality will be the key in retention of students, so that they (particularly, girls and students from other socio-economically disadvantaged groups) do not lose interest in attending school. This will require a system of incentives for deploying teachers with knowledge of the local language to areas with high dropout rates, as well as overhauling the curriculum to make it more engaging and useful.

3.5. To facilitate learning for all students, with special emphasis on Socio-Economically Disadvantaged Groups (SEDGs), the scope of school education will be broadened to facilitate multiple pathways to learning involving both formal and non-formal education modes. Open and Distance Learning (ODL) Programmes offered by the National Institute of Open Schooling (NIOS)

and State Open Schools will be expanded and strengthened for meeting the learning needs of young people in India who are not able to attend a physical school. NIOS and State Open Schools will offer the following programmes in addition to the present programmes: A, B and C levels that are equivalent to Grades 3, 5, and 8 of the formal school system; secondary education programmes that are equivalent to Grades 10 and 12; vocational education courses/programmes; and adult literacy and life-enrichment programmes. States will be encouraged to develop these offerings in regional languages by establishing new/strengthening existing State Institutes of Open Schooling (SIOS).

3.6. To make it easier for both governments as well as non-governmental philanthropic organizations to build schools, to encourage local variations on account of culture, geography, and demographics, and to allow alternative models of education, the requirements for schools will be made less restrictive. The focus will be to have less emphasis on input and greater emphasis on output potential concerning desired learning outcomes. Regulations on inputs will be limited to certain areas as enumerated in Chapter 8. Other models for schools will also be piloted, such as public-philanthropic partnerships.

3.7. Efforts will be made to involve community and alumni in volunteer efforts for enhancing learning by providing at schools: one-on-one tutoring; the teaching of literacy and holding of extra-help sessions; teaching support and guidance for educators; career guidance and mentoring to students; etc. In this regard, the support of active and healthy senior citizens, school alumni and local community members will be suitably garnered. Databases of literate volunteers, retired scientists/government/semi government employees, alumni, and educators will be created for this purpose.

4. Curriculum and Pedagogy in Schools: Learning Should be Holistic, Integrated, Enjoyable, and Engaging

Restructuring school curriculum and pedagogy in a new 5+3+3+4 design

4.1. The curricular and pedagogical structure of school education will be reconfigured to make it responsive and relevant to the developmental needs and interests of learners at different stages of their development, corresponding to the age ranges of 3-8, 8-11, 11-14, and 14-18 years, respectively. The curricular and pedagogical structure and the curricular framework for school education will therefore be guided by a 5+3+3+4 design, consisting of the Foundational Stage (in two parts, that is, 3 years of Anganwadi/pre-school + 2 years in primary school in Grades 1-2; both together covering ages 3-8), Preparatory Stage (Grades 3-5, covering ages 8-11), Middle Stage (Grades 6-8, covering ages 11-14), and Secondary Stage (Grades 9-12 in two phases, i.e., 9 and 10 in the first and 11 and 12 in the second, covering ages 14-18).

4.2. The Foundational Stage will consist of five years of flexible, multilevel, play/activity-based learning and the curriculum and pedagogy of ECCE as mentioned in para 1.2. The Preparatory Stage will comprise three years of education building on the play, discovery, and activity-based pedagogical and curricular style of the Foundational Stage, and will also begin to incorporate some light text books as well as aspects of more formal but interactive classroom learning, in order to lay a solid groundwork across subjects, including reading, writing, speaking, physical education, art, languages, science, and mathematics. The Middle Stage will comprise three years of education, building on the pedagogical and curricular style of the Preparatory Stage, but with the introduction of subject teachers for learning and discussion of the more abstract concepts in each subject that students will be ready for at this stage across the sciences, mathematics, arts, social sciences, and humanities. Experiential learning within each subject, and explorations of relations among different subjects, will be encouraged and emphasized despite the introduction of more specialized subjects and subject teachers. The Secondary Stage will comprise of four years of multidisciplinary study, building on the subject-oriented pedagogical and curricular style of the Middle Stage, but with greater depth, greater critical thinking, greater attention to life aspirations, and greater flexibility and student choice of subjects. In particular students would continue to have the option of exiting after Grade 10

and re-entering in the next phase to pursue vocational or any other courses available in Grades 11-12, including at a more specialized school, if so desired.

4.3. The above-described stages are purely curricular and pedagogical, designed to optimize learning for students based on the cognitive development of children; they will inform the development of National and State curricula and teaching-learning strategies at each stage, but parallel changes to physical infrastructure will not be required.

Holistic development of learners

4.4. The key overall thrust of curriculum and pedagogy reform across all stages will be to move the education system towards real understanding and towards learning how to learn - and away from the culture of rote learning as is largely present today. The aim of education will not only be cognitive development, but also building character and creating holistic and well-rounded individuals equipped with the key 21st century skills. Ultimately, knowledge is a deep-seated treasure and education helps in its manifestation as the perfection which is already within an individual. All aspects of curriculum and pedagogy will be reoriented and revamped to attain these critical goals. Specific sets of skills and values across domains will be identified for integration and incorporation at each stage of learning, from pre-school to higher education. Curriculum frameworks and transaction mechanisms will be developed for ensuring that these skills and values are imbibed through engaging processes of teaching and learning. NCERT will identify these required skill sets and include mechanisms for their transaction in the National Curriculum Framework for early childhood and school education.

Reduce curriculum content to enhance essential learning and critical thinking

4.5. Curriculum content will be reduced in each subject to its core essentials, to make space for critical thinking and more holistic, inquiry-based, discovery-based, discussion-based, and analysis-based learning. The mandated content will focus on key concepts, ideas, applications, and problem-solving. Teaching and learning will be conducted in a more interactive manner; questions will be encouraged, and classroom sessions will regularly contain more fun, creative, collaborative, and exploratory activities for students for deeper and more experiential learning.

Experiential learning

4.6. In all stages, experiential learning will be adopted, including hands-on learning, arts-integrated and sports-integrated education, story-telling-based pedagogy, among others, as standard pedagogy within each subject, and with explorations of relations among different subjects. To close the gap in achievement of learning outcomes, classroom transactions will shift, towards competency-based learning and education. The assessment tools (including assessment "as", "of", and "for" learning) will also be aligned with the learning outcomes, capabilities, and dispositions as specified for each subject of a given class.

4.7. Art-integration is a cross-curricular pedagogical approach that utilizes various aspects and forms of art and culture as the basis for learning of concepts across subjects. As a part of the thrust on experiential learning, art-integrated education will be embedded in classroom transactions not only for creating joyful classrooms, but also for imbibing the Indian ethos through integration of Indian art and culture in the teaching and learning process at every level. This art-integrated approach will strengthen the linkages between education and culture.

4.8. Sports-integration is another cross-curricular pedagogical approach that utilizes physical activities including indigenous sports, in pedagogical practices to help in developing skills such as collaboration, self-initiative, self-direction, self-discipline, teamwork, responsibility, citizenship, etc. Sports-integrated learning will be undertaken in classroom transactions to help students adopt fitness as a lifelong attitude and to achieve the related life skills along with the levels of fitness as envisaged in the Fit India Movement. The need to integrate sports in education is well recognized as it serves to

foster holistic development by promoting physical and psychological well-being while also enhancing cognitive abilities.

Empower students through flexibility in course choices

4.9. Students will be given increased flexibility and choice of subjects to study, particularly in secondary school - including subjects in physical education, the arts and crafts, and vocational skills – so that they can design their own paths of study and life plans. Holistic development and a wide choice of subjects and courses year to year will be the new distinguishing feature of secondary school education. There will be no hard separation among 'curricular', 'extracurricular', or 'co-curricular', among 'arts', 'humanities', and 'sciences', or between 'vocational' or 'academic' streams. Subjects such as physical education, the arts and crafts, and vocational skills, in addition to science, humanities, and mathematics, will be incorporated throughout the school curriculum, with a consideration for what is interesting and safe at each age.

4.10. Each of the four stages of school education, in accordance with what may be possible in different regions, may consider moving towards a semester or any other system that allows the inclusion of shorter modules, or courses that are taught on alternate days, in order to allow an exposure to more subjects and enable greater flexibility. States may look into innovative methods to achieve these aims of greater flexibility and exposure to and enjoyment of a wider range of subjects, including across the arts, sciences, humanities, languages, sports, and vocational subjects.

Multilingualism and the power of language

4.11. It is well understood that young children learn and grasp nontrivial concepts more quickly in their home language/mother tongue. Home language is usually the same language as the mother tongue or that which is spoken by local communities. However, at times in multi-lingual families, there can be a home language spoken by other family members which may sometimes be different from mother tongue or local language. Wherever possible, the medium of instruction until at least Grade 5, but preferably till Grade 8 and beyond, will be the home language/mother tongue/local language/regional language. Thereafter, the home/local language shall continue to be taught as a language wherever possible. This will be followed by both public and private schools. High-quality textbooks, including in science, will be made available in home languages/mother tongue. All efforts will be made early on to ensure that any gaps that exist between the language spoken by the child and the medium of teaching are bridged. In cases where home language/mother tongue textbook material is not available, the language of transaction between teachers and students will still remain the home language/mother tongue wherever possible. Teachers will be encouraged to use a bilingual approach, including bilingual teaching-learning materials, with those students whose home language may be different from the medium of instruction. All languages will be taught with high quality to all students; a language does not need to be the medium of instruction for it to be taught and learned well.

4.12. As research clearly shows that children pick up languages extremely quickly between the ages of 2 and 8 and that multilingualism has great cognitive benefits to young students, children will be exposed to different languages early on (but with a particular emphasis on the mother tongue), starting from the Foundational Stage onwards. All languages will be taught in an enjoyable and interactive style, with plenty of interactive conversation, and with early reading and subsequently writing in the mother tongue in the early years, and with skills developed for reading and writing in other languages in Grade 3 and beyond. There will be a major effort from both the Central and State governments to invest in large numbers of language teachers in all regional languages around the country, and, in particular, for all languages mentioned in the Eighth Schedule of the Constitution of India. States, especially States from different regions of India, may enter into bilateral agreements to hire teachers in large numbers from each other, to satisfy the three-language formula in their respective States, and also to encourage the study of Indian languages across the country. Extensive use of technology will be made for teaching and learning of different languages and to popularize language learning.

4.13. The three-language formula will continue to be implemented while keeping in mind the Constitutional provisions, aspirations of the people, regions, and the Union, and the need to promote multilingualism as well as promote national unity. However, there will be a greater flexibility in the three-language formula, and no language will be imposed on any State. The three languages learned by children will be the choices of States, regions, and of course the students themselves, so long as at least two of the three languages are native to India. In particular, students who wish to change one or more of the three languages they are studying may do so in Grade 6 or 7, as long as they are able to demonstrate basic proficiency in three languages (including one language of India at the literature level) by the end of secondary school.

4.14. All efforts will be made in preparing high-quality bilingual textbooks and teaching-learning materials for science and mathematics, so that students are enabled to think and speak about the two subjects both in their home language/mother tongue and in English.

4.15. As so many developed countries around the world have amply demonstrated, being well educated in one's language, culture, and traditions is not a detriment but indeed a huge benefit to educational, social, and technological advancement. India's languages are among the richest, most scientific, most beautiful, and most expressive in the world, with a huge body of ancient as well as modern literature (both prose and poetry), film, and music written in these languages that help form India's national identity and wealth. For purposes of cultural enrichment as well as national integration, all young Indians should be aware of the rich and vast array of languages of their country, and the treasures that they and their literatures contain.

4.16. Thus, every student in the country will participate in a fun project/activity on 'The Languages of India', sometime in Grades 6-8, such as, under the *'Ek Bharat Shrestha Bharat'* initiative. In this project/activity, students will learn about the remarkable unity of most of the major Indian languages, starting with their common phonetic and scientifically-arranged alphabets and scripts, their common grammatical structures, their origins and sources of vocabularies from Sanskrit and other classical languages, as well as their rich inter-influences and differences. They will also learn what geographical areas speak which languages, get a sense of the nature and structure of tribal languages, and learn to say commonly spoken phrases and sentences in every major language of India and also learn a bit about the rich and uplifting literature of each (through suitable translations as necessary). Such an activity would give them both a sense of the unity and the beautiful cultural heritage and diversity of India and would be a wonderful icebreaker their whole lives as they meet people from other parts of India. This project/activity would be a joyful activity and would not involve any form of assessment.

4.17. The importance, relevance, and beauty of the classical languages and literature of India also cannot be overlooked. Sanskrit, while also an important modern language mentioned in the Eighth Schedule of the Constitution of India, possesses a classical literature that is greater in volume than that of Latin and Greek put together, containing vast treasures of mathematics, philosophy, grammar, music, politics, medicine, architecture, metallurgy, drama, poetry, storytelling, and more (known as 'Sanskrit Knowledge Systems'), written by people of various religions as well as non-religious people, and by people from all walks of life and a wide range of socio-economic backgrounds over thousands of years. Sanskrit will thus be offered at all levels of school and higher education as an important, enriching option for students, including as an option in the three-language formula. It will be taught in ways that are interesting and experiential as well as contemporarily relevant, including through the use of Sanskrit Knowledge Systems, and in particular through phonetics and pronunciation. Sanskrit textbooks at the foundational and middle school level may be written in Simple Standard Sanskrit (SSS) to teach Sanskrit through Sanskrit (STS) and make its study truly enjoyable.

4.18. India also has an extremely rich literature in other classical languages, including classical Tamil, Telugu, Kannada, Malayalam, Odia. In addition to these classical languages Pali, Persian, and Prakrit; and their works of literature too must be preserved for their richness and for the pleasure and enrichment of posterity. As India becomes a fully developed country, the next generation will want to

partake in and be enriched by India's extensive and beautiful classical literature. In addition to Sanskrit, other classical languages and literatures of India, including Tamil, Telugu, Kannada, Malayalam, Odia, Pali, Persian, and Prakrit, will also be widely available in schools as options for students, possibly as online modules, through experiential and innovative approaches, to ensure that these languages and literature stay alive and vibrant. Similar efforts will be made for all Indian languages having rich oral and written literatures, cultural traditions, and knowledge.

4.19. For the enrichment of the children, and for the preservation of these rich languages and their artistic treasures, all students in all schools, public or private, will have the option of learning at least two years of a classical language of India and its associated literature, through experiential and innovative approaches, including the integration of technology, in Grades 6-12, with the option to continue from the middle stage through the secondary stage and beyond.

4.20. In addition to high quality offerings in Indian languages and English, foreign languages, such as Korean, Japanese, Thai, French, German, Spanish, Portuguese, and Russian, will also be offered at the secondary level, for students to learn about the cultures of the world and to enrich their global knowledge and mobility according to their own interests and aspirations.

4.21. The teaching of all languages will be enhanced through innovative and experiential methods, including through gamification and apps, by weaving in the cultural aspects of the languages - such as films, theatre, storytelling, poetry, and music - and by drawing connections with various relevant subjects and with real-life experiences. Thus, the teaching of languages will also be based on experiential-learning pedagogy.

4.22. Indian Sign Language (ISL) will be standardized across the country, and National and State curriculum materials developed, for use by students with hearing impairment. Local sign languages will be respected and taught as well, where possible and relevant.

Curricular Integration of Essential Subjects, Skills, and Capacities

4.23. While students must have a large amount of flexibility in choosing their individual curricula, certain subjects, skills, and capacities should be learned by all students to become good, successful, innovative, adaptable, and productive human beings in today's rapidly changing world. In addition to proficiency in languages, these skills include: scientific temper and evidence-based thinking; creativity and innovativeness; sense of aesthetics and art; oral and written communication; health and nutrition; physical education, fitness, wellness, and sports; collaboration and teamwork; problem solving and logical reasoning; vocational exposure and skills; digital literacy, coding, and computational thinking; ethical and moral reasoning; knowledge and practice of human and Constitutional values; gender sensitivity; Fundamental Duties; citizenship skills and values; knowledge of India; environmental awareness including water and resource conservation, sanitation and hygiene; and current affairs and knowledge of critical issues facing local communities, States, the country, and the world.

4.24. Concerted curricular and pedagogical initiatives, including the introduction of contemporary subjects such as Artificial Intelligence, Design Thinking, Holistic Health, Organic Living, Environmental Education, Global Citizenship Education (GCED), etc. at relevant stages will be undertaken to develop these various important skills in students at all levels.

4.25. It is recognized that mathematics and mathematical thinking will be very important for India's future and India's leadership role in the numerous upcoming fields and professions that will involve artificial intelligence, machine learning, and data science, etc. Thus, mathematics and computational thinking will be given increased emphasis throughout the school years, starting with the foundational stage, through a variety of innovative methods, including the regular use of puzzles and games that make mathematical thinking more enjoyable and engaging. Activities involving coding will be introduced in Middle Stage.

4.26. Every student will take a fun course, during Grades 6-8, that gives a survey and hands-on experience of a sampling of important vocational crafts, such as carpentry, electric work, metal work, gardening, pottery making, etc., as decided by States and local communities and as mapped by local skilling needs. A practice-based curriculum for Grades 6-8 will be appropriately designed by NCERT while framing the NCFSE 2020-21. All students will participate in a 10-day bagless period sometime during Grades 6-8 where they intern with local vocational experts such as carpenters, gardeners, potters, artists, etc. Similar internship opportunities to learn vocational subjects may be made available to students throughout Grades 6-12, including holiday periods. Vocational courses through online mode will also be made available. Bagless days will be encouraged throughout the year for various types of enrichment activities involving arts, quizzes, sports, and vocational crafts. Children will be given periodic exposure to activities outside school through visits to places/monuments of historical, cultural and tourist importance, meeting local artists and craftsmen and visits higher educational institutions in their village/Tehsil/District/State.

4.27. "Knowledge of India" will include knowledge from ancient India and its contributions to modern India and its successes and challenges, and a clear sense of India's future aspirations with regard to education, health, environment, etc. These elements will be incorporated in an accurate and scientific manner throughout the school curriculum wherever relevant; in particular, Indian Knowledge Systems, including tribal knowledge and indigenous and traditional ways of learning, will be covered and included in mathematics, astronomy, philosophy, yoga, architecture, medicine, agriculture, engineering, linguistics, literature, sports, games, as well as in governance, polity, conservation. Specific courses in tribal ethno-medicinal practices, forest management, traditional (organic) crop cultivation, natural farming, etc. will also be made available. An engaging course on Indian Knowledge Systems will also be available to students in secondary school as an elective. Competitions may be held in schools for learning various topics and subjects through fun and indigenous games. Video documentaries on inspirational luminaries of India, ancient and modern, in science and beyond, will be shown at appropriate points throughout the school curriculum. Students will be encouraged to visit different States as part of cultural exchange programmes.

4.28. Students will be taught at a young age the importance of "doing what's right", and will be given a logical framework for making ethical decisions. In later years, this would then be expanded along themes of cheating, violence, plagiarism, littering, tolerance, equality, empathy, etc., with a view to enabling children to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. As consequences of such basic ethical reasoning, traditional Indian values and all basic human and Constitutional values (such as *seva, ahimsa, swachchhata, satya, nishkam karma, shanti*, sacrifice, tolerance, diversity, pluralism, righteous conduct, gender sensitivity, respect for elders, respect for all people and their inherent capabilities regardless of background, respect for environment, helpfulness, courtesy, patience, forgiveness, empathy, compassion, patriotism, democratic outlook, integrity, responsibility, justice, liberty, equality, and fraternity) will be developed in all students. Children will have the opportunity to read and learn from the original stories of the Panchatantra, Jataka, Hitopadesh, and other fun fables and inspiring tales from the Indian tradition and learn about their influences on global literature. Excerpts from the Indian Constitution will also be considered essential reading for all students. Basic training in health, including preventive health, mental health, good nutrition, personal and public hygiene, disaster response and first-aid will also be included in the curriculum, as well as scientific explanations of the detrimental and damaging effects of alcohol, tobacco, and other drugs.

4.29. All curriculum and pedagogy, from the foundational stage onwards, will be redesigned to be strongly rooted in the Indian and local context and ethos in terms of culture, traditions, heritage, customs, language, philosophy, geography, ancient and contemporary knowledge, societal and scientific needs, indigenous and traditional ways of learning etc. – in order to ensure that education is maximally relatable, relevant, interesting, and effective for our students. Stories, arts, games, sports, examples, problems, etc. will be chosen as much as possible to be rooted in the Indian and local geographic context. Ideas, abstractions, and creativity will indeed best flourish when learning is thus rooted.

National Curriculum Framework for School Education (NCFSE)

4.30. The formulation of a new and comprehensive National Curricular Framework for School Education, NCFSE 2020-21, will be undertaken by the NCERT - based on the principles of this National Education Policy 2020, frontline curriculum needs, and after discussions with all stakeholders including State Governments, Ministries, relevant Departments of the Central Government, and other expert bodies, and will be made available in all regional languages. The NCFSE document shall henceforth be revisited and updated once every 5-10 years, taking into account frontline curriculum.

National Textbooks with Local Content and Flavour

4.31. The reduction in content and increased flexibility of school curriculum - and the renewed emphasis on constructive rather than rote learning - must be accompanied by parallel changes in school textbooks. All textbooks shall aim to contain the essential core material (together with discussion, analysis, examples, and applications) deemed important on a national level, but at the same time contain any desired nuances and supplementary material as per local contexts and needs. Where possible, schools and teachers will also have choices in the textbooks they employ - from among a set of textbooks that contain the requisite national and local material - so that they may teach in a manner that is best suited to their own pedagogical styles as well as to their students and communities' needs.

4.32. The aim will be to provide such quality textbooks at the lowest possible cost -namely, at the cost of production/printing - in order to mitigate the burden of textbook prices on the students and on the educational system. This may be accomplished by using high-quality textbook materials developed by NCERT in conjunction with the SCERTs; additional textbook materials could be funded by public-philanthropic partnerships and crowd sourcing that incentivize experts to write such high-quality textbooks at cost price. States will prepare their own curricula (which may be based on the NCFSE prepared by NCERT to the extent possible) and prepare textbooks (which may be based on the NCERT textbook materials to the extent possible), incorporating State flavour and material as needed. While doing so, it must be borne in mind that NCERT curriculum would be taken as the nationally acceptable criterion. The availability of such textbooks in all regional languages will be a top priority so that all students have access to high-quality learning. All efforts will be made to ensure timely availability of textbooks in schools. Access to downloadable and printable versions of all textbooks will be provided by all States/UTs and NCERT to help conserve the environment and reduce the logistical burden.

4.33. Concerted efforts, through suitable changes in curriculum and pedagogy, will be made by NCERT, SCERTs, schools, and educators to significantly reduce the weight of school bags and textbooks.

Transforming Assessment for Student Development

4.34. The aim of assessment in the culture of our schooling system will shift from one that is summative and primarily tests rote memorization skills to one that is more regular and formative, is more competency-based, promotes learning and development for our students, and tests higher-order skills, such as analysis, critical thinking, and conceptual clarity. The primary purpose of assessment will indeed be for learning; it will help the teacher and student, and the entire schooling system, continuously revise teaching-learning processes to optimize learning and development for all students. This will be the underlying principle for assessment at all levels of education.

4.35. The progress card of all students for school-based assessment, which is communicated by schools to parents, will be completely redesigned by States/UTs under guidance from the proposed National Assessment Centre, NCERT, and SCERTs. The progress card will be a holistic, 360-degree, multidimensional report that reflects in great detail the progress as well as the uniqueness of each

learner in the cognitive, affective, and psychomotor domains. It will include self-assessment and peer assessment, and progress of the child in project-based and inquiry-based learning, quizzes, role plays, group work, portfolios, etc., along with teacher assessment. The holistic progress card will form an important link between home and school and will be accompanied by parent-teacher meetings in order to actively involve parents in their children's holistic education and development. The progress card would also provide teachers and parents with valuable information on how to support each student in and out of the classroom. AI-based software could be developed and used by students to help track their growth through their school years based on learning data and interactive questionnaires for parents, students, and teachers, in order to provide students with valuable information on their strengths, areas of interest, and needed areas of focus, and to thereby help them make optimal career choices.

4.36. The current nature of secondary school exams, including Board exams and entrance exams - and the resulting coaching culture of today - are doing much harm, especially at the secondary school level, replacing valuable time for true learning with excessive exam coaching and preparation. These exams also force students to learn a very narrow band of material in a single stream, rather than allowing the flexibility and choice that will be so important in the education system of the future.

4.37. While the Board exams for Grades 10 and 12 will be continued, the existing system of Board and entrance examinations shall be reformed to eliminate the need for undertaking coaching classes. To reverse these harmful effects of the current assessment system, Board exams will be redesigned to encourage holistic development; students will be able to choose many of the subjects in which they take Board exams, depending on their individualized interests. Board exams will also be made 'easier', in the sense that they will test primarily core capacities/competencies rather than months of coaching and memorization; any student who has been going to and making a basic effort in a school class will be able to pass and do well in the corresponding subject Board Exam without much additional effort. To further eliminate the 'high stakes' aspect of Board Exams, all students will be allowed to take Board Exams on up to two occasions during any given school year, one main examination and one for improvement, if desired.

4.38. In addition to introducing greater flexibility, student choice, and best-of-two attempts, assessments that primarily test core capacities must be the immediate key reforms to all Board exams. Boards may over time also develop further viable models of Board Exams that reduce pressure and the coaching culture. Some possibilities include: a system of annual/semester/modular Board Exams could be developed - that each test far less material, and are taken immediately after the corresponding course is taken in school - so that the pressure from exams is better distributed, less intense, and less high-stakes across the Secondary Stage; all subjects and corresponding assessments, beginning with mathematics, could be offered at two levels, with students doing some of their subjects at the standard level and some at a higher level; and Board exams in certain subjects could be redesigned to have two parts – one part of an objective type with multiple-choice questions and the other of a descriptive type.

4.39. With regard to all of the above, guidelines will be prepared by NCERT, in consultation with major stakeholders, such as SCERTs, Boards of Assessment (BoAs), the proposed new National Assessment Centre etc., and teachers prepared, for a transformation in the assessment system by the 2022-23 academic session, to align with the NCFSE 2020-21.

4.40. To track progress throughout the school years, and not just at the end of Grades 10 and 12 - for the benefit of students, parents, teachers, principals, and the entire schooling system in planning improvements to schools and teaching-learning processes - all students will take school examinations in Grades 3, 5, and 8 which will be conducted by the appropriate authority. These examinations would test achievement of basic learning outcomes, through assessment of core concepts and knowledge from the national and local curricula, along with relevant higher-order skills and application of knowledge in real-life situations, rather than rote memorization. The Grade 3 examination, in particular, would test basic literacy, numeracy, and other foundational skills. The results of school examinations will be used only for developmental purposes of the school education

system, including for public disclosure by schools of their overall (anonymized) student outcomes, and for continuous monitoring and improvement of the schooling system.

4.41. It is proposed to set up a National Assessment Centre, PARAKH (Performance Assessment, Review, and Analysis of Knowledge for Holistic Development), as a standard-setting body under MHRD that fulfils the basic objectives of setting norms, standards, and guidelines for student assessment and evaluation for all recognized school boards of India, guiding the State Achievement Survey (SAS) and undertaking the National Achievement Survey (NAS), monitoring achievement of learning outcomes in the country, and encouraging and helping school boards to shift their assessment patterns towards meeting the skill requirements of the 21st century in consonance with the stated objectives of this Policy. This Centre will also advise school boards regarding new assessment patterns and latest researches, promote collaborations between school boards. It will also become an instrument for the sharing of best practices among school boards, and for ensuring equivalence of academic standards among learners across all school boards.

4.42. The principles for university entrance exams will be similar. The National Testing Agency (NTA) will work to offer a high-quality common aptitude test, as well as specialized common subject exams in the sciences, humanities, languages, arts, and vocational subjects, at least twice every year. These exams shall test conceptual understanding and the ability to apply knowledge and shall aim to eliminate the need for taking coaching for these exams. Students will be able to choose the subjects for taking the test, and each university will be able to see each student's individual subject portfolio and admit students into their programmes based on individual interests and talents. The NTA will serve as a premier, expert, autonomous testing organization to conduct entrance examinations for undergraduate and graduate admissions and fellowships in higher education institutions. The high quality, range, and flexibility of the NTA testing services will enable most universities to use these common entrance exams - rather than having hundreds of universities each devising their own entrance exams - thereby drastically reducing the burden on students, universities and colleges, and the entire education system. It will be left up to individual universities and colleges to use NTA assessments for their admissions.

Support for Gifted Students/Students with Special Talents

4.43. There are innate talents in every student, which must be discovered, nurtured, fostered, and developed. These talents may express themselves in the form of varying interests, dispositions, and capacities. Those students that show particularly strong interests and capacities in a given realm must be encouraged to pursue that realm beyond the general school curriculum. Teacher education will include methods for the recognition and fostering of such student talents and interests. The NCERT and NCTE will develop guidelines for the education of gifted children. B.Ed. programmes may also allow a specialization in the education of gifted children.

4.44. Teachers will aim to encourage students with singular interests and/or talents in the classroom by giving them supplementary enrichment material and guidance and encouragement. Topic-centered and Project-based Clubs and Circles will be encouraged and supported at the levels of schools, school complexes, districts, and beyond. Examples include Science Circles, Math Circles, Music & Dance Performance Circles, Chess Circles, Poetry Circles, Language Circles, Drama Circles, Debate Circles, Sports Circles, Eco-Clubs, Health & Well-being Clubs/ Yoga Clubs and so on. Along these lines, high-quality national residential summer programmes for secondary school students in various subjects will also be encouraged, with a rigorous merit-based but equitable admission process to attract the very best students and teachers from across the country including from socio-economically disadvantaged groups.

4.45. Olympiads and competitions in various subjects will be conducted across the country, with clear coordination and progression from school to local to state to national levels, to ensure that all students may participate at all levels for which they qualify. Efforts will be made to make these available in rural areas and in regional languages to ensure widespread participation. Public and private universities, including premier institutions like the IITs and NITs, would be encouraged to use merit-

based results from National, and International Olympiads, and results from other relevant national programmes, as part of the criteria for admissions into their undergraduate programmes.

4.46. Once internet-connected smart phones or tablets are available in all homes and/or schools, online apps with quizzes, competitions, assessments, enrichment materials, and online communities for shared interests will be developed, and will work to enhance all the aforementioned initiatives, as group activities for students with appropriate supervision of parents and teachers. Schools will develop smart classrooms, in a phased manner, for using digital pedagogy and thereby enriching the teaching-learning process with online resources and collaborations.

5. Teachers

5.1. Teachers truly shape the future of our children - and, therefore, the future of our nation. It is because of this noblest role that the teacher in India was the most respected member of society. Only the very best and most learned became teachers. Society gave teachers, or gurus, what they needed to pass on their knowledge, skills, and ethics optimally to students. The quality of teacher education, recruitment, deployment, service conditions, and empowerment of teachers is not where it should be, and consequently the quality and motivation of teachers does not reach the desired standards. The high respect for teachers and the high status of the teaching profession must be restored so as to inspire the best to enter the teaching profession. The motivation and empowerment of teachers is required to ensure the best possible future for our children and our nation.

Recruitment and Deployment

5.2. To ensure that outstanding students enter the teaching profession - especially from rural areas - a large number of merit-based scholarships shall be instituted across the country for studying quality 4-year integrated B.Ed. programmes. In rural areas, special merit-based scholarships will be established that also include preferential employment in their local areas upon successful completion of their B.Ed. programmes. Such scholarships will provide local job opportunities to local students, especially female students, so that these students serve as local-area role models and as highly qualified teachers who speak the local language. Incentives will be provided for teachers to take up teaching jobs in rural areas, especially in areas that are currently facing acute shortage of quality teachers. A key incentive for teaching in rural schools will be the provision of local housing near or on the school premises or increased housing allowances.

5.3. The harmful practice of excessive teacher transfers will be halted, so that students have continuity in their role models and educational environments. Transfers will occur in very special circumstances, as suitably laid down in a structured manner by State/UT governments. Furthermore, transfers will be conducted through an online computerized system that ensures transparency.

5.4. Teacher Eligibility Tests (TETs) will be strengthened to inculcate better test material, both in terms of content and pedagogy. The TETs will also be extended to cover teachers across all stages (Foundational, Preparatory, Middle and Secondary) of school education. For subject teachers, suitable TET or NTA test scores in the corresponding subjects will also be taken into account for recruitment. To gauge passion and motivation for teaching, a classroom demonstration or interview will become an integral part of teacher hiring at schools and school complexes. These interviews would also be used to assess comfort and proficiency in teaching in the local language, so that every school/school complex has at least some teachers who can converse with students in the local language and other prevalent home languages of students. Teachers in private schools also must have qualified similarly through TET, a demonstration/interview, and knowledge of local language(s).

5.5. To ensure an adequate number of teachers across subjects - particularly in subjects such as art, physical education, vocational education, and languages - teachers could be recruited to a school or school complex and the sharing of teachers across schools could be considered in accordance with the grouping-of-schools adopted by State/UT governments.

5.6. Schools/school complexes will be encouraged to hire local eminent persons or experts as 'master instructors' in various subjects, such as in traditional local arts, vocational crafts, entrepreneurship, agriculture, or any other subject where local expertise exists, to benefit students and help preserve and promote local knowledge and professions.

5.7. A technology-based comprehensive teacher-requirement planning forecasting exercise will be conducted by each State to assess expected subject-wise teacher vacancies over the next two decades. The above described initiatives in recruitment and deployment will be scaled as needed over time, to fill all vacancies with qualified teachers, including local teachers, with suitable incentives for career management and progression as described below. Teacher education programmes and offerings will also align with the vacancies thus projected.

Service Environment and Culture

5.8. The primary goal of overhauling the service environment and culture of schools will be to maximize the ability of teachers to do their jobs effectively, and to ensure that they are part of vibrant, caring, and inclusive communities of teachers, students, parents, principals, and other support staff, all of whom share a common goal: to ensure that our children are learning.

5.9. The first requirement in this direction will be to ensure decent and pleasant service conditions at schools. Adequate and safe infrastructure, including working toilets, clean drinking water, clean and attractive spaces, electricity, computing devices, internet, libraries, and sports and recreational resources will be provided to all schools to ensure that teachers and students, including children of all genders and children with disabilities, receive a safe, inclusive, and effective learning environment and are comfortable and inspired to teach and learn in their schools. In-service training will have inputs on safety, health and environment at workplace in schools to ensure that all teachers are sensitized to these requirements.

5.10. State/UT Governments may adopt innovative formats, such as school complex, rationalization of schools, without in any way reducing accessibility, for effective school governance, resource sharing, and community building. The creation of school complexes could go a long way towards building vibrant teacher communities. The hiring of teachers to school complexes could automatically create relationships among schools across the school complex; it would also help ensure excellent subject-wise distribution of teachers, creating a more vibrant teacher knowledge base. Teachers at very small schools will not remain isolated any longer and may become part of and work with larger school complex communities, sharing best practices with each other and working collaboratively to ensure that all children are learning. School complexes could also share counsellors, trained social workers, technical and maintenance staff, etc. to further support teachers and help create an effective learning environment.

5.11. In collaboration with parents and other key local stakeholders, teachers will also be more involved in the governance of schools/school complexes, including as members of the School Management Committees/School Complex Management Committees.

5.12. To prevent the large amounts of time spent currently by teachers on non-teaching activities, teachers will not be engaged any longer in work that is not directly related to teaching; in particular, teachers will not be involved in strenuous administrative tasks and more than a rationalized minimum time for mid-day meal related work, so that they may fully concentrate on their teaching-learning duties.

5.13. To help ensure that schools have positive learning environments, the role expectations of principals and teachers will explicitly include developing a caring and inclusive culture at their schools, for effective learning and the benefit of all stakeholders.

5.14. Teachers will be given more autonomy in choosing aspects of pedagogy, so that they may teach in the manner they find most effective for the students in their classrooms. Teachers will also focus

on socio-emotional learning - a critical aspect of any student's holistic development. Teachers will be recognized for novel approaches to teaching that improve learning outcomes in their classrooms.

Continuous Professional Development (CPD)

5.15. Teachers will be given continuous opportunities for self-improvement and to learn the latest innovations and advances in their professions. These will be offered in multiple modes, including in the form of local, regional, state, national, and international workshops as well as online teacher development modules. Platforms (especially online platforms) will be developed so that teachers may share ideas and best practices. Each teacher will be expected to participate in at least 50 hours of CPD opportunities every year for their own professional development, driven by their own interests. CPD opportunities will, in particular, systematically cover the latest pedagogies regarding foundational literacy and numeracy, formative and adaptive assessment of learning outcomes, competency-based learning, and related pedagogies, such as experiential learning, arts-integrated, sports-integrated, and storytelling-based approaches, etc.

5.16. School Principals and school complex leaders will have similar modular leadership/management workshops and online development opportunities and platforms to continuously improve their own leadership and management skills, and so that they too may share best practices with each other. Such leaders will also be expected to participate in 50 hours or more of CPD modules per year, covering leadership and management, as well as content and pedagogy with a focus on preparing and implementing pedagogical plans based on competency-based education.

Career Management and Progression (CMP)

5.17. Teachers doing outstanding work must be recognized and promoted, and given salary raises, to incentivize all teachers to do their best work. Therefore, a robust merit-based structure of tenure, promotion, and salary structure will be developed, with multiple levels within each teacher stage, that incentivizes and recognizes outstanding teachers. A system of multiple parameters for proper assessment of performance will be developed for the same by State/UT Governments that is based on peer reviews, attendance, commitment, hours of CPD, and other forms of service to the school and the community or based on NPST given in Para 5.20. In this Policy, in the context of careers, 'tenure' refers to confirmation for permanent employment, after due assessment of performance and contribution, while 'tenure track' refers to the period of probation preceding tenure.

5.18. Further, it will be ensured that career growth (in terms of tenure, promotions, salary increases, etc.) is available to teachers within a single school stage (i.e., Foundational, Preparatory, Middle, or Secondary), and that there is no career progression-related incentive to move from being teachers in early stages to later stages or vice versa (though such career moves across stages will be allowed, provided the teacher has the desire and qualifications for such a move). This is to support the fact that all stages of school education will require the highest-quality teachers, and no stage will be considered more important than any other.

5.19. Vertical mobility of teachers based on merit will also be paramount; outstanding teachers with demonstrated leadership and management skills would be trained over time to take on academic leadership positions in schools, school complexes, BRCs, CRCs, BITEs, DIETs as well as relevant government departments.

Professional Standards for Teachers

5.20. A common guiding set of National Professional Standards for Teachers (NPST) will be developed by 2022, by the National Council for Teacher Education in its restructured new form as a Professional Standard Setting Body (PSSB) under the General Education Council (GEC), in consultation with NCERT, SCERTs, teachers from across levels and regions, expert organizations in teacher preparation and development, expert bodies in vocational education, and higher education institutions. The standards would cover expectations of the role of the teacher at different levels of expertise/stage, and the competencies required for that stage. It will also comprise standards for

performance appraisal, for each stage, that would be carried out on a periodic basis. The NPST will also inform the design of pre-service teacher education programmes. This could be then adopted by States and determine all aspects of teacher career management, including tenure, professional development efforts, salary increases, promotions, and other recognitions. Promotions and salary increases will not occur based on the length of tenure or seniority, but only on the basis of such appraisal. The professional standards will be reviewed and revised in 2030, and thereafter every ten years, on the basis of rigorous empirical analysis of the efficacy of the system.

Special educators

5.21. There is an urgent need for additional special educators for certain areas of school education. Some examples of such specialist requirements include subject teaching for children with disabilities/*Divyang* children at the Middle and Secondary school level, including teaching for specific learning disabilities. Such teachers would require not only subject-teaching knowledge and understanding of subject-related aims of education, but also the relevant skills for understanding of special requirements of children. Therefore, such areas could be developed as secondary specializations for subject teachers or generalist teachers, during or after pre-service teacher preparation. They will be offered as certificate courses, in the pre-service as well as in-service mode, either full time or as part-time/blended courses - again, necessarily, at multidisciplinary colleges or universities. Greater synergy will be enabled between the course curriculum of NCTE and RCI to ensure adequate availability of qualified special educators who can handle subject teaching as well.

Approach to Teacher Education

5.22. Recognizing that the teachers will require training in high-quality content as well as pedagogy, teacher education will gradually be moved by 2030 into multidisciplinary colleges and universities. As colleges and universities all move towards becoming multidisciplinary, they will also aim to house outstanding education departments that offer B.Ed., M.Ed., and Ph.D. degrees in education.

5.23. By 2030, the minimum degree qualification for teaching will be a 4-year integrated B.Ed. degree that teaches a range of knowledge content and pedagogy and includes strong practicum training in the form of student-teaching at local schools. The 2-year B.Ed. programmes will also be offered, by the same multidisciplinary institutions offering the 4-year integrated B.Ed., and will be intended only for those who have already obtained Bachelor's Degrees in other specialized subjects. These B.Ed. programmes may also be suitably adapted as 1-year B.Ed. programmes, and will be offered only to those who have completed the equivalent of 4-year multidisciplinary Bachelor's Degrees or who have obtained a Master's degree in a specialty and wish to become a subject teacher in that specialty. All such B.Ed. degrees would be offered only by accredited multidisciplinary higher education institutions offering 4-year integrated B.Ed. programmes. Multidisciplinary higher education institutions offering the 4-year in-class integrated B.Ed. programme and having accreditation for ODL may also offer high-quality B.Ed. programmes in blended or ODL mode to students in remote or difficult-to-access locations and also to in-service teachers who are aiming to enhance their qualification, with suitable robust arrangements for mentoring and for the practicum-training and student-teaching components of the programme.

5.24. All B.Ed. programmes will include training in time-tested as well as the most recent techniques in pedagogy, including pedagogy with respect to foundational literacy and numeracy, multi-level teaching and evaluation, teaching children with disabilities, teaching children with special interests or talents, use of educational technology, and learner-centered and collaborative learning. All B.Ed. programmes will include strong practicum training in the form of in-classroom teaching at local schools. All B.Ed. programmes will also emphasize the practice of the Fundamental Duties (Article 51A) of the Indian Constitution along with other Constitutional provisions while teaching any subject or performing any activity. It will also appropriately integrate environmental awareness and sensitivity towards its conservation and sustainable development, so that environment education becomes an integral part of school curricula.

5.25. Special shorter local teacher education programmes will also be available at BITEs, DIETs, or at school complexes themselves for eminent local persons who can be hired to teach at schools or school complexes as 'master instructors', for the purpose of promoting local professions, knowledge, and skills, e.g., local art, music, agriculture, business, sports, carpentry, and other vocational crafts.

5.26. Shorter post-B.Ed. certification courses will also be made widely available, at multidisciplinary colleges and universities, to teachers who may wish to move into more specialized areas of teaching, such as the teaching of students with disabilities, or into leadership and management positions in the schooling system, or to move from one stage to another between foundational, preparatory, middle, and secondary stages.

5.27. It is recognized that there may be several pedagogical approaches internationally for teaching particular subjects; NCERT will study, research, document, and compile the varied international pedagogical approaches for teaching different subjects and make recommendations on what can be learnt and assimilated from these approaches into the pedagogies being practiced in India.

5.28. By 2021, a new and comprehensive National Curriculum Framework for Teacher Education, NCFTE 2021, will be formulated by the NCTE in consultation with NCERT, based on the principles of this National Education Policy 2020. The framework will be developed after discussions with all stakeholders including State Governments, relevant Ministries/Departments of Central Government and various expert bodies, and will be made available in all regional languages. The NCFTE 2021 will also factor in the requirements of teacher education curricula for vocational education. The NCFTE will thereafter be revised once every 5-10 years by reflecting the changes in revised NCFs as well as emerging needs in teacher education.

5.29. Finally, in order to fully restore the integrity of the teacher education system, stringent action will be taken against substandard stand-alone Teacher Education Institutions (TEIs) running in the country, including shutting them down, if required.

6. Equitable and Inclusive Education: Learning for All

6.1. Education is the single greatest tool for achieving social justice and equality. Inclusive and equitable education - while indeed an essential goal in its own right - is also critical to achieving an inclusive and equitable society in which every citizen has the opportunity to dream, thrive, and contribute to the nation. The education system must aim to benefit India's children so that no child loses any opportunity to learn and excel because of circumstances of birth or background. This Policy reaffirms that bridging the social category gaps in access, participation, and learning outcomes in school education will continue to be one of the major goals of all education sector development programmes. This Chapter may be read in conjunction with Chapter 14 which discusses analogous issues of Equity and Inclusion in Higher Education.

6.2. While the Indian education system and successive government policies have made steady progress towards bridging gender and social category gaps in all levels of school education, large disparities still remain - especially at the secondary level - particularly for socio-economically disadvantaged groups that have been historically underrepresented in education. Socio-Economically Disadvantaged Groups (SEDGs) can be broadly categorized based on gender identities (particularly female and transgender individuals), socio-cultural identities (such as Scheduled Castes, Scheduled Tribes, OBCs, and minorities), geographical identities (such as students from villages, small towns, and aspirational districts), disabilities (including learning disabilities), and socio-economic conditions (such as migrant communities, low income households, children in vulnerable situations, victims of or children of victims of trafficking, orphans including child beggars in urban areas, and the urban poor). While overall enrolments in schools decline steadily from Grade 1 to Grade 12, this decline in enrolments is significantly more pronounced for many of these SEDGs, with even greater declines for female students within each of these SEDGs and often even steeper in higher education. A brief status overview of the SEDGs that come within socio-cultural identities is given in following sub-sections.

6.2.1. According to U-DISE 2016-17 data, about 19.6% of students belong to Scheduled Castes at the primary level, but this fraction falls to 17.3% at the higher secondary level. These enrolment drop-offs are more severe for Scheduled Tribes students (10.6% to 6.8%), and differently-abled children (1.1% to 0.25%), with even greater declines for female students within each of these categories. The decline in enrolment in higher education is even steeper.

6.2.2. A multiplicity of factors, including lack of access to quality schools, poverty, social mores & customs, and language have had a detrimental effect on rates of enrolment and retention among the Scheduled Castes. Bridging these gaps in access, participation, and learning outcomes of children belonging to Scheduled Castes will continue to be one of the major goals. Also, the Other Backward Classes (OBCs) which have been identified on the basis of historically being socially and educationally backward also need special focus.

6.2.3. Tribal communities and children from Scheduled Tribes also face disadvantages at multiple levels due to various historical and geographical factors. Children from tribal communities often find their school education irrelevant and foreign to their lives, both culturally and academically. While several programmatic interventions to uplift children from tribal communities are currently in place, and will continue to be pursued, special mechanisms need to be made to ensure that children belonging to tribal communities receive the benefits of these interventions.

6.2.4. Minorities are also relatively underrepresented in school and higher education. The Policy acknowledges the importance of interventions to promote education of children belonging to all minority communities, and particularly those communities that are educationally underrepresented.

6.2.5. The Policy also recognizes the importance of creating enabling mechanisms for providing Children With Special Needs (CWSN) or *Divyang*, the same opportunities of obtaining quality education as any other child.

6.2.6. Separate strategies will be formulated for focused attention on reducing the social category gaps in school education as outlined in the following sub-sections.

6.3. The critical problems and recommendations regarding ECCE, foundational literacy and numeracy, access, enrolment and attendance discussed in Chapters 1–3, are particularly relevant and important for underrepresented and disadvantaged groups. Therefore, the measures from Chapters 1–3 will be targeted in a concerted way for SEDGs.

6.4. In addition, there have been various successful policies and schemes such as targeted scholarships, conditional cash transfers to incentivize parents to send their children to school, providing bicycles for transport, etc., that have significantly increased participation of SEDGs in the schooling system in certain areas. These successful policies and schemes must be significantly strengthened across the country.

6.5. It will also be essential to take into account research that ascertains which measures are particularly effective for certain SEDGs. For example, providing bicycles and organizing cycling and walking groups to provide access to school have been shown to be particularly powerful methods in increasing participation of female students - even at lesser distances - because of the safety benefits and comfort to parents that they provide. One-on-one teachers and tutors, peer tutoring, open schooling, appropriate infrastructure, and suitable technological interventions to ensure access can be particularly effective for certain children with disabilities. Schools providing quality ECCE reap the greatest dividends for children who come from families that are economically disadvantaged. Meanwhile, counsellors and/or well-trained social workers that work with and connect with students, parents, schools, and teachers in order to improve attendance and learning outcomes have been found to be especially effective for children in urban poor areas.

6.6. Data shows that certain geographical areas contain significantly larger proportions of SEDGs. Also, there are geographical locations that have been identified as Aspirational Districts which require special interventions for promoting their educational development. Hence, it is recommended that regions of the country with large populations from educationally-disadvantaged SEDGs should be declared Special Education Zones (SEZs), where all the schemes and policies are implemented to the maximum through additional concerted efforts, in order to truly change their educational landscape.

6.7. It must be noted that women cut across all underrepresented groups, making up about half of all SEDGs. Unfortunately, the exclusion and inequity that SEDGs face is only amplified for the women in these SEDGs. The policy additionally recognizes the special and critical role that women play in society and in shaping social mores; therefore, providing a quality education to girls is the best way to increase the education levels for these SEDGs, not just in the present but also in future generations. The policy thus recommends that the policies and schemes designed to include students from SEDGs should be especially targeted towards girls in these SEDGs.

6.8. In addition, the Government of India will constitute a 'Gender-Inclusion Fund' to build the nation's capacity to provide equitable quality education for all girls as well as transgender students. The fund will be available to States to implement priorities determined by the Central government critical for assisting female and transgender children in gaining access to education (such as the provisions of sanitation and toilets, bicycles, conditional cash transfers, etc.); funds will also enable States to support and scale effective community-based interventions that address local context-specific barriers to female and transgender children's access to and participation in education. Similar 'Inclusion Fund' schemes shall also be developed to address analogous access issues for other SEDGs. In essence, this Policy aims to eliminate any remaining disparity in access to education (including vocational education) for children from any gender or other socio-economically disadvantaged group.

6.9. Free boarding facilities will be built - matching the standard of Jawahar Navodaya Vidyalayas - in school locations where students may have to come from far, and particularly for students who from socio-economically disadvantaged backgrounds, with suitable arrangements for the safety of all children, especially girls. Kasturba Gandhi Balika Vidyalayas will be strengthened and expanded to increase the participation in quality schools (up to Grade 12) of girls from socio-economically disadvantaged backgrounds. Additional Jawahar Navodaya Vidyalayas and Kendriya Vidyalayas will be built around the country, especially in aspirational districts, Special Education Zones, and other disadvantaged areas, to increase high-quality educational opportunities. Pre-school sections covering at least one year of early childhood care and education will be added to Kendriya Vidyalayas and other primary schools around the nation, particularly in disadvantaged areas.

6.10. Ensuring the inclusion and equal participation of children with disabilities in ECCE and the schooling system will also be accorded the highest priority. Children with disabilities will be enabled to fully participate in the regular schooling process from the Foundational Stage to higher education. The Rights of Persons with Disabilities (RPWD) Act 2016 defines inclusive education as a 'system of education wherein students with and without disabilities learn together and the system of teaching and learning is suitably adapted to meet the learning needs of different types of students with disabilities'. This Policy is in complete consonance with the provisions of the RPWD Act 2016 and endorses all its recommendations with regard to school education. While preparing the National Curriculum Framework, NCERT will ensure that consultations are held with expert bodies such as National Institutes of DEPwD.

6.11. To this end, schools/school complexes will be provided resources for the integration of children with disabilities, recruitment of special educators with cross-disability training, and for the establishment of resource centres, wherever needed, especially for children with severe or multiple disabilities. Barrier free access for all children with disabilities will be enabled as per the RPWD Act. Different categories of children with disabilities have differing needs. Schools and school complexes will work and be supported for providing all children with disabilities accommodations and support

mechanisms tailored to suit their needs and to ensure their full participation and inclusion in the classroom. In particular, assistive devices and appropriate technology-based tools, as well as adequate and language-appropriate teaching-learning materials (e.g., textbooks in accessible formats such as large print and Braille) will be made available to help children with disabilities integrate more easily into classrooms and engage with teachers and their peers. This will apply to all school activities including arts, sports, and vocational education. NIOS will develop high-quality modules to teach Indian Sign Language, and to teach other basic subjects using Indian Sign Language. Adequate attention will be paid to the safety and security of children with disabilities.

6.12. As per the RPWD Act 2016, children with benchmark disabilities shall have the choice of regular or special schooling. Resource centres in conjunction with special educators will support the rehabilitation and educational needs of learners with severe or multiple disabilities and will assist parents/guardians in achieving high-quality home schooling and skilling for such students as needed. Home-based education will continue to be a choice available for children with severe and profound disabilities who are unable to go to schools. The children under home-based education must be treated as equal to any other child in the general system. There shall be an audit of home-based education for its efficiency and effectiveness using the principle of equity and equality of opportunity. Guidelines and standards for home-based schooling shall be developed based on this audit in line with the RPWD Act 2016. While it is clear that the education of all children with disabilities is the responsibility of the State, technology-based solutions will be used for the orientation of parents/caregivers along with wide-scale dissemination of learning materials to enable parents/caregivers to actively support their children's learning needs will be accorded priority.

6.13. Most classrooms have children with specific learning disabilities who need continuous support. Research is clear that the earlier such support begins, the better the chances of progress. Teachers must be helped to identify such learning disabilities early and plan specifically for their mitigation. Specific actions will include the use of appropriate technology allowing and enabling children to work at their own pace, with flexible curricula to leverage each child's strengths, and creating an ecosystem for appropriate assessment and certification. Assessment and certification agencies, including the proposed new National Assessment Centre, PARAKH, will formulate guidelines and recommend appropriate tools for conducting such assessment, from the foundational stage to higher education (including for entrance exams), in order to ensure equitable access and opportunities for all students with learning disabilities.

6.14. The awareness and knowledge of how to teach children with specific disabilities (including learning disabilities) will be an integral part of all teacher education programmes, along with gender sensitization and sensitization towards all underrepresented groups in order to reverse their underrepresentation.

6.15. Alternative forms of schools, will be encouraged to preserve their traditions or alternative pedagogical styles. At the same time, they will be supported to integrate the subject and learning areas prescribed by the NCFSE into their curricula in order to reduce and eventually eliminate the underrepresentation of children from these schools in higher education. In particular, financial assistance will be provided to introduce science, mathematics, social studies, Hindi, English, State languages, or other relevant subjects in the curriculum, as may be desired by these schools. This would enable children studying in these schools to attain the learning outcomes defined for Grades 1–12. Furthermore, students in such schools would be encouraged to appear for State or other Board examinations and assessments by the NTA, and thereby enroll in higher education institutions. Capacities of teachers in the teaching of science, mathematics, language, and social studies will be developed including orientation to new pedagogical practices. Libraries and laboratories will be strengthened and adequate reading materials like books, journals, etc., and other teaching-learning materials will be made available.

6.16. Within SEDGs, and with respect to all the above policy points, special attention will be given to reduce the disparities in the educational development of Scheduled Castes and Scheduled Tribes. As a part of the efforts to enhance participation in school education, special hostels in dedicated regions, bridge courses, and financial assistance through fee waivers and scholarships will be offered to

talented and meritorious students from all SEDGs on a larger scale, especially at the secondary stage of education, to facilitate their entry into higher education.

6.17. Under the aegis of the Ministry of Defence, State Governments may encourage opening NCC wings in their secondary and higher secondary schools, including those located in tribal dominated areas. This will enable harnessing of the natural talent and unique potential of students, which in turn would help them to aspire to a successful career in the defence forces.

6.18. All scholarships and other opportunities and schemes available to students from SEDGs will be coordinated and announced by a single agency and website to ensure that all students are aware of, and may apply in a simplified manner on such a 'single window system', as per eligibility.

6.19. All the above policies and measures are absolutely critical to attaining full inclusion and equity for all SEDGs - but they are not sufficient. What is also required is a change in school culture. All participants in the school education system, including teachers, principals, administrators, counsellors, and students, will be sensitized to the requirements of all students, the notions of inclusion and equity, and the respect, dignity, and privacy of all persons. Such an educational culture will provide the best pathway to help students become empowered individuals who, in turn, will enable society to transform into one that is responsible towards its most vulnerable citizens. Inclusion and equity will become a key aspect of teacher education (and training for all leadership, administrative, and other positions in schools); efforts will be made to recruit more high-quality teachers and leaders from SEDGs in order to bring in excellent role models for all students.

6.20. Students will be sensitized through this new school culture, brought in by teachers, trained social workers and counsellors as well as through corresponding changes to bring in an inclusive school curriculum. The school curriculum will include, early on, material on human values such as respect for all persons, empathy, tolerance, human rights, gender equality, non-violence, global citizenship, inclusion, and equity. It would also include more detailed knowledge of various cultures, religions, languages, gender identities, etc. to sensitize and develop respect for diversity. Any biases and stereotypes in school curriculum will be removed, and more material will be included that is relevant and relatable to all communities.

7. Efficient Resourcing and Effective Governance through School Complexes/Clusters

7.1. While the establishment of primary schools in every habitation across the country-driven by the Sarva Shiksha Abhiyan (SSA), now subsumed under the Samagra Shiksha Scheme and other important efforts across the States - has helped to ensure near-universal access to primary schools, it has also led to the development of numerous very small schools. According to U-DISE 2016–17 data, nearly 28% of India's public primary schools and 14.8% of India's upper primary schools have less than 30 students. The average number of students per grade in the elementary schooling system (primary and upper primary, i.e., Grades 1–8) is about 14, with a notable proportion having below 6; during the year 2016–17, there were 1,08,017 single-teacher schools, the majority of them (85743) being primary schools serving Grades 1–5.

7.2. These small school sizes have rendered it economically suboptimal and operationally complex to run good schools, in terms of deployment of teachers as well as the provision of critical physical resources. Teachers often teach multiple grades at a time, and teach multiple subjects, including subjects in which they may have no prior background; key areas such as music, arts, and sports are too often simply not taught; and physical resources, such as lab and sports equipment and library books, are simply not available across schools.

7.3. The isolation of small schools also has a negative effect on education and the teaching-learning process. Teachers function best in communities and teams, and so do students. Small schools also present a systemic challenge for governance and management. The geographical dispersion, challenging access conditions, and the very large numbers of schools make it difficult to reach all schools equally. Administrative structures have not been aligned with the increases in the number of school or with the unified structure of the Samagra Shiksha Scheme.

7.4. Although consolidation of schools is an option that is often discussed, it must be carried out very judiciously, and only when it is ensured that there is no impact on access. Such measures are nevertheless likely to result only in limited consolidation, and would not solve the overall structural problem and challenges presented by the large numbers of small schools.

7.5. These challenges will, by 2025, be addressed by State/UT governments by adopting innovative mechanisms to group or rationalize schools. The objective behind this intervention would be to ensure that every school has: (a) adequate number of counsellors/trained social workers and teachers (shared or otherwise) for teaching all subjects including art, music science, sports, languages, vocational subjects, etc; (b) adequate resources (shared or otherwise), such as a library, science labs, computer labs, skill labs, playgrounds, sports equipment and facilities, etc.; (c) a sense of community is built to overcome the isolation of teachers, students, and schools, through joint professional development programmes, sharing of teaching-learning content, joint content development, holding joint activities such as art and science exhibitions, sports meets, quizzes and debates, and fairs; (d) cooperation and support across schools for the education of children with disabilities; and (e) improved governance of the schooling system by devolving all finer decisions, to Principals, teachers, and other stakeholders within each group of schools and treating such a group of schools, which range from the foundational stage through the secondary stage, as an integrated semi-autonomous unit.

7.6. One possible mechanism for accomplishing the above would be the establishment of a grouping structure called the school complex, consisting of one secondary school together with all other schools offering lower grades in its neighbourhood including Anganwadis, in a radius of five to ten kilometers. This suggestion was first made by the Education Commission (1964–66) but was left unimplemented. This Policy strongly endorses the idea of the school complex/cluster, wherever possible. The aim of the school complex/cluster will be greater resource efficiency and more effective functioning, coordination, leadership, governance, and management of schools in the cluster.

7.7. The establishment of school complexes/clusters and the sharing of resources across complexes will have a number of other benefits as a consequence, such as improved support for children with disabilities, more topic-centred clubs and academic/sports/arts/crafts events across school complexes, better incorporation of art, music, language, vocational subjects, physical education, and other subjects in the classroom through the sharing of teachers in these subjects including use of ICT tools to conduct virtual classes, better student support, enrolment, attendance, and performance through the sharing of social workers and counsellors, and School Complex Management Committees (rather than simply School Management Committees) for more robust and improved governance, monitoring, oversight, innovations, and initiatives by local stakeholders. Building such larger communities of schools, school leaders, teachers, students, supporting staff, parents, and local citizens would energize and empower the schooling system, and in a resource-efficient manner.

7.8. The governance of schools will also improve and become far more efficient with school complexes/clusters. First, the DSE will devolve authority to the school complex/cluster, which will act as a semi-autonomous unit. The District Education Officer (DEO) and the Block Education Officers (BEO) will interact primarily with each school complex/cluster as a single unit and facilitate its work. The complex itself will perform certain tasks delegated by the DSE and will deal with the individual schools within it. The school complex/cluster will be given significant autonomy by the DSE to innovate towards providing integrated education and to experiment with pedagogies, curriculum, etc., while adhering to the National Curricular Framework (NCF) and State Curricular Framework (SCF). Under this organization, schools will gain in strength, will be able to exercise greater freedom, and will contribute towards making the complex more innovative and responsive. Meanwhile, the DSE will be able to focus on the aggregate level goals that need to be achieved, improving overall system effectiveness.

7.9. The culture of working to a plan, both short-term and long-term ones, will be developed through such complexes/clusters. Schools will develop their plans (SDPs) with the involvement of their SMCs. These plans will then become the basis for the creation of School Complex/Cluster Development Plans (SCDPs). The SCDP will also involve the plans of all other institutions

associated with the school complex, such as vocational education institutions, and will be created by the principals and teachers of the school complex with the involvement of the SCMC and will be made available publicly. The plans will include human resources, learning resources, physical resources and infrastructure, improvement initiatives, financial resources, school culture initiatives, teacher development plans, and educational outcomes. It will detail the efforts to leverage the teachers and students across the school complex to develop vibrant learning communities. The SDP and SCDP will be the primary mechanism to align all stakeholders of the school, including the DSE. The SMC and SCMC will use the SDP and SCDP for oversight of the functioning and direction of the school and will assist in the execution of these plans. The DSE, through its relevant official, e.g., the BEO, will endorse and confirm the SCDP of each school complex. It will then provide the resources (financial, human, physical, etc.) necessary to achieve the SCDPs, both short-term (1-year) and long-term (3-5 years). It will also provide all other relevant support to the school complexes to achieve the educational outcomes. The DSE and the SCERT may share specific norms (e.g., financial, staffing, process) and frameworks for development of the SDP and SCDP with all schools, which may be revised periodically.

7.10. To further enhance cooperation and positive synergy among schools, including between public and private schools, the twinning/pairing of one public school with one private school will be adopted across the country, so that such paired schools may meet/interact with each other, learn from each other, and also share resources, if possible. Best practices of private schools will be documented, shared, and institutionalized in public schools, and vice versa, where possible.

7.11. Every State will be encouraged to strengthen existing or establish "Bal Bhavans" where children of all ages can visit once a week (e.g., on weekends) or more often, as a special daytime boarding school, to partake in art-related, career-related, and play-related activities. Such Bal Bhavans may be incorporated as a part of school complexes/clusters if possible.

7.12. The school should be a point of celebration and honour for the whole community. The dignity of the school as an institution should be restored and important dates, such as the foundation day of the school, will be celebrated along with the community and the list of important alumni may be displayed and honoured. Furthermore, the un-utilized capacity of school infrastructure could be used to promote social, intellectual, and volunteer activities for the community and to promote social cohesion during non-teaching / schooling hours and may be used as a "Samajik Chetna Kendra".

8. Standard-setting and Accreditation for School Education

8.1. The goal of the school education regulatory system must be to continually improve educational outcomes; it must not overly restrict schools, prevent innovation, or demoralize teachers, principals, and students. All in all, regulation must aim to empower schools and teachers with trust, enabling them to strive for excellence and perform at their very best, while ensuring the integrity of the system through the enforcement of complete transparency and full public disclosure of all finances, procedures, and educational outcomes.

8.2. At present, all main functions of governance and regulation of the school education system - namely, the provision of public education, the regulation of education institutions, and policymaking - are handled by a single body, i.e., the Department of School Education or its arms. This leads to conflict of interests and excessive centralized concentration of power; it also leads to ineffective management of the school system, as efforts towards quality educational provision are often diluted by the focus on the other roles, particularly regulation, that the Departments of School Education also perform.

8.3. The current regulatory regime also has not been able to curb the commercialization and economic exploitation of parents by many for-profit private schools, yet at the same time it has all too often inadvertently discouraged public-spirited private/philanthropic schools. There has been far too much asymmetry between the regulatory approaches to public and private schools, even though the goals of both types of schools should be the same: to provide quality education.

8.4. The public education system is the foundation of a vibrant democratic society, and the way it is run must be transformed and invigorated in order to achieve the highest levels of educational outcomes for the nation. At the same time, the private/philanthropic school sector must also be encouraged and enabled to play a significant and beneficial role.

8.5. The key principles and recommendations of this Policy regarding the State school education system, the independent responsibilities within that system, and the approach to its regulation are as follows:

(a) The Department of School Education, which is the apex state-level body in school education, will be responsible for overall monitoring and policymaking for continual improvement of the public education system; it will not be involved with the provision and operation of schools or with the regulation of schools, in order to ensure due focus on the improvement of public schools and to eliminate conflict of interests.

(b) The educational operations and service provision for the public schooling system of the whole State will be handled by the Directorate of School Education (including the offices of the DEO and BEO, etc.); it will work independently to implement policies regarding educational operations and provision.

(c) An effective quality self-regulation or accreditation system will be instituted for all stages of education including pre-school education - private, public, and philanthropic - to ensure compliance with essential quality standards. To ensure that all schools follow certain minimal professional and quality standards, States/UTs will set up an independent, State-wide, body called the State School Standards Authority (SSSA). The SSSA will establish a minimal set of standards based on basic parameters (namely, safety, security, basic infrastructure, number of teachers across subjects and grades, financial probity, and sound processes of governance), which shall be followed by all schools. The framework for these parameters will be created by the SCERT in consultation with various stakeholders, especially teachers and schools.

    Transparent public self-disclosure of all the basic regulatory information, as laid down by the SSSA, will be used extensively for public oversight and accountability. The dimensions on which information has to be self-disclosed, and the format of disclosure will be decided by the SSSA in accordance with global best practices for standard-setting for schools. This information will have to be made available and kept updated and accurate by all schools, on the aforementioned public website maintained by the SSSA and on the schools' websites. Any complaints or grievances from stakeholders or others arising out of the information placed in the public domain shall be adjudicated by the SSSA. Feedback from randomly selected students will be solicited online to ensure valuable input at regular intervals. Technology will be employed suitably to ensure efficiency and transparency in all work of the SSSA. This will bring down significantly the heavy load of regulatory mandates currently borne by schools.

(d) Academic matters, including academic standards and curricula in the State will be led by the SCERT (with close consultation and collaboration with the NCERT), which will be reinvigorated as an institution. The SCERT will develop a School Quality Assessment and Accreditation Framework (SQAAF) through wide consultations with all stakeholders. The SCERT will also lead a "change management process" for the reinvigoration of CRCs, BRCs, and DIETs which must change the capacity and work culture of these institutions in 3 years, developing them into vibrant institutions of excellence. Meanwhile, certification of competencies of students at the school-leaving stage will be handled by the Boards of Assessment/Examination in each State.

8.6. The culture, structures, and systems that empower and provide adequate resources to schools, institutions, teachers, officials, communities, and other stakeholders, will also build concomitant accountability. Each stakeholder and participant of the education system will be accountable to perform their role with the highest level of integrity, full commitment, and exemplary work ethic.

Each role of the system will have explicitly articulated role expectations and rigorous assessment of their performance vis-à-vis these expectations. The assessment system will be objective and developmentally oriented, while ensuring accountability. It will have multiple sources of feedback and assessment, to ensure a full view of the performance (and will not just be linked simplistically, e.g., to 'marks' of students). The assessment will recognize that outcomes such as educational attainment of students have multiple intervening variables and extraneous influences. It will also recognize that education requires teamwork, particularly at the level of the school. Promotion, recognition, and accountability of all individuals will be based on such performance assessment. All functionaries will be responsible to ensure that this development, performance, and accountability system is run with high integrity, and systematically, within their span of control.

8.7. Public and private schools (except the schools that are managed/aided/controlled by the Central government) will be assessed and accredited on the same criteria, benchmarks, and processes, emphasizing online and offline public disclosure and transparency, so as to ensure that public-spirited private schools are encouraged and not stifled in any way. Private philanthropic efforts for quality education will be encouraged - thereby affirming the public-good nature of education - while protecting parents and communities from arbitrary increases in tuition fees. Public disclosure on the school website and on the SSSA website - for both public and private schools - would include (at the very least) information on the numbers of classrooms, students, and teachers, subjects taught, any fees, and overall student outcomes on standardized evaluations such as the NAS and SAS. For schools controlled/managed/aided by the Central government, the CBSE in consultation with the MHRD shall prepare a framework. All the education institutions will be held to similar standards of audit and disclosure as a 'not-for-profit' entity. Surpluses, if any, will be reinvested in the educational sector.

8.8. The standard-setting/regulatory framework and the facilitating systems for school regulation, accreditation, and governance shall be reviewed to enable improvements on the basis of the learnings and experiences gained in the last decade. This review will aim to ensure that all students, particularly students from underprivileged and disadvantaged sections, shall have universal, free and compulsory access to high-quality and equitable schooling from early childhood care and education (age 3 onwards) through higher secondary education (i.e., until Grade 12). The overemphasis on inputs, and the mechanistic nature of their specifications – physical and infrastructural – will be changed and requirements made more responsive to realities on the ground, e.g., regarding land areas and room sizes, practicalities of playgrounds in urban areas, etc. These mandates will be adjusted and loosened, leaving suitable flexibility for each school to make its own decisions based on local needs and constraints, while ensuring safety, security, and a pleasant and productive learning space. Educational outcomes and the transparent disclosure of all financial, academic, and operational matters will be given due importance and will be incorporated suitably in the assessment of schools. This will further improve India's progress towards achieving Sustainable Development Goal 4 (SDG4) of ensuring free, equitable, and quality primary and secondary education for all children.

8.9. The aim of the public-school education system will be to impart the highest quality education so that it becomes the most attractive option for parents from all walks of life for educating their children.

8.10. For a periodic 'health check-up' of the overall system, a sample-based National Achievement Survey (NAS) of student learning levels will be carried out by the proposed new National Assessment Centre, PARAKH with suitable cooperation with other governmental bodies- such as the NCERT– that may assist in assessment procedures as well as data analysis. The assessment will cover students across government as well as private schools. States will also be encouraged to conduct their own census-based State Assessment Survey (SAS), the results of which will be used only for developmental purposes, public disclosure by schools of their overall and anonymized student outcomes, and for continuous improvement of the school education system. Until the establishment of the proposed new National Assessment Centre, PARAKH, NCERT may continue to carry out NAS.

8.11. Finally, the children and adolescents enrolled in schools must not be forgotten in this whole process; after all, the school system is designed for them. Careful attention must be paid to their safety and rights- particularly girl children - and the various difficult issues faced by adolescents, such as substance or drug abuse and forms of discrimination and harassment including violence, with clear, safe, and efficient mechanisms for reporting and for due process on any infractions against children's/adolescents' rights or safety. The development of such mechanisms that are effective, timely, and well-known to all students will be accorded high priority.

Part II. HIGHER EDUCATION

9. Quality Universities and Colleges: A New and Forward-looking Vision for India's Higher Education System

9.1. Higher education plays an extremely important role in promoting human as well as societal well-being and in developing India as envisioned in its Constitution - a democratic, just, socially-conscious, cultured, and humane nation upholding liberty, equality, fraternity, and justice for all. Higher education significantly contributes towards sustainable livelihoods and economic development of the nation. As India moves towards becoming a knowledge economy and society, more and more young Indians are likely to aspire for higher education.

9.1.1. Given the 21st century requirements, quality higher education must aim to develop good, thoughtful, well-rounded, and creative individuals. It must enable an individual to study one or more specialized areas of interest at a deep level, and also develop character, ethical and Constitutional values, intellectual curiosity, scientific temper, creativity, spirit of service, and 21st century capabilities across a range of disciplines including sciences, social sciences, arts, humanities, languages, as well as professional, technical, and vocational subjects. A quality higher education must enable personal accomplishment and enlightenment, constructive public engagement, and productive contribution to the society. It must prepare students for more meaningful and satisfying lives and work roles and enable economic independence.

9.1.2. For the purpose of developing holistic individuals, it is essential that an identified set of skills and values will be incorporated at each stage of learning, from pre-school to higher education.

9.1.3. At the societal level, higher education must enable the development of an enlightened, socially conscious, knowledgeable, and skilled nation that can find and implement robust solutions to its own problems. Higher education must form the basis for knowledge creation and innovation thereby contributing to a growing national economy. The purpose of quality higher education is, therefore, more than the creation of greater opportunities for individual employment. It represents the key to more vibrant, socially engaged, cooperative communities and a happier, cohesive, cultured, productive, innovative, progressive, and prosperous nation.

9.2. Some of the major problems currently faced by the higher education system in India include:

(a) a severely fragmented higher educational ecosystem;
(b) less emphasis on the development of cognitive skills and learning outcomes;
(c) a rigid separation of disciplines, with early specialisation and streaming of students into narrow areas of study;
(d) limited access particularly in socio-economically disadvantaged areas, with few HEIs that teach in local languages
(e) limited teacher and institutional autonomy;
(f) inadequate mechanisms for merit-based career management and progression of faculty and institutional leaders;
(g) lesser emphasis on research at most universities and colleges, and lack of competitive peer-reviewed research funding across disciplines;
(h) suboptimal governance and leadership of HEIs;
(i) an ineffective regulatory system; and
(j) large affiliating universities resulting in low standards of undergraduate education.

9.3. This policy envisions a complete overhaul and re-energising of the higher education system to overcome these challenges and thereby deliver high-quality higher education, with equity and inclusion. The policy's vision includes the following key changes to the current system:

(a) moving towards a higher educational system consisting of large, multidisciplinary universities and colleges, with at least one in or near every district, and with more HEIs across India that offer medium of instruction or programmes in local/Indian languages;
(b) moving towards a more multidisciplinary undergraduate education;
(c) moving towards faculty and institutional autonomy;
(d) revamping curriculum, pedagogy, assessment, and student support for enhanced student experiences;
(e) reaffirming the integrity of faculty and institutional leadership positions through merit-appointments and career progression based on teaching, research, and service;
(f) establishment of a National Research Foundation to fund outstanding peer-reviewed research and to actively seed research in universities and colleges;
(g) governance of HEIs by high qualified independent boards having academic and administrative autonomy;
(h) "light but tight" regulation by a single regulator for higher education;
(i) increased access, equity, and inclusion through a range of measures, including greater opportunities for outstanding public education; scholarships by private/philanthropic universities for disadvantaged and underprivileged students; online education, and Open Distance Learning (ODL); and all infrastructure and learning materials accessible and available to learners with disabilities.

10. Institutional Restructuring and Consolidation

10.1. The main thrust of this policy regarding higher education is to end the fragmentation of higher education by transforming higher education institutions into large multidisciplinary universities, colleges, and HEI clusters/Knowledge Hubs, each of which will aim to have 3,000 or more students. This would help build vibrant communities of scholars and peers, break down harmful silos, enable students to become well-rounded across disciplines including artistic, creative, and analytic subjects as well as sports, develop active research communities across disciplines including cross-disciplinary research, and increase resource efficiency, both material and human, across higher education.

10.2. Moving to large multidisciplinary universities and HEI clusters is thus the highest recommendation of this policy regarding the structure of higher education. The ancient Indian universities Takshashila, Nalanda, Vallabhi, and Vikramshila, which had thousands of students from India and the world studying in vibrant multidisciplinary environments, amply demonstrated the type of great success that large multidisciplinary research and teaching universities could bring. India urgently needs to bring back this great Indian tradition to create well-rounded and innovative individuals, and which is already transforming other countries educationally and economically.

10.3. This vision of higher education will require, in particular, a new conceptual perception/understanding for what constitutes a higher education institution (HEI), i.e., a university or a college. A university will mean a multidisciplinary institution of higher learning that offers undergraduate and graduate programmes, with high quality teaching, research, and community engagement. The definition of university will thus allow a spectrum of institutions that range from those that place equal emphasis on teaching and research i.e., Research-intensive Universities, those that place greater emphasis on teaching but still conduct significant research i.e. Teaching-intensive Universities. Meanwhile, an Autonomous degree-granting College (AC) will refer to a large multidisciplinary institution of higher learning that grants undergraduate degrees and is primarily focused on undergraduate teaching though it would not be restricted to that and it need not be restricted to that and it would generally be smaller than a typical university.

10.4. A stage-wise mechanism for granting graded autonomy to colleges, through a transparent system of graded accreditation, will be established. Colleges will be encouraged, mentored, supported, and incentivized to gradually attain the minimum benchmarks required for each level of

accreditation. Over a period of time, it is envisaged that every college would develop into either an Autonomous degree-granting College, or a constituent college of a university - in the latter case, it would be fully a part of the university. With appropriate accreditations, Autonomous degree-granting Colleges could evolve into Research-intensive or Teaching-intensive Universities, if they so aspire.

10.5. It must be clearly stated that these three broad types of institutions are not in any natural way a rigid, exclusionary categorization, but are along a continuum. HEIs will have the autonomy and freedom to move gradually from one category to another, based on their plans, actions, and effectiveness. The most salient marker for these categories of institutions will be the focus of their goals and work. The Accreditation System will develop and use appropriately different and relevant norms across this range of HEIs. However, the expectations of high quality of education, and of teaching-learning, across all HEIs will be the same.

10.6. In addition to teaching and research, HEIs will have other crucial responsibilities, which they will discharge through appropriate resourcing, incentives, and structures. These include supporting other HEIs in their development, community engagement and service, contribution to various fields of practice, faculty development for the higher education system, and support to school education.

10.7. By 2040, all higher education institutions (HEIs) shall aim to become multidisciplinary institutions and shall aim to have larger student enrolments preferably in the thousands, for optimal use of infrastructure and resources, and for the creation of vibrant multidisciplinary communities. Since this process will take time, all HEIs will firstly plan to become multidisciplinary by 2030, and then gradually increase student strength to the desired levels.

10.8. More HEIs shall be established and developed in underserved regions to ensure full access, equity, and inclusion. There shall, by 2030, be at least one large multidisciplinary HEI in or near every district. Steps shall be taken towards developing high-quality higher education institutions both public and private that have medium of instruction in local/Indian languages or bilingually. The aim will be to increase the Gross Enrolment Ratio in higher education including vocational education from 26.3% (2018) to 50% by 2035. While a number of new institutions may be developed to attain these goals, a large part of the capacity creation will be achieved by consolidating, substantially expanding, and also improving existing HEIs.

10.9. Growth will be in both public and private institutions, with a strong emphasis on developing a large number of outstanding public institutions. There will be a fair and transparent system for determining increased levels of public funding support for public HEIs. This system will give an equitable opportunity for all public institutions to grow and develop, and will be based on transparent, pre-announced criteria from within the accreditation norms of the Accreditation System. HEIs delivering education of the highest quality as laid down in this Policy will be incentivized in expanding their capacity.

10.10. Institutions will have the option to run Open Distance Learning (ODL) and online programmes, provided they are accredited to do so, in order to enhance their offerings, improve access, increase GER, and provide opportunities for lifelong learning (SDG 4). All ODL programmes and their components leading to any diploma or degree will be of standards and quality equivalent to the highest quality programmes run by the HEIs on their campuses. Top institutions accredited for ODL will be encouraged and supported to develop high-quality online courses. Such quality online courses will be suitably integrated into curricula of HEIs, and blended mode will be preferred.

10.11. Single-stream HEIs will be phased out over time, and all will move towards becoming vibrant multidisciplinary institutions or parts of vibrant multidisciplinary HEI clusters, in order to enable and encourage high-quality multidisciplinary and cross-disciplinary teaching and research across fields. Single-stream HEIs will, in particular, add departments across different fields that would strengthen the single stream that they currently serve. Through the attainment of suitable accreditations, all HEIs will gradually move towards full autonomy - academic and administrative - in order to enable this vibrant culture. The autonomy of public institutions will be backed by adequate public financial

support and stability. Private institutions with a public-spirited commitment to high-quality equitable education will be encouraged.

10.12. The new regulatory system envisioned by this Policy will foster this overall culture of empowerment and autonomy to innovate, including by gradually phasing out the system of 'affiliated colleges' over a period of fifteen years through a system of graded autonomy, and to be carried out in a challenge mode. Each existing affiliating university will be responsible for mentoring its affiliated colleges so that they can develop their capabilities and achieve minimum benchmarks in academic and curricular matters; teaching and assessment; governance reforms; financial robustness; and administrative efficiency. All colleges currently affiliated to a university shall attain the required benchmarks over time to secure the prescribed accreditation benchmarks and eventually become autonomous degree-granting colleges. This will be achieved through a concerted national effort including suitable mentoring and governmental support for the same.

10.13. The overall higher education sector will aim to be an integrated higher education system, including professional and vocational education. This Policy and its approach will be equally applicable to all HEIs across all current streams, which would eventually merge into one coherent ecosystem of higher education.

10.14. University, worldwide, means a multidisciplinary institution of higher learning that offers undergraduate, graduate, and Ph.D programmes, and engages in high-quality teaching and research. The present complex nomenclature of HEIs in the country such as 'deemed to be university', 'affiliating university', 'affiliating technical university', 'unitary university' shall be replaced simply by 'university' on fulfilling the criteria as per norms.

11. Towards a More Holistic and Multidisciplinary Education

11.1. India has a long tradition of holistic and multidisciplinary learning, from universities such as Takshashila and Nalanda, to the extensive literatures of India combining subjects across fields. Ancient Indian literary works such as Banabhatta's Kadambari described a good education as knowledge of the 64 Kalaas or arts; and among these 64 'arts' were not only subjects, such as singing and painting, but also 'scientific 'fields, such as chemistry and mathematics, 'vocational ' fields such as carpentry and clothes-making, 'professional 'fields, such as medicine and engineering, as well as 'soft skills' such as communication, discussion, and debate. The very idea that all branches of creative human endeavour, including mathematics, science, vocational subjects, professional subjects, and soft skills should be considered 'arts', has distinctly Indian origins. This notion of a 'knowledge of many arts' or what in modern times is often called the 'liberal arts' (i.e., a liberal notion of the arts) must be brought back to Indian education, as it is exactly the kind of education that will be required for the 21st century.

11.2. Assessments of educational approaches in undergraduate education that integrate the humanities and arts with Science, Technology, Engineering and Mathematics (STEM) have consistently showed positive learning outcomes, including increased creativity and innovation, critical thinking and higher-order thinking capacities, problem-solving abilities, teamwork, communication skills, more in-depth learning and mastery of curricula across fields, increases in social and moral awareness, etc., besides general engagement and enjoyment of learning. Research is also improved and enhanced through a holistic and multidisciplinary education approach.

11.3. A holistic and multidisciplinary education would aim to develop all capacities of human beings -intellectual, aesthetic, social, physical, emotional, and moral in an integrated manner. Such an education will help develop well-rounded individuals that possess critical 21st century capacities in fields across the arts, humanities, languages, sciences, social sciences, and professional, technical, and vocational fields; an ethic of social engagement; soft skills, such as communication, discussion and debate; and rigorous specialization in a chosen field or fields. Such a holistic education shall be, in the long term, the approach of all undergraduate programmes, including those in professional, technical, and vocational disciplines.

11.4. A holistic and multidisciplinary education, as described so beautifully in India's past, is indeed what is needed for the education of India to lead the country into the 21st century and the fourth industrial revolution. Even engineering institutions, such as IITs, will move towards more holistic and multidisciplinary education with more arts and humanities. Students of arts and humanities will aim to learn more science and all will make an effort to incorporate more vocational subjects and soft skills.

11.5. Imaginative and flexible curricular structures will enable creative combinations of disciplines for study, and would offer multiple entry and exit points, thus, removing currently prevalent rigid boundaries and creating new possibilities for life-long learning. Graduate-level, master's and doctoral education in large multidisciplinary universities, while providing rigorous research-based specialization, would also provide opportunities for multidisciplinary work, including in academia, government, and industry.

11.6. Large multidisciplinary universities and colleges will facilitate the move towards high-quality holistic and multidisciplinary education. Flexibility in curriculum and novel and engaging course options will be on offer to students, in addition to rigorous specialization in a subject or subjects. This will be encouraged by increased faculty and institutional autonomy in setting curricula. Pedagogy will have an increased emphasis on communication, discussion, debate, research, and opportunities for cross-disciplinary and interdisciplinary thinking.

11.7. Departments in Languages, Literature, Music, Philosophy, Indology, Art, Dance, Theatre, Education, Mathematics, Statistics, Pure and Applied Sciences, Sociology, Economics, Sports, Translation and Interpretation, and other such subjects needed for a multidisciplinary, stimulating Indian education and environment will be established and strengthened at all HEIs. Credits will be given in all Bachelor's Degree programmes for these subjects if they are done from such departments or through ODL mode when they are not offered in-class at the HEI.

11.8. Towards the attainment of such a holistic and multidisciplinary education, the flexible and innovative curricula of all HEIs shall include credit-based courses and projects in the areas of community engagement and service, environmental education, and value-based education. Environment education will include areas such as climate change, pollution, waste management, sanitation, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living. Value-based education will include the development of humanistic, ethical, Constitutional, and universal human values of truth (*satya*), righteous conduct (*dharma*), peace (*shanti*), love (*prem*), nonviolence (*ahimsa*), scientific temper, citizenship values, and also life-skills; lessons in *seva*/service and participation in community service programmes will be considered an integral part of a holistic education. As the world is becoming increasingly interconnected, Global Citizenship Education (GCED), a response to contemporary global challenges, will be provided to empower learners to become aware of and understand global issues and to become active promoters of more peaceful, tolerant, inclusive, secure, and sustainable societies. Finally, as part of a holistic education, students at all HEIs will be provided with opportunities for internships with local industry, businesses, artists, crafts persons, etc., as well as research internships with faculty and researchers at their own or other HEIs/research institutions, so that students may actively engage with the practical side of their learning and, as a by-product, further improve their employability.

11.9. The structure and lengths of degree programmes shall be adjusted accordingly. The undergraduate degree will be of either 3 or 4-year duration, with multiple exit options within this period, with appropriate certifications, e.g., a certificate after completing 1 year in a discipline or field including vocational and professional areas, or a diploma after 2 years of study, or a Bachelor's degree after a 3-year programme. The 4-year multidisciplinary Bachelor's programme, however, shall be the preferred option since it allows the opportunity to experience the full range of holistic and multidisciplinary education in addition to a focus on the chosen major and minors as per the choices of the student. An Academic Bank of Credit (ABC) shall be established which would digitally store the academic credits earned from various recognized HEIs so that the degrees from an HEI can be awarded taking into account credits earned. The 4-year programme may also lead to a degree 'with

Research' if the student completes a rigorous research project in their major area(s) of study as specified by the HEI.

11.10. HEIs will have the flexibility to offer different designs of Master's programmes: (a) there may be a 2-year programme with the second year devoted entirely to research for those who have completed the 3-year Bachelor's programme; (b) for students completing a 4-year Bachelor's programme with Research, there could be a 1-year Master's programme; and (c) there may be an integrated 5-year Bachelor's/Master's programme. Undertaking a Ph.D. shall require either a Master's degree or a 4-year Bachelor's degree with Research. The M.Phil. programme shall be discontinued.

11.11. Model public universities for holistic and multidisciplinary education, at par with IITs, IIMs, etc., called MERUs (Multidisciplinary Education and Research Universities) will be set up and will aim to attain the highest global standards in quality education. They will also help set the highest standards for multidisciplinary education across India.

11.12. HEIs will focus on research and innovation by setting up start-up incubation centres; technology development centres; centres in frontier areas of research; greater industry-academic linkages; and interdisciplinary research including humanities and social sciences research. Given the scenario of epidemics and pandemics, it is critical that HEIs take the lead to undertake research in areas of infectious diseases, epidemiology, virology, diagnostics, instrumentation, vaccinology and other relevant areas. HEIs will develop specific hand holding mechanisms and competitions for promoting innovation among student communities. The NRF will function to help enable and support such a vibrant research and innovation culture across HEIs, research labs, and other research organizations.

12. Optimal Learning Environments and Support for Students

12.1. Effective learning requires a comprehensive approach that involves appropriate curriculum, engaging pedagogy, continuous formative assessment, and adequate student support. The curriculum must be interesting and relevant, and updated regularly to align with the latest knowledge requirements and to meet specified learning outcomes. High-quality pedagogy is then necessary to successfully impart the curricular material to students; pedagogical practices determine the learning experiences that are provided to students, thus directly influencing learning outcomes. The assessment methods must be scientific, designed to continuously improve learning and test the application of knowledge. Last but not least, the development of capacities that promote student wellness such as fitness, good health, psycho-social well-being, and sound ethical grounding are also critical for high-quality learning.

Thus, curriculum, pedagogy, continuous assessment, and student support are the cornerstones for quality learning. Along with providing suitable resources and infrastructure, such as quality libraries, classrooms, labs, technology, sports/recreation areas, student discussion spaces, and dining areas, a number of initiatives will be required to ensure that learning environments are engaging and supportive, and enable all students to succeed.

12.2. First, in order to promote creativity, institutions and faculty will have the autonomy to innovate on matters of curriculum, pedagogy, and assessment within a broad framework of higher education qualifications that ensures consistency across institutions and programmes and across the ODL, online, and traditional 'in-class' modes. Accordingly, curriculum and pedagogy will be designed by institutions and motivated faculty to ensure a stimulating and engaging learning experience for all students, and continuous formative assessment will be used to further the goals of each programme. All assessment systems shall also be decided by the HEI, including those that lead to final certification. The Choice Based Credit System (CBCS) will be revised for instilling innovation and flexibility. HEIs shall move to a criterion-based grading system that assesses student achievement based on the learning goals for each programme, making the system fairer and outcomes more comparable. HEIs shall also move away from high-stakes examinations towards more continuous and comprehensive evaluation.

12.3. Second, each institution will integrate its academic plans ranging from curricular improvement to quality of classroom transaction - into its larger Institutional Development Plan (IDP). Each institution will be committed to the holistic development of students and create strong internal systems for supporting diverse student cohorts in academic and social domains both inside and outside formal academic interactions in the classroom. For example, all HEIs will have mechanisms and opportunities for funding of topic-centred clubs and activities organized by students with the help of faculty and other experts as needed, such as clubs and events dedicated to science, mathematics, poetry, language, literature, debate, music, sports, etc. Over time, such activities could be incorporated into the curriculum once appropriate faculty expertise and campus student demand is developed. Faculty will have the capacity and training to be able to approach students not just as teachers, but also as mentors and guides.

12.4. Third, students from socio-economically disadvantaged backgrounds require encouragement and support to make a successful transition to higher education. Universities and colleges will thus be required to set up high-quality support centres and will be given adequate funds and academic resources to carry this out effectively. There will also be professional academic and career counselling available to all students, as well as counsellors to ensure physical, psychological and emotional well-being.

12.5. Fourth, ODL and online education provide a natural path to increase access to quality higher education. In order to leverage its potential completely, ODL will be renewed through concerted, evidence-based efforts towards expansion while ensuring adherence to clearly articulated standards of quality. ODL programmes will aim to be equivalent to the highest quality in-class programmes available. Norms, standards, and guidelines for systemic development, regulation, and accreditation of ODL will be prepared, and a framework for quality of ODL that will be recommendatory for all HEIs will be developed.

12.6. Finally, all programmes, courses, curricula, and pedagogy across subjects, including those in-class, online, and in ODL modes as well as student support will aim to achieve global standards of quality.

Internationalization

12.7. The various initiatives mentioned above will also help in having larger numbers of international students studying in India, and provide greater mobility to students in India who may wish to visit, study at, transfer credits to, or carry out research at institutions abroad, and vice versa. Courses and programmes in subjects, such as Indology, Indian languages, AYUSH systems of medicine, yoga, arts, music, history, culture, and modern India, internationally relevant curricula in the sciences, social sciences, and beyond, meaningful opportunities for social engagement, quality residential facilities and on-campus support, etc. will be fostered to attain this goal of global quality standards, attract greater numbers of international students, and achieve the goal of 'internationalization at home'.

12.8. India will be promoted as a global study destination providing premium education at affordable costs thereby helping to restore its role as a Vishwa Guru. An International Students Office at each HEI hosting foreign students will be set up to coordinate all matters relating to welcoming and supporting students arriving from abroad. Research/teaching collaborations and faculty/student exchanges with high-quality foreign institutions will be facilitated, and relevant mutually beneficial MOUs with foreign countries will be signed. High performing Indian universities will be encouraged to set up campuses in other countries, and similarly, selected universities e.g., those from among the top 100 universities in the world will be facilitated to operate in India. A legislative framework facilitating such entry will be put in place, and such universities will be given special dispensation regarding regulatory, governance, and content norms on par with other autonomous institutions of India. Furthermore, research collaboration and student exchanges between Indian institutions and global institutions will be promoted through special efforts. Credits acquired in foreign universities will be permitted, where appropriate as per the requirements of each HEI, to be counted for the award of a degree.

Student Activity and Participation

12.9. Students are the prime stakeholders in the education system. Vibrant campus life is essential for high-quality teaching-learning processes. Towards this end, students will be given plenty of opportunities for participation in sports, culture/arts clubs, eco-clubs, activity clubs, community service projects, etc. In every education institution, there shall be counselling systems for handling stress and emotional adjustments. Furthermore, a systematized arrangement shall be created to provide the requisite support to students from rural backgrounds, including increasing hostel facilities as needed. All HEIs will ensure quality medical facilities for all students in their institutions.

Financial support for students

12.10. Financial assistance to students shall be made available through various measures. Efforts will be made to incentivize the merit of students belonging to SC, ST, OBC, and other SEDGs. The National Scholarship Portal will be expanded to support, foster, and track the progress of students receiving scholarships. Private HEIs will be encouraged to offer larger numbers of free ships and scholarships to their students.

13. Motivated, Energized, and Capable Faculty

13.1. The most important factor in the success of higher education institutions is the quality and engagement of its faculty. Acknowledging the criticality of faculty in achieving the goals of higher education, various initiatives have been introduced in the past several years to systematize recruitment and career progression, and to ensure equitable representation from various groups in the hiring of faculty. Compensation levels of permanent faculty in public institutions have also been increased substantially. Various initiatives have also been taken towards providing faculty with professional development opportunities. However, despite these various improvements in the status of the academic profession, faculty motivation in terms of teaching, research, and service in HEIs remains far lower than the desired level. The various factors that lie behind low faculty motivation levels must be addressed to ensure that each faculty member is happy, enthusiastic, engaged, and motivated towards advancing her/his students, institution, and profession. To this end, the policy recommends the following initiatives to achieve the best, motivated, and capable faculty in HEIs.

13.2. As the most basic step, all HEIs will be equipped with the basic infrastructure and facilities, including clean drinking water, clean working toilets, blackboards, offices, teaching supplies, libraries, labs, and pleasant classroom spaces and campuses. Every classroom shall have access to the latest educational technology that enables better learning experiences.

13.3. Teaching duties also will not be excessive, and student-teacher ratios not too high, so that the activity of teaching remains pleasant and there is adequate time for interaction with students, conducting research, and other university activities. Faculty will be appointed to individual institutions and generally not be transferable across institutions so that they may feel truly invested in, connected to, and committed to their institution and community.

13.4. Faculty will be given the freedom to design their own curricular and pedagogical approaches within the approved framework, including textbook and reading material selections, assignments, and assessments. Empowering the faculty to conduct innovative teaching, research, and service as they see best will be a key motivator and enabler for them to do truly outstanding, creative work.

13.5. Excellence will be further incentivized through appropriate rewards, promotions, recognitions, and movement into institutional leadership. Meanwhile, faculty not delivering on basic norms will be held accountable.

13.6. In keeping with the vision of autonomous institutions empowered to drive excellence, HEIs will have clearly defined, independent, and transparent processes and criteria for faculty recruitment. Whereas the current recruitment process will be continued, a ‘tenure-track’ i.e., suitable probation period shall be put in place to further ensure excellence. There shall be a fast-track promotion system

for recognizing high impact research and contribution. A system of multiple parameters for proper performance assessment, for the purposes of 'tenure' i.e., confirmed employment after probation, promotion, salary increases, recognitions, etc., including peer and student reviews, innovations in teaching and pedagogy, quality and impact of research, professional development activities, and other forms of service to the institution and the community, shall be developed by each HEI and clearly enunciated in it's Institutional Development Plan (IDP).

13.7. The presence of outstanding and enthusiastic institutional leaders that cultivate excellence and innovation is the need of the hour. Outstanding and effective institutional leadership is extremely important for the success of an institution and of its faculty. Excellent faculty with high academic and service credentials as well as demonstrated leadership and management skills will be identified early and trained through a ladder of leadership positions. Leadership positions shall not remain vacant, but rather an overlapping time period during transitions in leadership shall be the norm to ensure the smooth running of institutions. Institutional leaders will aim to create a culture of excellence that will motivate and incentivize outstanding and innovative teaching, research, institutional service, and community outreach from faculty members and all HEI leaders.

14. Equity and Inclusion in Higher Education

14.1. Entry into quality higher education can open a vast array of possibilities that can lift both individuals as well as communities out of the cycles of disadvantage. For this reason, making quality higher education opportunities available to all individuals must be among the highest priorities. This Policy envisions ensuring equitable access to quality education to all students, with a special emphasis on SEDGs.

14.2. The dynamics and also many of the reasons for exclusion of SEDGs from the education system are common across school and higher education sectors. Therefore, the approach to equity and inclusion must be common across school and higher education. Furthermore, there must be continuity across the stages to ensure sustainable reform. Thus, the policy initiatives required to meet the goals of equity and inclusion in higher education must be read in conjunction with those for school education.

14.3. There are certain facets of exclusion, that are particular to or substantially more intense in higher education. These must be addressed specifically, and include lack of knowledge of higher education opportunities, economic opportunity cost of pursuing higher education, financial constraints, admission processes, geographical and language barriers, poor employability potential of many higher education programmes, and lack of appropriate student support mechanisms.

14.4. For this purpose, additional actions that are specific to higher education shall be adopted by all Governments and HEIs:

14.4.1. Steps to be taken by Governments

(a) Earmark suitable Government funds for the education of SEDGs
(b) Set clear targets for higher GER for SEDGs
(c) Enhance gender balance in admissions to HEIs
(d) Enhance access by establishing more high-quality HEIs in aspirational districts and Special Education Zones containing larger numbers of SEDGs
(e) Develop and support high-quality HEIs that teach in local/Indian languages or bilingually
(f) Provide more financial assistance and scholarships to SEDGs in both public and private HEIs
(g) Conduct outreach programmes on higher education opportunities and scholarships among SEDGs
(h) Develop and support technology tools for better participation and learning outcomes.

14.4.2. Steps to be taken by all HEIs

(a) Mitigate opportunity costs and fees for pursuing higher education
(b) Provide more financial assistance and scholarships to socio-economically disadvantaged students
(c) Conduct outreach on higher education opportunities and scholarships
(d) Make admissions processes more inclusive
(e) Make curriculum more inclusive
(f) Increase employability potential of higher education programmes
(g) Develop more degree courses taught in Indian languages and bilingually
(h) Ensure all buildings and facilities are wheelchair-accessible and disabled-friendly
(i) Develop bridge courses for students that come from disadvantaged educational backgrounds
(j) Provide socio-emotional and academic support and mentoring for all such students through suitable counselling and mentoring programmes
(k) Ensure sensitization of faculty, counsellor, and students on gender-identity issue and its inclusion in all aspects of the HEI, including curricula
(l) Strictly enforce all no-discrimination and anti-harassment rules
(m) Develop Institutional Development Plans that contain specific plans for action on increasing participation from SEDGs, including but not limited to the above items.

15. Teacher Education

15.1. Teacher education is vital in creating a pool of schoolteachers that will shape the next generation. Teacher preparation is an activity that requires multidisciplinary perspectives and knowledge, formation of dispositions and values, and development of practice under the best mentors. Teachers must be grounded in Indian values, languages, knowledge, ethos, and traditions including tribal traditions, while also being well-versed in the latest advances in education and pedagogy.

15.2. According to the Justice J. S. Verma Commission (2012) constituted by the Supreme Court, a majority of stand-alone TEIs - over 10,000 in number are not even attempting serious teacher education but are essentially selling degrees for a price. Regulatory efforts so far have neither been able to curb the malpractices in the system, nor enforce basic standards for quality, and in fact have had the negative effect of curbing the growth of excellence and innovation in the sector. The sector and its regulatory system are, therefore, in urgent need of revitalization through radical action, in order to raise standards and restore integrity, credibility, efficacy, and high quality to the teacher education system.

15.3. In order to improve and reach the levels of integrity and credibility required to restore the prestige of the teaching profession, the Regulatory System shall be empowered to take stringent action against substandard and dysfunctional teacher education institutions (TEIs) that do not meet basic educational criteria, after giving one year for remedy of the breaches. By 2030, only educationally sound, multidisciplinary, and integrated teacher education programmes shall be in force.

15.4. As teacher education requires multidisciplinary inputs, and education in high-quality content as well as pedagogy, all teacher education programmes must be conducted within composite multidisciplinary institutions. To this end, all multidisciplinary universities and colleges - will aim to establish, education departments which, besides carrying out cutting-edge research in various aspects of education, will also run B.Ed. programmes, in collaboration with other departments such as psychology, philosophy, sociology, neuroscience, Indian languages, arts, music, history, literature, physical education, science and mathematics. Moreover, all stand-alone TEIs will be required to convert to multidisciplinary institutions by 2030, since they will have to offer the 4-year integrated teacher preparation programme.

15.5. The 4-year integrated B.Ed. offered by such multidisciplinary HEIs will, by 2030, become the minimal degree qualification for school teachers. The 4-year integrated B.Ed. will be a dual-major holistic Bachelor′s degree, in Education as well as a specialized subject such as a language, history, music, mathematics, computer science, chemistry, economics, art, physical education, etc. Beyond

the teaching of cutting-edge pedagogy, the teacher education will include grounding in sociology, history, science, psychology, early childhood care and education, foundational literacy and numeracy, knowledge of India and its values/ethos/art/traditions, and more. The HEI offering the 4-year integrated B.Ed. may also run a 2-year B.Ed., for students who have already received a Bachelor's degree in a specialized subject. A 1-year B.Ed. may also be offered for candidates who have received a 4-year undergraduate degree in a specialized subject. Scholarships for meritorious students will be established for the purpose of attracting outstanding candidates to the 4-year, 2-year, and 1-year B.Ed. programmes.

15.6. HEIs offering teacher education programmes will ensure the availability of a range of experts in education and related disciplines as well as specialized subjects. Each higher education institution will have a network of government and private schools to work closely with, where potential teachers will student-teach along with participating in other activities such as community service, adult and vocational education, etc.

15.7. In order to maintain uniform standards for teacher education, the admission to pre-service teacher preparation programmes shall be through suitable subject and aptitude tests conducted by the National Testing Agency, and shall be standardized keeping in view the linguistic and cultural diversity of the country.

15.8. The faculty profile in Departments of Education will necessarily aim to be diverse and but teaching/field/research experience will be highly valued. Faculty with training in areas of social sciences that are directly relevant to school education e.g., psychology, child development, linguistics, sociology, philosophy, economics, and political science as well as from science education, mathematics education, social science education, and language education programmes will be attracted and retained in teacher education institutions, to strengthen multidisciplinary education of teachers and provide rigour in conceptual development.

15.9. All fresh Ph.D. entrants, irrespective of discipline, will be required to take credit-based courses in teaching/education/pedagogy/writing related to their chosen Ph.D subject during their doctoral training period. Exposure to pedagogical practices, designing curriculum, credible evaluation systems, communication, and so on will be ensured since many research scholars will go on to become faculty or public representatives/communicators of their chosen disciplines. Ph.D students will also have a minimum number of hours of actual teaching experience gathered through teaching assistantships and other means. Ph.D. programmes at universities around the country will be re-oriented for this purpose.

15.10. In-service continuous professional development for college and university teachers will continue through the existing institutional arrangements and ongoing initiatives; these will be strengthened and substantially expanded to meet the needs of enriched teaching-learning processes for quality education. The use of technology platforms such as SWAYAM/DIKSHA for online training of teachers will be encouraged, so that standardized training programmes can be administered to large numbers of teachers within a short span of time.

15.11. A National Mission for Mentoring shall be established, with a large pool of outstanding senior/retired faculty – including those with the ability to teach in Indian languages – who would be willing to provide short and long-term mentoring/professional support to university/college teachers.

16. Reimagining Vocational Education

16.1. The 12th Five-Year Plan (2012–2017) estimated that only a very small percentage of the Indian workforce in the age group of 19–24 (less than 5%) received formal vocational education Whereas in countries such as the USA the number is 52%, in Germany 75%, and South Korea it is as high as 96%. These numbers only underline the urgency of the need to hasten the spread of vocational education in India.

16.2. One of the primary reasons for the small numbers of students receiving vocational education is the fact that vocational education has in the past focused largely on Grades 11–12 and on dropouts in Grade 8 and upwards. Moreover, students passing out from Grades 11–12 with vocational subjects often did not have well-defined pathways to continue with their chosen vocations in higher education. The admission criteria for general higher education were also not designed to provide openings to students who had vocational education qualifications, leaving them at a disadvantage relative to their compatriots from 'mainstream' or 'academic' education. This led to a complete lack of vertical mobility for students from the vocational education stream, an issue that has only been addressed recently through the announcement of the National Skills Qualifications Framework (NSQF) in 2013.

16.3. Vocational education is perceived to be inferior to mainstream education and meant largely for students who are unable to cope with the latter. This is a perception that affects the choices students make. It is a serious concern that can only be dealt with by a complete re-imagination of how vocational education is offered to students in the future.

16.4. This policy aims to overcome the social status hierarchy associated with vocational education and requires integration of vocational education programmes into mainstream education in all education institutions in a phased manner. Beginning with vocational exposure at early ages in middle and secondary school, quality vocational education will be integrated smoothly into higher education. It will ensure that every child learns at least one vocation and is exposed to several more. This would lead to emphasizing the dignity of labour and importance of various vocations involving /Indian arts and artisanship.

16.5. By 2025, at least 50% of learners through the school and higher education system shall have exposure to vocational education, for which a clear action plan with targets and timelines will be developed. This is in alignment with Sustainable Development Goal 4.4 and will help to realize the full potential of India's demographic dividend. The number of students in vocational education will be considered while arriving at the GER targets. The development of vocational capacities will go hand-in-hand with the development of 'academic' or other capacities. Vocational education will be integrated in the educational offerings of all secondary schools in a phased manner over the next decade. Towards this, secondary schools will also collaborate with ITIs, polytechnics, local industry, etc. Skill labs will also be set up and created in the schools in a hub and spoke model which will allow other schools to use the facility. Higher education institutions will offer vocational education either on their own or in partnership with industry and NGOs. The B.Voc. degrees introduced in 2013 will continue to exist, but vocational courses will also be available to students enrolled in all other Bachelor's degree programmes, including the 4-year multidisciplinary Bachelor's programmes. HEIs will also be allowed to conduct short-term certificate courses in various skills including soft skills. 'Lok Vidya', i.e., important vocational knowledge developed in India, will be made accessible to students through integration into vocational education courses. The possibility of offering vocational courses through ODL mode will also be explored.

16.6. Vocational education will be integrated into all school and higher education institutions in a phased manner over the next decade. Focus areas for vocational education will be chosen based on skills gap analysis and mapping of local opportunities. MHRD will constitute a National Committee for the Integration of Vocational Education (NCIVE), consisting of experts in vocational education and representatives from across Ministries, in collaboration with industry, to oversee this effort.

16.7. Individual institutions that are early adopters must innovate to find models and practices that work and then share these with other institutions through mechanisms set up by NCIVE, so as to help extend the reach of vocational education. Different models of vocational education, and apprenticeships, will also be experimented by higher education institutions. Incubation centres will be set up in higher education institutions in partnership with industries.

16.8. The National Skills Qualifications Framework will be detailed further for each discipline vocation and profession. Further, Indian standards will be aligned with the International Standard Classification of Occupations maintained by the International Labour Organization. This Framework will provide the basis for Recognition of Prior Learning. Through this, dropouts from the formal

system will be reintegrated by aligning their practical experience with the relevant level of the Framework. The credit-based Framework will also facilitate mobility across 'general' and vocational education.

17. Catalysing Quality Academic Research in All Fields through a new National Research Foundation

17.1. Knowledge creation and research are critical in growing and sustaining a large and vibrant economy, uplifting society, and continuously inspiring a nation to achieve even greater heights. Indeed, some of the most prosperous civilizations (such as India, Mesopotamia, Egypt, and Greece) to the modern era (such as the United States, Germany, Israel, South Korea, and Japan), were/are strong knowledge societies that attained intellectual and material wealth in large part through celebrated and fundamental contributions to new knowledge in the realm of science as well as art, language, and culture that enhanced and uplifted not only their own civilizations but others around the globe.

17.2. A robust ecosystem of research is perhaps more important than ever with the rapid changes occurring in the world today, e.g., in the realm of climate change, population dynamics and management, biotechnology, an expanding digital marketplace, and the rise of machine learning and artificial intelligence. If India is to become a leader in these disparate areas, and truly achieve the potential of its vast talent pool to again become a leading knowledge society in the coming years and decades, the nation will require a significant expansion of its research capabilities and output across disciplines. Today, the criticality of research is more than ever before, for the economic, intellectual, societal, environmental, and technological health and progress of a nation.

17.3. Despite this critical importance of research, the research and innovation investment in India is, at the current time, only 0.69% of GDP as compared to 2.8% in the United States of America, 4.3% in Israel and 4.2% in South Korea.

17.4. The societal challenges that India needs to address today, such as access for all its citizens to clean drinking water and sanitation, quality education and healthcare, improved transportation, air quality, energy, and infrastructure, will require the implementation of approaches and solutions that are not only informed by top-notch science and technology but are also rooted in a deep understanding of the social sciences and humanities and the various socio-cultural and environmental dimensions of the nation. Facing and addressing these challenges will require high-quality interdisciplinary research across fields that must be done in India and cannot simply be imported; the ability to conduct one's own research also enables a country to much more easily import and adapt relevant research from abroad.

17.5. Furthermore, in addition to their value in solutions to societal problems, any country's identity, upliftment, spiritual/intellectual satisfaction and creativity is also attained in a major way through its history, art, language, and culture. Research in the arts and humanities, along with innovations in the sciences and social sciences, are, therefore, extremely important for the progress and enlightened nature of a nation.

17.6. Research and innovation at education institutions in India, particularly those that are engaged in higher education, is critical. Evidence from the world′s best universities throughout history shows that the best teaching and learning processes at the higher education level occur in environments where there is also a strong culture of research and knowledge creation; conversely, much of the very best research in the world has occurred in multidisciplinary university settings.

17.7. India has a long historical tradition of research and knowledge creation, in disciplines ranging from science and mathematics to art and literature to phonetics and languages to medicine and agriculture. This needs to be further strengthened to make India lead research and innovation in the

21st century, as a strong and enlightened knowledge society and one of the three largest economies in the world.

17.8. Thus, this Policy envisions a comprehensive approach to transforming the quality and quantity of research in India. This includes definitive shifts in school education to a more play and discovery-based style of learning with emphasis on the scientific method and critical thinking. This includes career counselling in schools towards identifying student interests and talents, promoting research in universities, the multidisciplinary nature of all HEIs and the emphasis on holistic education, the inclusion of research and internships in the undergraduate curriculum, faculty career management systems that give due weightage to research, and the governance and regulatory changes that encourage an environment of research and innovation. All of these aspects are extremely critical for developing a research mindset in the country.

17.9. To build on these various elements in a synergistic manner, and to thereby truly grow and catalyze quality research in the nation, this policy envisions the establishment of a National Research Foundation (NRF). The overarching goal of the NRF will be to enable a culture of research to permeate through our universities. In particular, the NRF will provide a reliable base of merit-based but equitable peer-reviewed research funding, helping to develop a culture of research in the country through suitable incentives for and recognition of outstanding research, and by undertaking major initiatives to seed and grow research at State Universities and other public institutions where research capability is currently limited. The NRF will competitively fund research in all disciplines. Successful research will be recognized, and where relevant, implemented through close linkages with governmental agencies as well as with industry and private/philanthropic organizations.

17.10. Institutions that currently fund research at some level, such as the Department of Science and Technology (DST), Department of Atomic Energy (DAE), Department of Bio-Technology (DBT), Indian Council of Agriculture Research (ICAR), Indian Council of Medical Research (ICMR), Indian Council of Historical Research (ICHR), and University Grants Commission (UGC), as well as various private and philanthropic organizations, will continue to independently fund research according to their priorities and needs. However, NRF will carefully coordinate with other funding agencies and will work with science, engineering, and other academies to ensure synergy of purpose and avoid duplication of efforts. The NRF will be governed, independently of the government, by a rotating Board of Governors consisting of the very best researchers and innovators across fields.

17.11. The primary activities of the NRF will be to:

(a) fund competitive, peer-reviewed grant proposals of all types and across all disciplines;
(b) seed, grow, and facilitate research at academic institutions, particularly at universities and colleges where research is currently in a nascent stage, through mentoring of such institutions;
(c) act as a liaison between researchers and relevant branches of government as well as industry, so that research scholars are constantly made aware of the most urgent national research issues, and so that policymakers are constantly made aware of the latest research breakthroughs; so as to allow breakthroughs to be optimally brought into policy and/or implementation; and
(d) recognise outstanding research and progress

18. Transforming the Regulatory System of Higher Education

18.1. Regulation of higher education has been too heavy-handed for decades; too much has been attempted to be regulated with too little effect. The mechanistic and disempowering nature of the regulatory system has been rife with very basic problems, such as heavy concentrations of power within a few bodies, conflicts of interest among these bodies, and a resulting lack of accountability. The regulatory system is in need of a complete overhaul in order to re-energize the higher education sector and enable it to thrive.

18.2. To address the above-mentioned issues, the regulatory system of higher education will ensure that the distinct functions of regulation, accreditation, funding, and academic standard setting will be performed by distinct, independent, and empowered bodies. This is considered essential to create checks-and-balances in the system, minimize conflicts of interest, and eliminate concentrations of power. To ensure that the four institutional structures carrying out these four essential functions work independently yet at the same time and work in synergy towards common goals. These four structures will be set up as four independent verticals within one umbrella institution, the Higher Education Commission of India (HECI).

18.3. The first vertical of HECI will be the National Higher Education Regulatory Council (NHERC). It will function as the common, single point regulator for the higher education sector including teacher education and excluding medical and legal education, thus eliminating the duplication and disjunction of regulatory efforts by the multiple regulatory agencies that exist at the current time. It will require a relook and repealing of existing Acts and restructuring of various existing regulatory bodies to enable this single point regulation. NHERC will be set up to regulate in a 'light but tight' and facilitative manner, meaning that a few important matters particularly financial probity, good governance, and the full online and offline public self-disclosure of all finances, audits, procedures, infrastructure, faculty/staff, courses, and educational outcomes will be very effectively regulated. This information will have to be made available and kept updated and accurate by all higher education institutions on a public website maintained by NHERC and on the institutions' websites. Any complaints or grievances from stakeholders and others arising out of the information placed in public domain shall be adjudicated by NHERC. Feedback from randomly selected students including differently-abled students at each HEI will be solicited online to ensure valuable input at regular intervals.

18.4. The primary mechanism to enable such regulation will be accreditation. The second vertical of HECI will, therefore, be a 'meta-accrediting body', called the National Accreditation Council (NAC). Accreditation of institutions will be based primarily on basic norms, public self-disclosure, good governance, and outcomes, and it will be carried out by an independent ecosystem of accrediting institutions supervised and overseen by NAC. The task to function as a recognized accreditor shall be awarded to an appropriate number of institutions by NAC. In the short term, a robust system of graded accreditation shall be established, which will specify phased benchmarks for all HEIs to achieve set levels of quality, self-governance, and autonomy. In turn, all HEIs will aim, through their Institutional Development Plans (IDPs), to attain the highest level of accreditation over the next 15 years, and thereby eventually aim to function as self-governing degree-granting institutions/clusters. In the long run, accreditation will become a binary process, as per the extant global practice.

18.5. The third vertical of HECI will be the Higher Education Grants Council (HEGC), which will carry out funding and financing of higher education based on transparent criteria, including the IDPs prepared by the institutions and the progress made on their implementation. HEGC will be entrusted with the disbursement of scholarships and developmental funds for launching new focus areas and expanding quality programme offerings at HEIs across disciplines and fields.

18.6. The fourth vertical of HECI will be the General Education Council (GEC), which will frame expected learning outcomes for higher education programmes, also referred to as 'graduate attributes'. A National Higher Education Qualification Framework (NHEQF) will be formulated by the GEC and it shall be in sync with the National Skills Qualifications Framework (NSQF) to ease the integration of vocational education into higher education. Higher education qualifications leading to a degree/diploma/certificate shall be described by the NHEQF in terms of such learning outcomes. In addition, the GEC shall set up facilitative norms for issues, such as credit transfer, equivalence, etc., through the NHEQF. The GEC will be mandated to identify specific skills that students must acquire during their academic programmes, with the aim of preparing well-rounded learners with 21st century skills.

18.7. The professional councils, such as the Indian Council for Agricultural Research (ICAR), Veterinary Council of India (VCI), National Council for Teacher Education (NCTE), Council of Architecture (CoA), National Council for Vocational Education and Training (NCVET) etc., will act

as Professional Standard Setting Bodies (PSSBs). They will play a key role in the higher education system and will be invited to be members of the GEC. These bodies, after restructuring as PSSBs, will continue to draw the curricula, lay down academic standards and coordinate between teaching, research and extension of their domain/discipline, as members of the GEC. As members of the GEC, they would help in specifying the curriculum framework, within which HEIs may prepare their own curricula. Thus, PSSBs would also set the standards or expectations in particular fields of learning and practice while having no regulatory role. All HEIs will decide how their educational programmes respond to these standards, among other considerations, and would also be able to reach out for support from these standard-setting bodies or PSSBs, if needed.

18.8. Such a system architecture will ensure the principle of functional separation by eliminating conflicts of interests between different roles. It will also aim to empower HEIs, while ensuring that the few key essential matters are given due attention. Responsibility and accountability shall devolve to the HEIs concomitantly. No distinction in such expectations shall be made between public and private HEIs.

18.9. Such a transformation will require existing structures and institutions to reinvent themselves and undergo an evolution of sorts. The separation of functions would mean that each vertical within HECI would take on a new, single role which is relevant, meaningful, and important in the new regulatory scheme.

18.10. The functioning of all the independent verticals for Regulation (NHERC), Accreditation (NAC), Funding (HEGC), and Academic Standard Setting (GEC) and the overarching autonomous umbrella body (HECI) itself will be based on transparent public disclosure, and use technology extensively to reduce human interface to ensure efficiency and transparency in their work. The underlying principle will be that of a faceless and transparent regulatory intervention using technology. Strict compliance measures with stringent action, including penalties for false disclosure of mandated information, will be ensured so that Higher Education Institutions are conforming to the basic minimum norms and standards. HECI itself will be resolving disputes among the four verticals. Each vertical in HECI will be an independent body consisting of persons having high expertise in the relevant areas along with integrity, commitment, and a demonstrated track record of public service. HECI itself will be a small, independent body of eminent public-spirited experts in higher education, which will oversee and monitor the integrity and effective functioning of HECI. Suitable mechanisms will be created within HECI to carry out its functions, including adjudication.

18.11. Setting up new quality HEIs will also be made far easier by the regulatory regime, while ensuring with great effectiveness that these are set up with the spirit of public service and with due financial backing for long-term stability. HEIs performing exceptionally well will be helped by Central and State governments to expand their institutions, and thereby attain larger numbers of students and faculty as well as disciplines and programmes. Public Philanthropic Partnership models for HEIs may also be piloted with the aim to further expand access to high-quality higher education.

Curbing Commercialization of Education

18.12. Multiple mechanisms with checks and balances will combat and stop the commercialization of higher education. This will be a key priority of the regulatory system. All education institutions will be held to similar standards of audit and disclosure as a 'not for profit' entity. Surpluses, if any, will be reinvested in the educational sector. There will be transparent public disclosure of all these financial matters with recourse to grievance-handling mechanisms to the general public. The accreditation system developed by NAC will provide a complementary check on this system, and NHERC will consider this as one of the key dimensions of its regulatory objective.

18.13. All HEIs - public and private - shall be treated on par within this regulatory regime. The regulatory regime shall encourage private philanthropic efforts in education. There will be common national guidelines for all legislative Acts that will form private HEIs. These common minimal guidelines will enable all such Acts to establish private HEIs, thus enabling common standards for

private and public HEIs. These common guidelines will cover Good Governance, Financial Stability & Security, Educational Outcomes, and Transparency of Disclosures.

18.14. Private HEIs having a philanthropic and public-spirited intent will be encouraged through a progressive regime of fees determination. Transparent mechanisms for fixing of fees with an upper limit, for different types of institutions depending on their accreditation, will be developed so that individual institutions are not adversely affected. This will empower private HEIs to set fees for their programmes independently, though within the laid-out norms and the broad applicable regulatory mechanism. Private HEIs will be encouraged to offer freeships and scholarships in significant numbers to their students. All fees and charges set by private HEIs will be transparently and fully disclosed, and there shall be no arbitrary increases in these fees/charges during the period of enrolment of any student. This fee determining mechanism will ensure reasonable recovery of cost while ensuring that HEIs discharge their social obligations.

19. Effective Governance and Leadership for Higher Education Institutions

19.1. It is effective governance and leadership that enables the creation of a culture of excellence and innovation in higher education institutions. The common feature of all world-class institutions globally including India has indeed been the existence of strong self-governance and outstanding merit-based appointments of institutional leaders.

19.2. Through a suitable system of graded accreditation and graded autonomy, and in a phased manner over a period of 15 years, all HEIs in India will aim to become independent self-governing institutions pursuing innovation and excellence. Measures will be taken at all HEIs to ensure leadership of the highest quality and promote an institutional culture of excellence. Upon receiving the appropriate graded accreditations that deem the institution ready for such a move, a Board of Governors (BoG) shall be established consisting of a group of highly qualified, competent, and dedicated individuals having proven capabilities and a strong sense of commitment to the institution. The BoG of an institution will be empowered to govern the institution free of any external interference, make all appointments including that of head of the institution, and take all decisions regarding governance. There shall be overarching legislation that will supersede any contravening provisions of other earlier legislation and would provide for constitution, appointment, modalities of functioning, rules and regulations, and the roles and responsibilities of the BoG. New members of the Board shall be identified by an expert committee appointed by the Board; and the selection of new members shall be carried out by the BoG itself. Equity considerations will also be taken care of while selecting the members. It is envisaged that all HEIs will be incentivized, supported, and mentored during this process, and shall aim to become autonomous and have such an empowered BoG by 2035.

19.3. The BoG shall be responsible and accountable to the stakeholders through transparent self-disclosures of all relevant records. It will be responsible for meeting all regulatory guidelines mandated by HECI through the National Higher Education Regulatory Council (NHERC).

19.4. All leadership positions and Heads of institutions will be offered to persons with high academic qualifications and demonstrated administrative and leadership capabilities along with abilities to manage complex situations. Leaders of an HEI will demonstrate strong alignment to Constitutional values and the overall vision of the institution, along with attributes such as a strong social commitment, belief in teamwork, pluralism, ability to work with diverse people, and a positive outlook. The selection shall be carried out by the BoG through a rigorous, impartial, merit-based, and competency-based process led by an Eminent Expert Committee (EEC) constituted by the BoG. While stability of tenure is important to ensure the development of a suitable culture, at the same time leadership succession will be planned with care to ensure that good practices that define an institution's processes do not end due to a change in leadership; leadership changes will come with sufficient overlaps, and not remain vacant, in order to ensure smooth transitions. Outstanding leaders will be identified and developed early, working their way through a ladder of leadership positions.

19.5. While being provided with adequate funding, legislative enablement, and autonomy in a phased manner, all HEIs, in turn, will display commitment to institutional excellence, engagement with their

local communities, and the highest standards of financial probity and accountability. Each institution will make a strategic Institutional Development Plan on the basis of which institutions will develop initiatives, assess their own progress, and reach the goals set therein, which could then become the basis for further public funding. The IDP shall be prepared with the joint participation of Board members, institutional leaders, faculty, students, and staff.

Part III. OTHER KEY AREAS OF FOCUS

20. Professional Education

20.1. Preparation of professionals must involve an education in the ethic and importance of public purpose, an education in the discipline, and an education for practice. It must centrally involve critical and interdisciplinary thinking, discussion, debate, research, and innovation. For this to be achieved, professional education should not take place in the isolation of one's specialty.

20.2. Professional education thus becomes an integral part of the overall higher education system. Stand-alone agricultural universities, legal universities, health science universities, technical universities, and stand-alone institutions in other fields, shall aim to become multidisciplinary institutions offering holistic and multidisciplinary education. All institutions offering either professional or general education will aim to organically evolve into institutions/clusters offering both seamlessly, and in an integrated manner by 2030.

20.3. Agricultural education with allied disciplines will be revived. Although Agricultural Universities comprise approximately 9% of all universities in the country, enrolment in agriculture and allied sciences is less than 1% of all enrolment in higher education. Both capacity and quality of agriculture and allied disciplines must be improved in order to increase agricultural productivity through better skilled graduates and technicians, innovative research, and market-based extension linked to technologies and practices. The preparation of professionals in agriculture and veterinary sciences through programmes integrated with general education will be increased sharply. The design of agricultural education will shift towards developing professionals with the ability to understand and use local knowledge, traditional knowledge, and emerging technologies while being cognizant of critical issues such as declining land productivity, climate change, food sufficiency for our growing population, etc. Institutions offering agricultural education must benefit the local community directly; one approach could be to set up Agricultural Technology Parks to promote technology incubation and dissemination and promote sustainable methodologies.

20.4. Legal education needs to be competitive globally, adopting best practices and embracing new technologies for wider access to and timely delivery of justice. At the same time, it must be informed and illuminated with Constitutional values of Justice - Social, Economic, and Political - and directed towards national reconstruction through instrumentation of democracy, rule of law, and human rights. The curricula for legal studies must reflect socio-cultural contexts along with, in an evidence-based manner, the history of legal thinking, principles of justice, the practice of jurisprudence, and other related content appropriately and adequately. State institutions offering law education must consider offering bilingual education for future lawyers and judges - in English and in the language of the State in which the institution is situated.

20.5. Healthcare education needs to be re-envisioned so that the duration, structure, and design of the educational programmes need to match the role requirements that graduates will play. Students will be assessed at regular intervals on well-defined parameters primarily required for working in primary care and in secondary hospitals. Given that people exercise pluralistic choices in healthcare, our healthcare education system must be integrative meaning thereby that all students of allopathic medical education must have a basic understanding of Ayurveda, Yoga and Naturopathy, Unani, Siddha, and Homeopathy (AYUSH), and vice versa. There shall also be a much greater emphasis on preventive healthcare and community medicine in all forms of healthcare education.

20.6. Technical education includes degree and diploma programmes in, engineering, technology, management, architecture, town planning, pharmacy, hotel management, catering technology etc., which are critical to India's overall development. There will not only be a greater demand for well-qualified manpower in these sectors, it will also require closer collaborations between industry and higher education institutions to drive innovation and research in these fields. Furthermore, influence of technology on human endeavours is expected to erode the silos between technical education and other disciplines too. Technical education will, thus, also aim to be offered within multidisciplinary education institutions and programmes and have a renewed focus on opportunities to engage deeply with other disciplines. India must also take the lead in preparing professionals in cutting-edge areas that are fast gaining prominence, such as Artificial Intelligence (AI), 3-D machining, big data analysis, and machine learning, in addition to genomic studies, biotechnology, nanotechnology, neuroscience, with important applications to health, environment, and sustainable living that will be woven into undergraduate education for enhancing the employability of the youth.

21. Adult Education and Lifelong Learning

21.1. The opportunity to attain foundational literacy, obtain an education, and pursue a livelihood must be viewed as basic rights of every citizen. Literacy and basic education open up whole new worlds of personal, civic, economic, and lifelong-learning opportunities for individuals that enable them to progress personally and professionally. At the level of society and the nation, literacy and basic education are powerful force multipliers which greatly enhance the success of all other developmental efforts. Worldwide data on nations indicate extremely high correlations between literacy rates and per capita GDP.

21.2. Meanwhile, being a non-literate member of a community, has innumerable disadvantages, including the inability to: carry out basic financial transactions; compare the quality/quantity of goods purchased against the price charged; fill out forms to apply for jobs, loans, services, etc.; comprehend public circulars and articles in the news media; use conventional and electronic mail to communicate and conduct business; make use of the internet and other technology to improve one's life and profession; comprehend directions and safety directives on the street, on medicines, etc.; help children with their education; be aware of one's basic rights and responsibilities as a citizen of India; appreciate works of literature; and pursue employment in medium or high-productivity sectors that require literacy. The abilities listed here are an illustrative list of outcomes to be achieved through adoption of innovative measures for Adult Education.

21.3. Extensive field studies and analyses, both in India and across the world, clearly demonstrate that volunteerism and community involvement and mobilization are key success factors of adult literacy programmes, in conjunction with political will, organizational structure, proper planning, adequate financial support, and high-quality capacity building of educators and volunteers. Successful literacy programmes result not only in the growth of literacy among adults, but also result in increased demand for education for all children in the community, as well as greater community contribution to positive social change. The National Literacy Mission, when it was launched in 1988, was largely based on the voluntary involvement and support of the people, and resulted in significant increases in national literacy during the period of 1991–2011, including among women, and also initiated dialogue and discussions on pertinent social issues of the day.

21.4. Strong and innovative government initiatives for adult education - in particular, to facilitate community involvement and the smooth and beneficial integration of technology - will be affected as soon as possible to expedite this all-important aim of achieving 100% literacy.

21.5. First, an outstanding adult education curriculum framework will be developed by a new and well-supported constituent body of the NCERT that is dedicated to adult education, so as to develop synergy with and build upon NCERT's existing expertise in establishing outstanding curricula for literacy, numeracy, basic education, vocational skills, and beyond. The curriculum framework for adult education will include at least five types of programmes, each with clearly defined outcomes: (a) foundational literacy and numeracy; (b) critical life skills (including financial literacy, digital literacy, commercial skills, health care and awareness, child care and education, and family welfare);

(c) vocational skills development (with a view towards obtaining local employment); (d) basic education (including preparatory, middle, and secondary stage equivalency); and (e) continuing education (including engaging holistic adult education courses in arts, sciences, technology, culture, sports, and recreation, as well as other topics of interest or use to local learners, such as more advanced material on critical life skills). The framework would keep in mind that adults in many cases will require rather different teaching-learning methods and materials than those designed for children.

21.6. Second, suitable infrastructure will be ensured so that all interested adults will have access to adult education and lifelong learning. A key initiative in this direction will be to use schools/ school complexes after school hours and on weekends and public library spaces for adult education courses which will be ICT-equipped when possible and for other community engagement and enrichment activities. The sharing of infrastructure for school, higher, adult, and vocational education, and for other community and volunteer activities, will be critical for ensuring efficient use of both physical and human resources as well as for creating synergy among these five types of education and beyond. For these reasons, Adult Education Centres (AECs) could also be included within other public institutions such as HEIs, vocational training centres, etc.

21.7. Third, the instructors/educators will be required to deliver the curriculum framework to mature learners for all five types of adult education as described in the Adult Education Curriculum Framework. These instructors will be trained by the National, State, and district level resource support institutions to organize and lead learning activities at Adult Education Centres, as well as coordinate with volunteer instructors. Qualified community members including from HEIs as part of each HEI's mission to engage with their local communities will be encouraged and welcomed to take a short training course and volunteer, as adult literacy instructors, or to serve as one-on-one volunteer tutors, and will be recognized for their critical service to the nation. States will also work with NGOs and other community organizations to enhance efforts towards literacy and adult education.

21.8. Fourth, all efforts will be undertaken to ensure the participation of community members in adult education. Social workers/counsellors travelling through their communities to track and ensure participation of non-enrolled students and dropouts will also be requested, during their travels, to gather data of parents, adolescents, and others interested in adult education opportunities both as learners and as teachers/tutors. The social workers/counsellors will then connect them with local Adult Education Centres (AECs). Opportunities for adult education will also be widely publicized, through advertisements and announcements and through events and initiatives of NGOs and other local organizations.

21.9. Fifth, improving the availability and accessibility of books is essential to inculcating the habit of reading within our communities and educational institutions. This Policy recommends that all communities and educational institutions - schools, colleges, universities and public libraries - will be strengthened and modernized to ensure an adequate supply of books that cater to the needs and interests of all students, including persons with disabilities and other differently-abled persons. The Central and State governments will take steps to ensure that books are made accessible and affordable to all across the country including socio-economically disadvantaged areas as well as those living in rural and remote areas. Both public and private sector agencies/institutions will devise strategies to improve the quality and attractiveness of books published in all Indian languages. Steps will be taken to enhance online accessibility of library books and further broad basing of digital libraries. For ensuring vibrant libraries in communities and educational institutions, it will be imperative to make available adequate library staff and also devise appropriate career pathways and CPD for them. Other steps will include strengthening all existing libraries, setting up rural libraries and reading rooms in disadvantaged regions, making widely available reading material in Indian languages, opening children's libraries and mobile libraries, establishing social book clubs across India and across subjects, and fostering greater collaborations between education institutions and libraries.

21.10. Finally, technology will be leveraged to strengthen and even undertake the above initiatives. Quality technology-based options for adult learning such as apps, online courses/modules, satellite-based TV channels, online books, and ICT-equipped libraries and Adult Education Centres, etc. will

be developed, through government and philanthropic initiatives as well as through crowd sourcing and competitions. In many cases, quality adult education could thereby be conducted in an online or blended mode.

22. Promotion of Indian Languages, Arts, and Culture

22.1. India is a treasure trove of culture, developed over thousands of years and manifested in the form of arts, works of literature, customs, traditions, linguistic expressions, artefacts, heritage sites, and more. Crores of people from around the world partake in, enjoy, and benefit from this cultural wealth daily, in the form of visiting India for tourism, experiencing Indian hospitality, purchasing India's handicrafts and handmade textiles, reading the classical literature of India, practicing yoga and meditation, being inspired by Indian philosophy, participating in India's unique festivals, appreciating India's diverse music and art, and watching Indian films, amongst many other aspects. It is this cultural and natural wealth that truly makes India, "Incredible !ndia", as per India's tourism slogan. The preservation and promotion of India's cultural wealth must be considered a high priority for the country, as it is truly important for the nation's identity as well as for its economy.

22.2. The promotion of Indian arts and culture is important not only for the nation but also for the individual. Cultural awareness and expression are among the major competencies considered important to develop in children, in order to provide them with a sense of identity, belonging, as well as an appreciation of other cultures and identities. It is through the development of a strong sense and knowledge of their own cultural history, arts, languages, and traditions that children can build a positive cultural identity and self-esteem. Thus, cultural awareness and expression are important contributors both to individual as well as societal well-being.

22.3. The arts form a major medium for imparting culture. The arts - besides strengthening cultural identity, awareness, and uplifting societies - are well known to enhance cognitive and creative abilities in individuals and increase individual happiness. The happiness/well-being, cognitive development, and cultural identity of individuals are important reasons that Indian arts of all kinds must be offered to students at all levels of education, starting with early childhood care and education.

22.4. Language, of course, is inextricably linked to art and culture. Different languages 'see' the world differently, and the structure of a language, therefore, determines a native speaker's perception of experience. In particular, languages influence the way people of a given culture speak with others, including with family members, authority figures, peers, and strangers, and influence the tone of conversation. The tone, perception of experience, and familiarity/'*apnapan*' inherent in conversations among speakers of a common language are a reflection and record of a culture. Culture is, thus, encased in our languages. Art, in the form of literature, plays, music, film, etc. cannot be fully appreciated without language. In order to preserve and promote culture, one must preserve and promote a culture's languages.

22.5. Unfortunately, Indian languages have not received their due attention and care, with the country losing over 220 languages in the last 50 years alone. UNESCO has declared 197 Indian languages as 'endangered'. Various unscripted languages are particularly in danger of becoming extinct. When senior member(s) of a tribe or community that speak such languages pass away, these languages often perish with them; too often, no concerted actions or measures are taken to preserve or record these rich languages/expressions of culture.

22.6. Moreover, even those languages of India that are not officially on such endangered lists, such as the 22 languages of Eighth Schedule of the Constitution of India, are facing serious difficulties on many fronts. Teaching and learning of Indian languages need to be integrated with school and higher education at every level. For languages to remain relevant and vibrant, there must be a steady stream of high-quality learning and print materials in these languages including textbooks, workbooks, videos, plays, poems, novels, magazines, etc. Languages must also have consistent official updates to their vocabularies and dictionaries, widely disseminated, so that the most current issues and concepts can be effectively discussed in these languages. Enabling such learning materials, print materials, and

translations of important materials from world languages, and constantly updating vocabularies, are carried out by countries around the world for languages such as English, French, German, Hebrew, Korean, and Japanese. However, India has remained quite slow in producing such learning and print materials and dictionaries to help keep its languages optimally vibrant and current with integrity.

22.7. Additionally, there has been a severe scarcity of skilled language teachers in India, despite various measures being taken. Language-teaching too must be improved to be more experiential and to focus on the ability to converse and interact in the language and not just on the literature, vocabulary, and grammar of the language. Languages must be used more extensively for conversation and for teaching-learning.

22.8. A number of initiatives to foster languages, arts, and culture in school children have been discussed in Chapter 4, which include a greater emphasis on music, arts, and crafts throughout all levels of school; early implementation of the three-language formula to promote multilingualism; teaching in the home/local language wherever possible; conducting more experiential language learning; the hiring of outstanding local artists, writers, craftspersons, and other experts as master instructors in various subjects of local expertise; accurate inclusion of traditional Indian knowledge including tribal and other local knowledge throughout into the curriculum, across humanities, sciences, arts, crafts, and sports, whenever relevant; and a much greater flexibility in the curriculum, especially in secondary schools and in higher education, so that students can choose the ideal balance among courses for themselves to develop their own creative, artistic, cultural, and academic paths.

22.9. To enable the key latter initiatives, a number of further actions will be taken in tandem at the higher education level and beyond. First, to develop and teach many of the courses of the type mentioned above, an excellent team of teachers and faculty will have to be developed. Strong departments and programmes in Indian languages, comparative literature, creative writing, arts, music, philosophy, etc. will be launched and developed across the country, and degrees including 4-year B.Ed. dual degrees will be developed in these subjects. These departments and programmes will, in particular help to develop a large cadre of high-quality language teachers - as well as teachers of art, music, philosophy and writing - who will be needed around the country to carry out this Policy. The NRF will fund quality research in all these areas. Outstanding local artists and craftspersons will be hired as guest faculty to promote local music, art, languages, and handicraft, and to ensure that students are aware of the culture and local knowledge where they study. Every higher education institution and even every school or school complex will aim to have Artist(s)-in-Residence to expose students to art, creativity, and the rich treasures of the region/country.

22.10. More HEIs, and more programmes in higher education, will use the mother tongue/local language as a medium of instruction, and/or offer programmes bilingually, in order to increase access and GER and also to promote the strength, usage, and vibrancy of all Indian languages. Private HEIs too will be encouraged and incentivized to use Indian languages as medium of instruction and/or offer bilingual programmes. Four-year B.Ed. dual degree programmes offered bilingually will also help, e.g. in training cadres of science and mathematics teachers to teach science bilingually at schools across the country.

22.11. High-quality programmes and degrees in Translation and Interpretation, Art and Museum Administration, Archaeology, Artefact Conservation, Graphic Design, and Web Design within the higher education system will also be created. In order to preserve and promote its art and culture, develop high-quality materials in various Indian languages, conserve artefacts, develop highly qualified individuals to curate and run museums and heritage or tourist sites, thereby also vastly strengthening the tourism industry.

22.12. The Policy recognizes that the knowledge of the rich diversity of India should be imbibed first hand by learners. This would mean including simple activities, like touring by students to different parts of the country, which will not only give a boost to tourism but will also lead to an understanding and appreciation of diversity, culture, traditions and knowledge of different parts of India. Towards this direction under '*Ek Bharat Shrestha Bharat*', 100 tourist destinations in the country will be identified where educational institutions will send students to study these destinations and their

history, scientific contributions, traditions, indigenous literature and knowledge, etc., as a part of augmenting their knowledge about these areas.

22.13. Creating such programmes and degrees in higher education, across the arts, languages, and humanities, will also come with expanded high-quality opportunities for employment that can make effective use of these qualifications. There are already hundreds of Academies, museums, art galleries, and heritage sites in dire need of qualified individuals for their effective functioning. As positions are filled with suitably qualified candidates, and further artefacts are procured and conserved, additional museums, including virtual museums/e-museums, galleries, and heritage sites may contribute to the conservation of our heritage as well as to India's tourism industry.

22.14. India will also urgently expand its translation and interpretation efforts in order to make high-quality learning materials and other important written and spoken material available to the public in various Indian and foreign languages. For this, an Indian Institute of Translation and Interpretation (IITI) will be established. Such an institute would provide a truly important service for the country, as well as employ numerous multilingual language and subject experts, and experts in translation and interpretation, which will help to promote all Indian languages. The IITI shall also make extensive use of technology to aid in its translation and interpretation efforts. The IITI could naturally grow with time, and be housed in multiple locations including in HEIs to facilitate collaborations with other research departments as demand and the number of qualified candidates grows.

22.15. Due to its vast and significant contributions and literature across genres and subjects, its cultural significance, and its scientific nature, rather than being restricted to single-stream Sanskrit Pathshalas and Universities, Sanskrit will be mainstreamed with strong offerings in school - including as one of the language options in the three-language formula - as well as in higher education. It will be taught not in isolation, but in interesting and innovative ways, and connected to other contemporary and relevant subjects such as mathematics, astronomy, philosophy, linguistics, dramatics, yoga, etc. Thus, in consonance with the rest of this policy, Sanskrit Universities too will move towards becoming large multidisciplinary institutions of higher learning. Departments of Sanskrit that conduct teaching and outstanding interdisciplinary research on Sanskrit and Sanskrit Knowledge Systems will be established/strengthened across the new multidisciplinary higher education system. Sanskrit will become a natural part of a holistic multidisciplinary higher education if a student so chooses. Sanskrit teachers in large numbers will be professionalized across the country in mission mode through the offering of 4-year integrated multidisciplinary B.Ed. dual degrees in education and Sanskrit.

22.16. India will similarly expand its institutes and universities studying all classical languages and literature, with strong efforts to collect, preserve, translate, and study the tens of thousands of manuscripts that have not yet received their due attention. Sanskrit and all Indian language institutes and departments across the country will be significantly strengthened, with adequate training given to large new batches of students to study, in particular, the large numbers of manuscripts and their interrelations with other subjects. Classical language institutes will aim to be merged with universities, while maintaining their autonomy, so that faculty may work, and students too may be trained as part of robust and rigorous multidisciplinary programmes. Universities dedicated to languages will become multidisciplinary, towards the same end; where relevant, they may then also offer B.Ed. dual degrees in education and a language, to develop outstanding language teachers in that language. Further, it is also proposed that a new institution for Languages will be established. National Institute (or Institutes) for Pali, Persian and Prakrit will also be set up within a university campus. Similar initiatives will be carried out for institutes and universities studying Indian arts, art history, and Indology. Research for outstanding work in all these areas will be supported by the NRF.

22.17. Efforts to preserve and promote all Indian languages including classical, tribal and endangered languages will be taken on with new vigour. Technology and crowdsourcing, with extensive participation of the people, will play a crucial role in these efforts.

22.18. For each of the languages mentioned in the Eighth Schedule of the Constitution of India, Academies will be established consisting of some of the greatest scholars and native speakers to

determine simple yet accurate vocabulary for the latest concepts, and to release the latest dictionaries on a regular basis (analogous to the successful efforts for many other languages around the world). The Academies would also consult with each other, and in some cases take the best suggestions from the public, in order to construct these dictionaries attempting to adopt common words whenever possible. These dictionaries would be widely disseminated, for use in education, journalism, writing, speechmaking, and beyond, and would be available on the web as well as in book form. These Academies for Eighth Schedule languages will be established by the Central Government in consultation or collaboration with State Governments. Academies for other highly spoken Indian languages may also be similarly established by the Centre and/or States.

22.19. All languages in India, and their associated arts and culture will be documented through a web-based platform/portal/wiki, in order to preserve endangered and all Indian languages and their associated rich local arts and culture. The platform will contain videos, dictionaries, recordings, and more, of people (especially elders) speaking the language, telling stories, reciting poetry, and performing plays, folk songs and dances, and more. People from across the country will be invited to contribute to these efforts by adding relevant material onto these platforms/portals/wikis. Universities and their research teams will work with each other and with communities across the country towards enriching such platforms. These preservation efforts, and the associated research projects, e.g., in history, archaeology, linguistics, etc., will be funded by the NRF.

22.20. Scholarships for people of all ages to study Indian Languages, Arts, and Culture with local masters and/or within the higher education system will be established. The promotion of Indian languages is possible only if they are used regularly and if they are used for teaching and learning. Incentives, such as prizes for outstanding poetry and prose in Indian languages across categories, will be established to ensure vibrant poetry, novels, nonfiction books, textbooks, journalism, and other works in all Indian languages. Proficiency in Indian languages will be included as part of qualification parameters for employment opportunities.

23. Technology Use and Integration

23.1. India is a global leader in information and communication technology and in other cutting-edge domains, such as space. The Digital India Campaign is helping to transform the entire nation into a digitally empowered society and knowledge economy. While education will play a critical role in this transformation, technology itself will play an important role in the improvement of educational processes and outcomes; thus, the relationship between technology and education at all levels is bi-directional.

23.2. Given the explosive pace of technological development allied with the sheer creativity of tech-savvy teachers and entrepreneurs including student entrepreneurs, it is certain that technology will impact education in multiple ways, only some of which can be foreseen at the present time. New technologies involving artificial intelligence, machine learning, block chains, smart boards, handheld computing devices, adaptive computer testing for student development, and other forms of educational software and hardware will not just change what students learn in the classroom but how they learn, and thus these areas and beyond will require extensive research both on the technological as well as educational fronts.

23.3. Use and integration of technology to improve multiple aspects of education will be supported and adopted, provided these interventions are rigorously and transparently evaluated in relevant contexts before they are scaled up. An autonomous body, the National Educational Technology Forum (NETF), will be created to provide a platform for the free exchange of ideas on the use of technology to enhance learning, assessment, planning, administration, and so on, both for school and higher education. The aim of the NETF will be to facilitate decision making on the induction, deployment, and use of technology, by providing to the leadership of education institutions, State and Central governments, and other stakeholders, the latest knowledge and research as well as the opportunity to consult and share best practices. The NETF will have the following functions:

a) provide independent evidence-based advice to Central and State Government agencies on technology-based interventions;
b) build intellectual and institutional capacities in educational technology;
c) envision strategic thrust areas in this domain; and
d) articulate new directions for research and innovation.

23.4. To remain relevant in the fast-changing field of educational technology, the NETF will maintain a regular inflow of authentic data from multiple sources including educational technology innovators and practitioners and will engage with a diverse set of researchers to analyze the data. To support the development of a vibrant body of knowledge and practice, the NETF will organize multiple regional and national conferences, workshops, etc. to solicit inputs from national and international educational technology researchers, entrepreneurs, and practitioners.

23.5. The thrust of technological interventions will be for the purposes of improving teaching-learning and evaluation processes, supporting teacher preparation and professional development, enhancing educational access, and streamlining educational planning, management, and administration including processes related to admissions, attendance, assessments, etc.

23.6. A rich variety of educational software, for all the above purposes, will be developed and made available for students and teachers at all levels. All such software will be available in all major Indian languages and will be accessible to a wide range of users including students in remote areas and *Divyang* students. Teaching-learning e-content will continue to be developed by all States in all regional languages, as well as by the NCERT, CIET, CBSE, NIOS, and other bodies/institutions, and will be uploaded onto the DIKSHA platform. This platform may also be utilized for Teacher's Professional Development through e-content. CIET will be strengthened to promote and expand DIKSHA as well as other education technology initiatives. Suitable equipment will be made available to teachers at schools so that teachers can suitably integrate e-contents into teaching-learning practices. Technology-based education platforms, such as DIKSHA/SWAYAM, will be better integrated across school and higher education, and will include ratings/reviews by users, so as to enable content developers create user friendly and qualitative content.

23.7. Particular attention will need to be paid to emerging disruptive technologies that will necessarily transform the education system. When the 1986/1992 National Policy on Education was formulated, it was difficult to predict the disruptive effect that the internet would have brought. Our present education system's inability to cope with these rapid and disruptive changes places us individually and nationally at a perilous disadvantage in an increasingly competitive world. For example, while computers have largely surpassed humans in leveraging factual and procedural knowledge, our education at all levels excessively burdens students with such knowledge at the expense of developing their higher-order competencies.

23.8. This policy has been formulated at a time when an unquestionably disruptive technology - Artificial Intelligence (AI) 3D/7D Virtual Reality - has emerged. As the cost of AI-based prediction falls, AI will be able to match or outperform and, therefore, be a valuable aid to even skilled professionals such as doctors in certain predictive tasks. AI's disruptive potential in the workplace is clear, and the education system must be poised to respond quickly. One of the permanent tasks of the NETF will be to categorize emergent technologies based on their potential and estimated timeframe for disruption, and to periodically present this analysis to MHRD. Based on these inputs, MHRD will formally identify those technologies whose emergence demands responses from the education system.

23.9. In response to MHRD's formal recognition of a new disruptive technology, the National Research Foundation will initiate or expand research efforts in the technology. In the context of AI, NRF may consider a three-pronged approach: (a) advancing core AI research, (b) developing and deploying application-based research, and (c) advancing international research efforts to address global challenges in areas such as healthcare, agriculture, and climate change using AI.

23.10. HEIs will play an active role not only in conducting research on disruptive technologies but also in creating initial versions of instructional materials and courses including online courses in cutting-edge domains and assessing their impact on specific areas such as professional education. Once the technology has attained a level of maturity, HEIs with thousands of students will be ideally placed to scale these teaching and skilling efforts, which will include targeted training for job readiness. Disruptive technologies will make certain jobs redundant, and hence approaches to skilling and deskilling that are both efficient and ensure quality will be of increasing importance to create and sustain employment. Institutions will have autonomy to approve institutional and non-institutional partners to deliver such training, which will be integrated with skills and higher education frameworks.

23.11. Universities will aim to offer Ph.D. and Masters programmes in core areas such as Machine Learning as well as multidisciplinary fields "AI + X" and professional areas like health care, agriculture, and law. They may also develop and disseminate courses in these areas via platforms, such as SWAYAM. For rapid adoption, HEIs may blend these online courses with traditional teaching in undergraduate and vocational programmes. HEIs may also offer targeted training in low-expertise tasks for supporting the AI value chain such as data annotation, image classification, and speech transcription. Efforts to teach languages to school students will be dovetailed with efforts to enhance Natural Language Processing for India's diverse languages.

23.12. As disruptive technologies emerge, schooling and continuing education will assist in raising the general populace′s awareness of their potential disruptive effects and will also address related issues. This awareness is necessary to have informed public consent on matters related to these technologies. In school, the study of current affairs and ethical issues will include a discussion on disruptive technologies such as those identified by NETF/MHRD. Appropriate instructional and discussion materials will also be prepared for continuing education.

23.13. Data is a key fuel for AI-based technologies, and it is critical to raise awareness on issues of privacy, laws, and standards associated with data handling and data protection, etc. It is also necessary to highlight ethical issues surrounding the development and deployment of AI-based technologies. Education will play a key role in these awareness raising efforts. Other disruptive technologies that are expected to change the way we live, and, therefore, change the way we educate students, include those relating to clean and renewable energy, water conservation, sustainable farming, environmental preservation, and other green initiatives; these will also receive prioritized attention in education.

24. Online and Digital Education: Ensuring Equitable Use of Technology

24.1. New circumstances and realities require new initiatives. The recent rise in epidemics and pandemics necessitates that we are ready with alternative modes of quality education whenever and wherever traditional and in-person modes of education are not possible. In this regard, the National Education Policy 2020 recognizes the importance of leveraging the advantages of technology while acknowledging its potential risks and dangers. It calls for carefully designed and appropriately scaled pilot studies to determine how the benefits of online/digital education can be reaped while addressing or mitigating the downsides. In the meantime, the existing digital platforms and ongoing ICT-based educational initiatives must be optimized and expanded to meet the current and future challenges in providing quality education for all.

24.2. However, the benefits of online/digital education cannot be leveraged unless the digital divide is eliminated through concerted efforts, such as the Digital India campaign and the availability of affordable computing devices. It is important that the use of technology for online and digital education adequately addresses concerns of equity.

24.3. Teachers require suitable training and development to be effective online educators. It cannot be assumed that a good teacher in a traditional classroom will automatically be a good teacher in an online classroom. Aside from changes required in pedagogy, online assessments also require a

different approach. There are numerous challenges to conducting online examinations at scale, including limitations on the types of questions that can be asked in an online environment, handling network and power disruptions, and preventing unethical practices. Certain types of courses/subjects, such as performing arts and science practical have limitations in the online/digital education space, which can be overcome to a partial extent with innovative measures. Further, unless online education is blended with experiential and activity-based learning, it will tend to become a screen-based education with limited focus on the social, affective and psychomotor dimensions of learning.

24.4. Given the emergence of digital technologies and the emerging importance of leveraging technology for teaching-learning at all levels from school to higher education, this Policy recommends the following key initiatives:

(a) **Pilot studies for online education**: Appropriate agencies, such as the NETF, CIET, NIOS, IGNOU, IITs, NITs, etc. will be identified to conduct a series of pilot studies, in parallel, to evaluate the benefits of integrating education with online education while mitigating the downsides and also to study related areas, such as, student device addiction, most preferred formats of e-content, etc. The results of these pilot studies will be publicly communicated and used for continuous improvement.

(b) **Digital infrastructure**: There is a need to invest in creation of open, interoperable, evolvable, public digital infrastructure in the education sector that can be used by multiple platforms and point solutions, to solve for India's scale, diversity, complexity and device penetration. This will ensure that the technology-based solutions do not become outdated with the rapid advances in technology.

(c) **Online teaching platform and tools**: Appropriate existing e-learning platforms such as SWAYAM, DIKSHA, will be extended to provide teachers with a structured, user-friendly, rich set of assistive tools for monitoring progress of learners. Tools, such as, two-way video and two-way-audio interface for holding online classes are a real necessity as the present pandemic has shown.

(d) **Content creation, digital repository, and dissemination**: A digital repository of content including creation of coursework, Learning Games & Simulations, Augmented Reality and Virtual Reality will be developed, with a clear public system for ratings by users on effectiveness and quality. For fun based learning student-appropriate tools like apps, gamification of Indian art and culture, in multiple languages, with clear operating instructions, will also be created. A reliable backup mechanism for disseminating e-content to students will be provided.

(e) **Addressing the digital divide**: Given the fact that there still persists a substantial section of the population whose digital access is highly limited, the existing mass media, such as television, radio, and community radio will be extensively used for telecast and broadcasts. Such educational programmes will be made available 24/7 in different languages to cater to the varying needs of the student population. A special focus on content in all Indian languages will be emphasized and required; digital content will need to reach the teachers and students in their medium of instruction as far as possible.

(f) **Virtual Labs:** Existing e-learning platforms such as DIKSHA, SWAYAM and SWAYAMPRABHA will also be leveraged for creating virtual labs so that all students have equal access to quality practical and hands-on experiment-based learning experiences. The possibility of providing adequate access to SEDG students and teachers through suitable digital devices, such as tablets with pre-loaded content, will be considered and developed.

(g) **Training and incentives for teachers**: Teachers will undergo rigorous training in learner-centric pedagogy and on how to become high-quality online content creators themselves using online teaching platforms and tools. There will be emphasis on the teacher's role in facilitating active student engagement with the content and with each other.

(h) **Online assessment and examinations**: Appropriate bodies, such as the proposed National Assessment Centre or PARAKH, School Boards, NTA, and other identified bodies will design and implement assessment frameworks encompassing design of competencies, portfolio, rubrics, standardized assessments, and assessment analytics. Studies will be undertaken to pilot new ways of assessment using education technologies focusing on 21st century skills.

(i) **Blended models of learning**: While promoting digital learning and education, the importance of face-to-face in-person learning is fully recognized. Accordingly, different effective models of blended learning will be identified for appropriate replication for different subjects.

(j) **Laying down standards**: As research on online/digital education emerges, NETF and other appropriate bodies shall set up standards of content, technology, and pedagogy for online/digital teaching-learning. These standards will help to formulate guidelines for e-learning by States, Boards, schools and school complexes, HEIs, etc.

24.5 Creating a Dedicated Unit for Building of World Class, Digital Infrastructure, Educational Digital Content and Capacity

Technology in education is a journey and not a destination and capacity will be needed to orchestrate the various ecosystem players to implement policy objectives. A dedicated unit for the purpose of orchestrating the building of digital infrastructure, digital content and capacity building will be created in the Ministry to look after the e-education needs of both school and higher education. Since technology is rapidly evolving, and needs specialists to deliver high quality e-learning, a vibrant ecosystem has to be encouraged to create solutions that not only solve India's challenges of scale, diversity, equity, but also evolve in keeping with the rapid changes in technology, whose half-life reduces with each passing year. This centre will, therefore, consist of experts drawn from the field of administration, education, educational technology, digital pedagogy and assessment, e-governance, etc.

Part IV. MAKING IT HAPPEN

25. Strengthening the Central Advisory Board of Education

25.1. Achieving successful implementation of this policy demands a long-term vision, availability of expertise on a sustained basis, and concerted action from all concerned encompassing National, State, institutional, and individual levels. In this context, the Policy recommends strengthening and empowering the Central Advisory Board of Education (CABE) which will have a much greater mandate and not only a forum for widespread consultation and examination of issues relating to educational and cultural development. The remodeled and rejuvenated CABE shall also be responsible for developing, articulating, evaluating, and revising the vision of education in the country on a continuous basis, in close collaboration with MHRD and the corresponding apex bodies of States. It shall also create and continuously review the institutional frameworks that shall help attain this vision.

25.2. To bring the focus back on education and learning, it is desirable that the Ministry of Human Resource Development (MHRD) be re-designated as the Ministry of Education (MoE).

26. Financing: Affordable and Quality Education for All

26.1. The Policy commits to significantly raising educational investment, as there is no better investment towards a society's future than the high-quality education of our young people. Unfortunately, public expenditure on education in India has not come close to the recommended level of 6% of GDP, as envisaged by the 1968 Policy, reiterated in the Policy of 1986, and which was further reaffirmed in the 1992 review of the Policy. The current public (Government - Centre and States) expenditure on education in India has been around 4.43% of GDP (Analysis of Budgeted

Expenditure 2017-18) and only around 10% of the total Government spending towards education (Economic Survey 2017-18). These numbers are far smaller than most developed and developing countries.

26.2. In order to attain the goal of education with excellence and the corresponding multitude of benefits to this Nation and its economy, this Policy unequivocally endorses and envisions a substantial increase in public investment in education by both the Central government and all State Governments. The Centre and the States will work together to increase the public investment in Education sector to reach 6% of GDP at the earliest. This is considered extremely critical for achieving the high-quality and equitable public education system that is truly needed for India's future economic, social, cultural, intellectual, and technological progress and growth.

26.3. In particular, financial support will be provided to various critical elements and components of education, such as ensuring universal access, learning resources, nutritional support, matters of student safety and well-being, adequate numbers of teachers and staff, teacher development, and support for all key initiatives towards equitable high-quality education for underprivileged and socio-economically disadvantaged groups.

26.4. In addition to one-time expenditures, primarily related to infrastructure and resources, this Policy identifies the following key long-term thrust areas for financing to cultivate an education system: (a) universal provisioning of quality early childhood care education; (b) ensuring foundational literacy and numeracy; (c) providing adequate and appropriate resourcing of school complexes/clusters; (d) providing food and nutrition (breakfast and midday meals); (e) investing in teacher education and continuing professional development of teachers; (f) revamping colleges and universities to foster excellence; (g) cultivating research; and (h) extensive use of technology and online education.

26.5. Even the low level of funding on education in India, is frequently not spent in a timely manner at the District/institution level, hampering the achievement of the intended targets of those funds. Hence, the need is to increase efficiency in use of available budget by suitable policy changes. Financial governance and management will focus on the smooth, timely, and appropriate flow of funds, and their usage with probity; administrative processes will be suitably amended and streamlined so that the disbursal mechanism may not lead to a high volume of unspent balances. The provisions of GFR, PFMS and 'Just in Time' release to implementing agencies will be followed for efficient use of government resources and avoiding parking of funds. Mechanism of performance-based funding to States / HEIs may be devised. Similarly, efficient mechanism will be ensured for the optimal allocation and utilization of funds earmarked for SEDGs. The new suggested regulatory regime, with clear separations of roles and transparent self-disclosures, empowerment and autonomy to institutions, and the appointment of outstanding and qualified experts to leadership positions will help to enable a far smoother, quicker, and more transparent flow of funds.

26.6. The Policy also calls for the rejuvenation, active promotion, and support for private philanthropic activity in the education sector. In particular, over and above the public budgetary support which would have been otherwise provided to them, any public institution can take initiatives towards raising private philanthropic funds to enhance educational experiences.

26.7. The matter of commercialization of education has been dealt with by the Policy through multiple relevant fronts, including: the 'light but tight' regulatory approach that mandates full public self-disclosure of finances, procedures, course and programme offerings, and educational outcomes; the substantial investment in public education; and mechanisms for good governance of all institutions, public and private. Similarly, opportunities for higher cost recovery without affecting the needy or deserving sections will also be explored.

27. Implementation

27.1. Any policy's effectiveness depends on its implementation. Such implementation will require multiple initiatives and actions, which will have to be taken by multiple bodies in a synchronized and

systematic manner. Therefore, the implementation of this Policy will be led by various bodies including MHRD, CABE, Union and State Governments, education-related Ministries, State Departments of Education, Boards, NTA, the regulatory bodies of school and higher education, NCERT, SCERTs, schools, and HEIs along with timelines and a plan for review, in order to ensure that the policy is implemented in its spirit and intent, through coherence in planning and synergy across all these bodies involved in education.

27.2. Implementation will be guided by the following principles. First, implementation of the spirit and intent of the Policy will be the most critical matter. Second, it is important to implement the policy initiatives in a phased manner, as each policy point has several steps, each of which requires the previous step to be implemented successfully. Third, prioritization will be important in ensuring optimal sequencing of policy points, and that the most critical and urgent actions are taken up first, thereby enabling a strong base. Fourth, comprehensiveness in implementation will be key; as this Policy is interconnected and holistic, only a full-fledged implementation, and not a piecemeal one, will ensure that the desired objectives are achieved. Fifth, since education is a concurrent subject, it will need careful planning, joint monitoring, and collaborative implementation between the Centre and States. Sixth, timely infusion of requisite resources - human, infrastructural, and financial - at the Central and State levels will be crucial for the satisfactory execution of the Policy. Finally, careful analysis and review of the linkages between multiple parallel implementation steps will be necessary in order to ensure effective dovetailing of all initiatives. This will also include early investment in some of the specific actions (such as the setting up of early childhood care and education infrastructure) that will be imperative to ensuring a strong base and a smooth progression for all subsequent programmes and actions.

27.3. Subject-wise implementation committees of experts in cooperation and consultation with other relevant Ministries will be set up at both the Central and State levels to develop detailed implementation plans for each aspect of this Policy in accordance with the above principles to achieve the goals of the Policy in a clear and phased manner. Yearly joint reviews of the progress of implementation of the policy, in accordance with the targets set for each action, will be conducted by designated teams constituted by MHRD and the States, and reviews will be shared with CABE. In the decade of 2030-40, the entire policy will be in an operational mode, following which another comprehensive review will be undertaken.

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Abbreviations

ABC	Academic Bank of Credit
AI	Artificial Intelligence
AC	Autonomous degree-granting College
AEC	Adult Education Centre
API	Application Programming Interface
AYUSH	Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy
B.Ed.	Bachelor of Education
BEO	Block Education Officer
BITE	Block Institute of Teacher Education
BoA	Board of Assessment
BoG	Board of Governors
BRC	Block Resource Centre
B.Voc	Bachelor of Vocational Education
CABE	Central Advisory Board of Education
CBCS	Choice Based Credit System
CBSE	Central Board of Secondary Education
CIET	Central Institute of Educational Technology
CMP	Career Management and Progression
CoA	Council of Architecture
CPD	Continuous Professional Development
CRC	Cluster Resource Centre
CWSN	Children With Special Needs
DAE	Department of Atomic Energy
DBT	Department of Biotechnology
DEO	District Education Officer
DIET	District Institute of Education and Training
DIKSHA	Digital Infrastructure for Knowledge Sharing
DSE	Directorate of School Education
DST	Department of Science and Technology
ECCE	Early Childhood Care and Education
EEC	Eminent Expert Committee
GCED	Global Citizenship Education
GDP	Gross Domestic Product
GEC	General Education Council
GER	Gross Enrolment Ratio
GFR	General Financial Rule
HECI	Higher Education Commission of India
HEGC	Higher Education Grants Council
HEI	Higher Education Institutions
ICAR	Indian Council of Agricultural Research
ICHR	Indian Council of Historical Research
ICMR	Indian Council of Medical Research
ICT	Information and Communication Technology
IDP	Institutional Development Plan
IGNOU	Indira Gandhi National Open University
IIM	Indian Institute of Management
IIT	Indian Institute of Technology
IITI	Indian Institute of Translation and Interpretation
ISL	Indian Sign Language
ITI	Industrial Training Institute
M.Ed.	Master of Education
MBBS	Bachelor of Medicine and Bachelor of Surgery
MERU	Multidisciplinary Education and Research Universities
MHFW	Ministry of Health and Family Welfare

MHRD	Ministry of Human Resource Development
MoE	Ministry of Education
MOOC	Massive Open Online Course
MOU	Memorandum of Understanding
M. Phil	Master of Philosophy
MWCD	Ministry of Women and Child Development
NAC	National Accreditation Council
NAS	National Achievement Survey
NCC	National Cadet Corps
NCERT	National Council of Educational Research and Training
NCF	National Curriculum Framework
NCFSE	National Curriculum Framework for School Education
NCFTE	National Curriculum Framework for Teacher Education
NCIVE	National Committee for the Integration of Vocational Education
NCPFECCE	National Curricular and Pedagogical Framework for Early Childhood Care and Education
NCTE	National Council for Teacher Education
NCVET	National Council for Vocational Education and Training
NETF	National Educational Technology Forum
NGO	Non-Governmental Organization
NHEQF	National Higher Education Qualifications Framework
NHERC	National Higher Education Regulatory Council
NIOS	National Institute of Open Schooling
NIT	National Institute of Technology
NITI	National Institution for Transforming India
NPE	National Policy on Education
NPST	National Professional Standards for Teachers
NRF	National Research Foundation
NSQF	National Skills Qualifications Framework
NSSO	National Sample Survey Office
NTA	National Testing Agency
OBC	Other Backward Classes
ODL	Open and Distance Learning
PARAKH	Performance Assessment, Review and Analysis of Knowledge for Holistic development
PCI	Pharmacy Council of India
PFMS	Public Financial Management System
Ph.D	Doctor of Philosophy
PSSB	Professional Standard Setting Body
PTR	Pupil Teacher Ratio
R&I	Research and Innovation
RCI	Rehabilitation Council of India
RPWD	Rights of Persons with Disabilities
SAS	State Achievement Survey
SC	Scheduled Caste(s)
SCDP	School Complex/Cluster Development Plans
SCERT	State Council of Educational Research and Training
SCF	State Curricular Framework
SCMC	School Complex Management Committee
SDG	Sustainable Development Goal
SDP	School Development Plan
SEDG	Socio-Economically Disadvantaged Group
SEZ	Special Education Zone
SIOS	State Institutes of Open Schooling
SMC	School Management Committee
SQAAF	School Quality Assessment and Accreditation Framework
SSA	Sarva Shiksha Abhiyan
SSS	Simple Standard Sanskrit

SSSA	State School Standards Authority
ST	Scheduled Tribe(s)
STEM	Science, Technology, Engineering, and Mathematics
STS	Sanskrit Through Sanskrit
SWAYAM	Study Webs of Active Learning for Young Aspiring Minds
TEI	Teacher Education Institution
TET	Teacher Eligibility Test
U-DISE	Unified District Information System for Education
UGC	University Grants Commission
UNESCO	United Nations Educational, Scientific and Cultural Organization
UT	Union Territory
VCI	Veterinary Council of India

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TASK FORCE REPORT

The Roadmap for Implementation of National Education Policy - 2020

हरियाणा केंद्रीय विश्वविद्यालय

Central University of Haryana

TASK FORCE REPORT

The Roadmap for Implementation of National Education Policy - 2020

FOREWORD

The National Education Policy (NEP) 2020 has offered bouquet of opportunities for all the stakeholders of education in the country. The policy document blends the best components of previous policies with the innovative concepts suiting to the realistic requirements of the present times. It commemorates the contributions of classical Indian saints, scholars and gurus, and focuses on their relevance in modern education system. Primarily based on Indian ethos, some of the foundational principles of NEP-2020 include— multidisciplinary and holistic education and research; creative and critical thinking; human and constitutional values; respect for diversity and multilingualism; synergy in curriculum; pride for Indian cultural heritage; celebration of liberal arts; and global peace, harmony and well-being.

The policy spells out a concrete framework for the academic, research and innovative pursuits of higher education institutions. A thorough reading of the document suggests that the students, teachers, educational administrators and policy makers ought to review their strategies for better learning outcomes and bright future of young learners. Starting from curriculum designing to restructuring of governance, the policy leaves no scope for complacency and redundancy. It expects each and every stakeholder to contribute by internalising one's duty towards the sublime objectives of building the nation the way our great ancestors once dreamt of.

Keeping the above aspects and all other crucial aspects covered in the policy in mind, Central University of Haryana, within no time after the release of the Policy by the Ministry of Education, formed the Task Force to chart the roadmap for implementing the policy in the University. The gigantic task of preparing this draft Task Force Report involved series of discussions/meetings with the eminent experts from various prestigious higher educational institutes and academia of the University. The series of goal-oriented brainstorming sessions helped us devise this well-articulated report for consideration of the University authorities.

The Task Force is of the strong view that the reformative steps proposed in this Report shall pave the way for excellence in academic, research, and innovative initiatives of the University. The curricular and structural changes proposed in the Report shall have sustainable impact on the eco-system of the University. The Task Force further affirms that the Road Map shall have the desired impact only with the support of students, parents, teachers, administrative staff and the academic leadership of the University. The role of the community is no less important in effective implementation of some of the recommendations. It being an ambitious document, the Task Force might have evaded some of the components of the policy which may be taken care of during the implementation process. The esteemed members are also of the firm view that early implementation of the policy in the University would definitely inspire the other higher educational institutes of the country also.

We feel privileged to acknowledge and put on record the constant support and guidance of Prof. R. C. Kuhad, Vice-Chancellor of the University who motivated the team with his scholarly inputs and framework for the future. The Task Force is also indebted to all the Deans, Heads of the Departments, Statutory Officers and IQAC Officials for their timely support and encouragement.

- ***Task Force***

Acknowledgements

The process of devising the roadmap for implementation of National Education Policy-2020 has been a rewarding and enriching experience with the generous support and guidance of the Honourable Vice Chancellor who motivated the task force to accomplish the assignment in a time bound manner. The informed inputs and directions received from Prof. Kuhad oriented the task force to conduct series of discussion sessions and consultations with various stakeholders including Deans, Heads of Departments, faculty and administrative staff.

Here, I would like to acknowledge the active participation and contribution of all the external experts and internal members of the task force who have been instrumental in structuring the recommendations in the form of the roadmap for future. The task force could draft the roadmap in its present form with the help of valuable comments and serious engagement of eminent experts, from prestigious universities/ organisations, including Prof. Pawan Sharma, Kurukshetra University, Kurukshetra; Prof. Kadloor Savitri, Jamia Millia Islamia, Delhi; Prof. SVS Chaudhary, who has served NCTE, IGNOU and NCERT in different capacities; Prof. Sathans, NIT Kurukshetra; Prof. Prince Sharma, Panjab University Chandigarh; Dr. Avichal Kapur, Joint Secretary University Grants Commission, New Delhi and Dr. Aditya Saxena, University of Delhi.

I will fail in my duties if I don't mention the names of internal members of the task force including Prof. Sarika Sharma, Prof. Rajesh Malik, Prof. Satish Kumar, Prof. Neelam Sangwan, Prof. Rajbir Singh, Prof. Dinesh Kumar Gupta, Dr. Santosh CH, Dr. Anand Sharma, Dr. Ajay Bansal, Dr. Rajesh Kumar Gupta, Dr. Vinod Kumar (Chemistry), Dr. Pawan Kumar Maurya, Dr. Ranjan Aneja, Dr. Dinesh Chahal, Dr. Ajay Kumar, Dr. Amit Kumar (Hindi), Dr. Tejpal Dheva, Dr. Prakash Kanoo, Dr. Kalpana Chauhan (Electrical), Dr. Jaswant Kumar, Dr. Namarta Dhaka, Dr. Ajay Pal (Yoga), Dr. Amit Yadav (SoET) and Dr. Suyash Mishra, who have been crucial in the entire process of consultations, discussions, compiling and structuring of the report.

I, on the behalf of the Task Force, also express my gratitude to all the Deans, Heads of departments, Mr. Naresh Kumar, Assistant Librarian, entire administrative staff, ICT staff and IQAC officials for their vital contribution. I would also like to thank all other stakeholders of the University who have helped the Task Force in one way or the other.

(SANJIV KUMAR)
Chairperson, Task Force

Executive Summary

Background

With the notification of much awaited National Education Policy-2020, the Government has added one more feather in its cap, more so because it addresses the critical issues faced by the community of learners at various stages of education. The acceptability of the document can be measured by the fact that it is the outcome of rigorous deliberations at various levels across the country. As a result, National Education Policy-2020 is widely appreciated by all the stakeholders viz. students, parents, teachers, educational administrators, industry and media.

The Policy presents to the nation the vision for truly 'Atmanirbhar Bharat' with the young population trained in employable life skills to be imparted to them at an appropriate stage of learning. It has much to offer for the Higher Education sector where it envisages the rationalised institutional architecture for optimum utilisation of resources through the concepts of large multidisciplinary education and research universities (MERUs), Teaching-Intensive Universities, and Autonomous Degree-granting Colleges; performance-based graded autonomy; flexible curricular structures to promote multidisciplinary approach to knowledge; UG Degree of 3-4 year duration with multiple exit options, four year Teacher Training programmes, Academic Bank of Credit to store the academic credits earned; formative assessment; professional education as the integral part of higher education, expansion of open and distance learning programmes; 50% GER by 2035, and internationalisation of higher education.

Putting all doubts to rest, it introduces Higher Education Commission as the apex architecture body with other empowered organs like National Higher Education Regulatory Council (NHERC), National Research Foundation, National Accreditation Council; National Educational Technology Forum (NETF) and many others with different mandates.

Undoubtedly, the NEP-2020 underlines the importance of accessibility, equity, inclusion and affordability for the nation to emerge as the knowledge super power. The Policy is a revolutionary step of the Government and will bring transformational changes in the entire education system through advancements in pedagogies, knowledge creation, innovative delivery mechanism and integrated management of education systems.

Methodology

The Task Force of Central University of Haryana devised its Institutional Implementation Plan after conducting multiple rounds of consultations with various stakeholders including faculty, Heads and Deans of the University and eminent experts from various prestigious organisations like National Council of Educational Research and Training, National Council of Teacher Education, University Grants Commission, Panjab University, Chandigarh, Kurukshetra University, Kurukshetra, Jamia Milia Islamia University, Delhi, University of Delhi, Delhi, and NIT, Kurukshetra. The Action Plan is based on the relevant components of the Policy with regard to Higher Education, Teacher Education and other key areas of focus including Professional Education, Life Long Learning, Promotion of Indian Languages, Arts, and Culture, Online and Digital Education and Implementation.

In **Part-I** of the Institutional Implementation Plan, the following vital areas are covered:

- Forward looking vision for India's Higher Education System
- Institutional Restructuring and Consolidation
- Towards a More Holistic and Multidisciplinary Education
- Optimal Learning Environments and Support for Students
- Motivated, Energised and Capable Faculty
- Equity and Inclusion in Higher Education
- Teacher Education
- Reimagining Vocational Education
- Catalysing Quality Academic Research in All Fields through National Research Foundation
- Transforming the Regulatory System of Higher Education
- Effective Governance and Leadership for Higher Education Institutions
- Professional Education
- Adult Education and Life-Long Learning
- Promotion of Indian Languages, Arts and Culture

In **Part-II** of the document, Key Strategic Initiatives have been earmarked to achieve the desired academic goals envisaged in National Education Policy-2020 in order of priority:

- Curricular and Pedagogical Aspects

- Restructuring of Institutional Priorities for Multidisciplinary Teaching and Research
- Necessary Steps for Implementation of the Recommendations

Part-III of the recommendations mentions the Action Plan with defined responsibilities and indicative timeline for the major academic reforms in abstract form.

Each component of the Policy has been studied and analysed threadbare to chart out the modalities for implementation at various levels of institution in a time bound manner. The reforms envisaged through the Policy shall see the light of the day with the cohesive efforts of all the stakeholders. The responsibilities and targets earmarked at various levels require active engagement of all the organs of the University.

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PART-I

NEP Provisions and Proposed Roadmap

PART-I
NEP Provisions and Proposed Roadmap

A. Forward looking vision for India's Higher Education System

Sr. No.	Specific Provision contained in NEP-2020	Strategy/ Roadmap for Implementation
i	Identified set of skills and values to be incorporated at each stage of learning, from pre-school to higher education (9.1.2)	• Vision and Mission of the University may be aligned with the spirit of NEP-2020, and the vision of each department should be in sync with the vision of the University. • The departments of study should identify the set of skills (physical, social, mental, emotional and ethical) and values to be imparted through each course, and these may be listed in the learning outcomes of each course and programme of study. This process may be completed within 6 months by each department so that the revised syllabus is displayed on University website well in advance before the commencement of Academic Session (2021-22). All the departments of the University may also devise the strategies to impart the identified skills. • The University may establish/strengthen various clubs for sports, dance, music, photography, fine arts, theatre activities, extension activities, literary activities, animation and designing etc. for up-skilling of the students. • While revising the curriculum, the University should promote integration of hobbies with academic learning. The University shall orient the students, faculty and staff to nurture human values enabling them to be sensitive about their responsibilities towards environment, underprivileged sections, community and society.
ii	Offering medium of instruction or programmes in local/Indian languages (9.3. a)	• In view of the focus of the policy on promotion of Indian Languages, arts and culture, the University may initially introduce local/Indian languages as medium of

		instruction in some of the UG courses, wherever relevant.
iii	Moving towards a more multidisciplinary undergraduate education (9.3. b)	• As specified in the NEP-2020, the University is required to integrate the Humanities and Arts with Science, Technology, Engineering and Mathematics (STEM) with special focus on social and moral awareness, soft skills and communication skills. The University may offer one-credit courses in communication skills, behavioural science and human social science as mandatory for all the graduates and post-graduates of the university. • The University may decide about the multidisciplinary courses/programmes and degrees to be offered by each school in coordination with other departments/schools for which the University may constitute a University-level Moderation Committee to suggest the multidisciplinary courses/programmes and their credits. • The University may prescribe minimum number of credits to be earned by a student from other disciplines/universities.
iv	Moving towards faculty and institutional autonomy (9.3. c)	• The University may move towards faculty autonomy by institutionalizing the mechanism for more freedom to the teachers in the matters relating to curricular and pedagogical nature. Faculty autonomy in these matters may be provided in gradual manner. • Taking a concrete step, each department may identify the relevant areas and the Faculty/Course-Coordinator may be assigned the responsibility to develop the course, pedagogical strategies and formative assessment strategies. • Ultimately, the University should move towards autonomy across the board i.e. for Vice Chancellor, faculty and even the students, particularly in the matters of academic interest. • The University in general and the faculty in

		particular should be conscious of the fact that autonomy necessitates accountability. • Each department should be provided adequate administrative/secretarial support.
v	Revamping curriculum, pedagogy, assessment, and student support for enhanced student experiences (9.3. d)	Considering the student to be the pivot of entire learning exercise, the University may revisit the curriculum, pedagogy, assessment strategies and student support mechanism by introducing the following steps: • Taking Student feedback/inputs during the process of revision of curriculum, pedagogy and assessment. • Remedial measures to address the academic needs of each student in addition to the classroom teaching. • Emphasizing on 'more learning' instead of 'rote learning', the University should give more emphasis on creative and critical thinking, and entrepreneurship in the process of student assessment. • Orienting the faculty towards designing the question papers in such a way that each question invokes the students for creative and original inputs. • Giving more freedom to the student to earn the credits not only from various departments of the University but also from Institutes of Higher learning located in India and Abroad. • Creating of Academic Credit Bank at the University level. • Strengthening the student support system through academic support for admission, guidance and counselling and placement and also administrative support for hostel, transport, student welfare, women helpdesk, library, registration and examination.

vi	Reaffirming the integrity of faculty and institutional leadership positions through merit appointments and career progression based on teaching, research, and service (9.3. e)	The policy considers the teacher to be instrumental in revamping of education system. Therefore, the University may initiate following steps: • Minimum 50 hours of professional development opportunities to each teacher every year. • The University should be equipped with the latest educational technologies to enable better learning experiences. • The faculty may be given the freedom to design their own curricular, pedagogical approaches within the approved framework, include textbook, reading material selection, assignment and assessment. • The University may institutionalize the steps to incentivise the faculty through appropriate rewards, promotions, recognitions and movement to institutional leadership positions. • The University may introduce a fast track promotion system for recognizing high impact research and contribution.
vii	NRF Funding to seed research in universities (9.3. f)	• The University may promote the funded seed research in Universities by incentivising the young faculty earning handsome grants and research fellowships. • The University may establish an IPR Cell and Research Promotion Cell to promote the culture of quality research in the university.
viii	Governance of HEIs by high qualified independent boards having academic and administrative autonomy (9.3. g)	Reference clause no. 19.2 of National Education Policy 2020. • The policy provides that— "upon receiving the appropriate graded accreditation that deemed the Institution ready for such a move, a Board of Governors shall be established consisting of a group of highly qualified,

		competent and dedicated individual having proven capabilities and strong sense commitment to the institution…. It is envisaged that all HEIs will be incentivised, supported and mentored during this process, and shall aim to become autonomous and have such an empowered Board of Governors (BoG) by 2035."
ix	Increased access, equity, and inclusion through a range of measures (9.3. i)	Reference 14.4.2 of National Education Policy 2020. The University is required to take various steps as under: • Mitigating opportunity costs and fees for pursuing higher education • Providing more financial assistance and scholarships to socio-economically disadvantaged students • Conducting outreach on higher education opportunities and scholarships • Making admissions processes more inclusive • Make curriculum more inclusive. • Increasing employability potential of higher education programmes. • Developing more degree courses taught in Indian languages and bilingually. • Ensuring all buildings and facilities are wheelchair-accessible and disabled-friendly • Developing bridge courses for students that come from disadvantaged educational backgrounds. • Providing socio-emotional and academic support and mentoring for all such students through suitable counselling and mentoring programmes. • Ensuring sensitization of faculty, counsellor, and students on gender-identity issue and its inclusion in all aspects of the HEI, including curricula. • Strictly enforcing all no-discrimination and anti-harassment rules.

		• Developing Institutional Development Plans that contain specific plans for action on increasing participation from SEDGs, including but not limited to the above items. • Further, equity and inclusion may also be enhanced by creating an enabling environment, sound grievance redressal mechanism, facilitation of socio-economically disadvantaged groups and periodical monitoring and reviewing of the targets.
		• Creating the environment to promote diversity and mutual respect regardless of colour, religious belief, caste, creed or cultures, the University may implement the affirmative policies, programmes, schemes, facilities for the persons belonging to socially and economically disadvantaged groups of the society including persons with disabilities.
x	All infrastructure and learning materials accessible and available to learners with disabilities (9.3. i)	• The policy recommends that all the educational institutions will be strengthened and modernised to ensure an adequate supply of books that cater to the needs and interest of all students, including PWD and other differently-abled persons. The University may also enhance online accessibility of Library books with remote access, suiting to the needs of learners with disability. • The University may establish partnership with the Ministries/Organisations/Institutions such as Ministry of Social Justice and Empowerment, NCERT,NCTE, RCI, Ministry of Skill Development and Entrepreneurship etc**.** focused on specific skills and curricular requirements for differently-abled persons for appropriate support at regular intervals.
B. Institutional Restructuring and Consolidation		
i	Enabling the students to become well-rounded across	Considering the student to be the pivot of entire learning exercise, the University may

	disciplines including artistic, creative, and analytic subjects as well as sports (10.1)	revisit the curriculum, pedagogy, assessment strategies and student support mechanism by introducing the following steps: • Putting more emphasis on creative and critical thinking in the process of student assessment. • Conducting more freedom to the student to earn the credits not only from various departments of the University but also from Institutes of Higher learning located in India and Abroad. • Creating Academic Credit Bank at the University level. • The student support system may also be strengthened through academic support for admission, guidance, counselling & placement, and also through administrative support for hostel, transport, student welfare, women helpdesk, library, registration and examination.
ii	Developing active research communities across disciplines including cross-disciplinary research, and increasing resource efficiency, both material and human, across higher education (10.1)	The University may promote Multidisciplinary and cross-disciplinary research by- • Earmarking thrust areas of multidisciplinary research at University level. • Promoting the participation of faculty in cross- disciplinary researches. • Creating a research and development promotion cell for the effective implementation of research policies at university level. • The University may establish a multidisciplinary research centre to act as a bridge between university and industries, and to enhance the multidisciplinary research.
iii	A university will mean a multidisciplinary institution of higher learning that offers	• To achieve the desired objectives, the University may incorporate the components of value system, rich Indian tradition,

	undergraduate and graduate programmes, with high quality teaching, research, and community engagement (10.3)	sustainable philosophy of life and respect for plurality and diversity in the revised multidisciplinary curriculum • The University may incorporate the relevant Indian classical text in each course in the form of background reading for historical understanding of course/subject. • The University may prescribe the text like Bhagavad Gita, Kautilya's *Arthashastra*, *Charaka-samhita*, *Patanjali Yoga Sutras* and other seminal text in each programme of study to impart essential understanding of rich Indian traditions. • The University may also incorporate relevant *constitutional* provisions relating to equality on the basis of gender, caste, religion, region, class or language, respect for diversity and democratic ethos.
iv	Placing equal emphasis on teaching and research to develop as a 'Research-intensive university' or to place greater emphasis on teaching while conducting significant research to develop as a 'Teaching-intensive University' (10.3)	The University shall take appropriate steps to develop as a "Research Intensive University" while placing significant emphasis on multidisciplinary teaching. Some of the steps may include: • The University may introduce four-year degree programme leading to a degree with research if the student completes a rigorous research project in his/her major area of study as specified by the University. • The University may also introduce four year teacher training programme with component of research orientation in the last year. • All fresh Ph.D. entrance will be required to take credit based courses in teaching/education/pedagogy/writing related to their chosen Ph.D. subject during their doctoral training period. • The University may make a provision for Ph.D. students to have a minimum number of hours of actual teaching experience gathered

		through teaching assistantships and other means. • The University may make it a policy to consider only Ph.D. candidates for appointment as Assistant Professor. • The University may devise a mechanism to promote multidisciplinary research, consultancy and funded research projects for which a research manual of the University may be prepared. • The University may focus on research and innovation by setting up start-up incubation centres, technology development centres, centres in frontier areas of research with greater industry-academic linkages and interdisciplinary research • The University may take the lead to undertake research in areas of infectious diseases, epidemiology, virology, diagnostics, instrumentation, vaccinology and other relevant areas to combat epidemics and pandemics. • The University should promote the pedagogical advancements rooted in research while maintaining a fine balance between research and teaching.
v	HEIs will have the autonomy and freedom to move gradually from one category to another, based on their plans, actions, and effectiveness (10.5)	• The University shall initiate concerted efforts to achieve desired outcomes to be eligible for complete autonomy.
vi	In addition to teaching and research, the University will have other crucial responsibilities to discharge through appropriate resourcing, incentives, and structures. These include supporting other HEIs in their development,	Some of the important initiatives that the University may start are: • Promoting resource sharing amongst the departments and other Universities. • Identifying and adopting some neighbouring HEIs for academic support

	community engagement and service, contribution to various fields of practice, faculty development for the higher education system, and support to school education (10.6)	• Creating an annual calendar of activities for community engagement • Conducting extension activities in collaboration with HEIs. • Adopting the School complexes to provide them with essential support for quality education at school level. • Imparting training and faculty development facilities to the neighbouring HEIs. • Identifying schools for demonstration and nurturing of best practices being introduced in B.Ed/M.Ed programmes. • Regular interaction of B.Ed/M.Ed students and faculty with real life curriculum and pedagogical activities in schools.
vii	By 2040, all higher education institutions (HEIs) shall aim to become multidisciplinary institutions and shall aim to have larger student enrolments preferably in the thousands, for optimal use of infrastructure and resources, and for the creation of vibrant multidisciplinary communities (10.7)	The University may initiate various steps towards multidisciplinary and holistic education such as- • Introduction of UG programme integrating the Humanities and Arts with Science, Technology, Engineering and Mathematics (STEM) • Identifying set of professional/life skills to be imparted to all the students across the disciplines. These may include ethics of social engagement, soft skills, communication and respect for Indian value system. • Offering of bilingual academic programmes, wherever relevant • Using the mother tongue/local language as a medium of instruction, wherever relevant • The University may start the process to restructure the academic programmes with creating combination of disciplines for study. • The University may also offer multidisciplinary entry and exit points by removing rigid boundaries to facilitate new

		possibilities for lifelong learning. • The University may add the departments of study like Music, Philosophy, Indology, Fine arts, Translation and Interpretation and Comparative Literature. • The university may offer credit based courses and project in the areas of community engagement, environment education and value based education. • The academic programmes of the University may be revised in consonance with global citizenship education to make the learners aware of global issues so that they become active promoters of more peaceful, tolerant, inclusive, secure and sustainable societies. • To promote holistic education, the University may provide the students opportunities for internships with local industry, reputed educational institutes, businesses, artists, craft persons as well as research internship with other HEIs/research Institutions.
viii	Developing high-quality higher education institutions that have medium of instruction in local/Indian languages or bilingually (10.8)	• Identifying the courses and departments to introduce local/Indian languages as medium of instruction or to offer the courses in bilingual mode.
ix	The aim will be to increase the Gross Enrolment Ratio in higher education including vocational education from 26.3% (2018) to 50% by 2035 (10.8)	The University may attract large number of students to join its academic programmes by: • Providing adequate Hostel facility. • Affordable education to all. • Incorporating skill component in each programme. • Providing special facilities for socio-economically disadvantaged groups. • Integrating Humanities with STEM. • Creating employment-oriented curriculum. • Engaging adequate number of human resources at all levels

x	There will be a fair and transparent system for determining increased levels of public funding support for public HEIs. HEIs delivering education of the highest quality as laid down in this Policy will be incentivized in expanding their capacity (10.9)	• To be implemented at the level of Ministry/UGC
xi	Institutions will have the option to run Open Distance Learning (ODL) and online programmes, provided they are accredited to do so, in order to enhance their offerings, improve access, increase GER, and provide opportunities for lifelong learning (SDG-4). (10.10)	• The University should consolidate the efforts to have better ranking score in the next cycle of NAAC accreditation and NIRF ranking to be eligible for running ODL and online programmes.
xii	The overall higher education sector will aim to be an integrated higher education system, including professional and vocational education. (10.13)	• The University may restructure its academic programmes to integrate Arts, Humanities, Professional Courses, Science, Technology, Engineering and Mathematics (STEM) in tune with the spirit of the policy to impart multidisciplinary and holistic education.
C. Towards a More Holistic and Multidisciplinary Education		
i	The notion of a 'knowledge of many arts' or what in modern times is often called the 'liberal arts' (i.e., a liberal notion of the arts) must be brought back to Indian education, as it is exactly the kind of education that will be required for the 21st century. (11.1)	As listed at B (vii), The University may initiate various steps towards multidisciplinary and holistic education such as – • Introduction of UG programme integrating the Humanities and Arts with Science, Technology, Engineering and Mathematics (STEM) • Identifying set of professional/life skills to be imparted to all the students across the disciplines. These may include ethics of social engagement, soft skills, communication

		and respect for Indian value system. • Offering of bilingual academic programmes, wherever relevant • Using the mother tongue/local language as a medium of instruction, wherever relevant • The University may start the process to restructure the academic programmes with creating combination of disciplines for study. • The University may also offer multidisciplinary entry and exit points by removing rigid boundaries to facilitate new possibilities for lifelong learning. • The University may add the departments of study like Music, Philosophy, Indology, Fine arts, Translation and Interpretation and Comparative Literature. • The university may offer credit based courses and project in the areas of community engagement, environment education and value based education. • The academic programmes of the University may be revised in consonance with global citizenship education to make the learners aware of global issues so that they become active promoters of more peaceful, tolerant, inclusive, secure and sustainable societies. • To promote holistic education, the University may provide the students opportunities for internships with local industry, reputed educational institutes, businesses, artists, craft persons as well as research internship with other HEIs/research Institutions.
ii	Even engineering institutions, such as IITs, will move towards more holistic and multidisciplinary education with more arts and humanities. Students of arts and humanities	• The School of Engineering and Technology (SOET) may revisit the curriculum of Engineering programmes to integrate with arts and humanities. Similarly, the curriculum of programmes in arts, humanities and sciences may also be revised to promote

	will aim to learn more science and all will make an effort to incorporate more vocational subjects and soft skills. (11.4)	multidisciplinary/holistic education. • While revising the curriculum, the university may make the skill component necessary for Science, Engineering and Professional Courses, and an appropriate ratio for academic and skill components may be fixed.
iii	Imaginative and flexible curricular structures will enable creative combinations of disciplines for study, and would offer multiple entry and exit points. Graduate-level, master's and doctoral education in large multidisciplinary universities, while providing rigorous research-based specialization, would also provide opportunities for multidisciplinary work, including in academia, government, and industry. (11.5)	• The University may introduce multiple entry and exit points to facilitate life-long multidisciplinary education. • The University may offer rigorous research-based specialisation in multidisciplinary areas. • The project-work/dissertation/internships may be conducted in collaboration with industry, other Universities/research organisations.
iv	Flexibility in curriculum and novel and engaging course options will be on offer to students, in addition to rigorous specialization in a subject or subjects. This will be encouraged by increased faculty and institutional autonomy in setting curricula. Pedagogy will have an increased emphasis on communication, discussion, debate, research, and opportunities for cross-disciplinary and interdisciplinary thinking. (11.6)	• Allowing the faculty to exercise more autonomy in designing curriculum and pedagogical strategies. • Promoting the culture of cross-disciplinary and interdisciplinary research by allowing the students to register for Ph.D. programmes in the subjects other than their core subjects. • While revising the curriculum, the University may develop a mechanism to offer basket of three different types of courses namely, Core Courses, Discipline-centric Electives and Generic/Open Electives. • The general elective courses offered by the departments may be revised so as to make them truly multidisciplinary in nature. • The Academic Council may authorise the

		departments to make necessary revisions in the syllabi with the approval of Departmental Committee, and the same may be reported to the Board of Studies and the School Board to avoid delay in the process of revision/updation.
v	Departments in Languages, Literature, Music, Philosophy, Indology, Art, Dance, Theatre, Education, Mathematics, Statistics, Pure and Applied Sciences, Sociology, Economics, Sports, Translation and Interpretation, and other such subjects needed for a multidisciplinary, stimulating Indian education and environment will be established and strengthened at all HEIs. Credits will be given in all Bachelor's Degree programmes for these subjects if they are done from such departments or through ODL mode when they are not offered in-class at the HEI. (11.7)	• The University may add the departments of study like Music, Philosophy, Indology, Fine Arts, Translation and Interpretation and Comparative Literature.
vi	The flexible and innovative curricula of all HEIs shall include credit-based courses and projects in the areas of community engagement and service, environmental education, and value-based education. (11.8)	• The University may offer credit-based courses and projects in the areas of community engagement, environment education and value-based education. • The University may prepare a manual of 'University Social Responsibilities' with specific mention of the community engagement activities to be carried out during a year. Similarly, each department can plan its 'Departmental Social Responsibilities' by identifying such areas/issues where students and teachers can contribute significantly. • Academic programmes should be designed in

		such a way that each student gets fair opportunity to interact with society for proper understanding of application of knowledge for human/social welfare. • As a whole, the curriculum should be aligned with the societal needs.
vii	Environment education will include areas such as climate change, pollution, waste management, sanitation, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living. (11.8)	• The department of Environmental Science may introduce a basic course on Environment Education covering climate change, pollution, waste management, sanitation, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living as Generic Elective Course (GEC) for all the students.
viii	Value-based education will include the development of humanistic, ethical, Constitutional, and universal human values of truth (satya), righteous conduct (dharma), peace (shanti), love (prem), nonviolence (ahimsa), scientific temper, citizenship values, and also life-skills; lessons in seva/service and participation in community service programmes will be considered an integral part of a holistic education. (11.8)	• The School of Education may offer a course on value-based education including the development of humanistic, ethical, constitutional, and universal human values of truth (satya), righteous conduct (dharma), peace (shanti), love (prem), nonviolence (ahimsa), scientific temper, citizenship values, and also life-skills as Generic Elective Course for all the students of the University. • The University may award 1-2 credits for Seva/Service/Community Service programmes in tune with the existing provisions of *Swachh Bharat* Summer Internship programme. • The Department of Life Skills, Department of Yoga and School of Education may plan Generic Elective Courses on Life Skills as compulsory for all UG and PG students.
ix	As the world is becoming increasingly interconnected, Global Citizenship Education (GCED), a response to contemporary global	• The academic programmes of the University may be revised in consonance with global citizenship education to make the learners aware of global issues so that they become active promoters of more peaceful, tolerant,

	challenges, will be provided to empower learners to become aware of and understand global issues and to become active promoters of more peaceful, tolerant, inclusive, secure, and sustainable societies. (11.8)	inclusive, secure and sustainable societies.
x	Students will be provided with opportunities for internships with local industry, businesses, artists, crafts persons, etc., as well as research internships with faculty and researchers at their own or other HEIs/research institutions, so that students may actively engage with the practical side of their learning and, as a by-product, further improve their employability. (11.8)	• To promote holistic education, the University may provide the students opportunities for internships with local industry, businesses, artists, craft persons as well as research internship with other HEIs/Research Institutions. • The University may contribute in preservation and promotion of local knowledge, resources and traditional knowledge-based products through community-based projects. • The University may be instrumental in preserving and promoting of local/regional cultural/sociological/archaeological/historical resources with active support of students and researchers. • The University may contribute in tapping the unexplored resources (cultural/human/physical/geographical/historical) in the state, and can contribute in the preservation and promotion of rich regional heritage.
xi	The undergraduate degree will be of either 3 or 4-year duration, with multiple exit options within this period, with appropriate certifications, e.g., a certificate after completing 1 year in a discipline or field including vocational and professional areas, or a diploma after 2 years of study, or a Bachelor's degree after a	• The University may restructure its UG degree programmes in consonance with the provision contained in NEP 2020 to offer the choice of multiple exit option with appropriate certifications as prescribed.

	3-year programme. (11.9)	
xii	The 4-year multidisciplinary Bachelor's programme, however, shall be the preferred option since it allows the opportunity to experience the full range of holistic and multidisciplinary education in addition to a focus on the chosen major and minors as per the choices of the student. The 4-year programme may also lead to a degree 'with Research' if the student completes a rigorous research project in their major area(s) of study as specified by the HEI. (11.9)	• The University may switch over to four-year multidisciplinary bachelor programmes. Such 4-year programme may also lead to a degree 'with research' if the student completes a rigorous research project in the major areas of study as specified by the University.
xiii	An Academic Bank of Credit (ABC) shall be established which would digitally store the academic credits earned from various recognized HEIs so that the degrees from an HEI can be awarded taking into account credits earned. (11.9)	• The University may create an Academic Bank of Credit to facilitate flexible exit and entry options.
xiv	HEIs will have the flexibility to offer different designs of Master's programmes: (a) there may be a 2-year programme with the second year devoted entirely to research for those who have completed the 3-year Bachelor's programme; (b) for students completing a 4-year Bachelor's programme with Research, there could be a 1-year Master's programme; and (c) there may be an integrated	• The provisions contained in NEP 2020 may be adopted as it is.

	5-year Bachelor's/Master's programme. Undertaking a Ph.D. shall require either a Master's degree or a 4-year Bachelor's degree with Research. (11.10)	
xv	The M.Phil. programme shall be discontinued. (11.10)	• The University may discontinue the M.Phil programme w.e.f. 2021-22.
xvi	HEIs will focus on research and innovation by setting up start-up incubation centres; technology development centres; centres in frontier areas of research; greater industry-academic linkages; and interdisciplinary research including humanities and social sciences research. (11.12)	• All these provisions may be adopted as such for promotion of multidisciplinary/interdisciplinary research and innovation activities in the University. • The University may establish micro incubators in collaboration with industry to promote the culture of ideation, innovation and training in employability skills. • As a small technology for industry or common man is no less important than any publication in high impact factor journal, the students/young researchers may be motivated to give shape to their innovative ideas with the help of incubation centres. The University shall create the culture of 'Lab to Land' by promoting multidisciplinary research and innovations in the areas of societal importance in tune with national priorities. • Appropriate training and industry exposure to the students of professional/ vocational programmes for startups in the areas of manufacturing scientific/ educational instruments/ devices. • Appropriate training and industry exposure for the graduates of professional/vocational courses for establishment of startups for the production of affordable diagnostic kits for various diseases and assistive devices. • The vocational/professional programmes should have significant component of industry-based projects.

xvii	Given the scenario of epidemics and pandemics, it is critical that HEIs take the lead to undertake research in areas of infectious diseases, epidemiology, virology, diagnostics, instrumentation, vaccinology and other relevant areas. (11.12)	• The University may take the lead to undertake research in areas of infectious diseases, epidemiology, virology, diagnostics, instrumentation, vaccinology and other relevant areas to combat epidemics and pandemics.
xviii	HEIs will develop specific hand holding mechanisms and competitions for promoting innovation among student communities. (11.12)	The University may organise- • Competitions on students' innovation activities at regular intervals. • Annual Innovation awards may be institutionalised. Innovation on local/ethnic/regional foods/ dress to promote local area culture.
D. Optimal Learning Environments and Support for Students		
i	Effective learning requires a comprehensive approach that involves appropriate curriculum, engaging pedagogy, continuous formative assessment, and adequate student support. (12.1)	• The University may initiate the process of revising the curriculum in accordance with the spirit of NEP, the stresses upon engaging pedagogy, continuous formative assessment and adequate academic support to the students. • The University may constitute a University-level committee consisting of Deans/Senior faculty to devise the pattern of examinations and to develop model question papers in tune with NEP-2020.
ii	The curriculum must be interesting and relevant, and updated regularly to align with the latest knowledge requirements and to meet specified learning outcomes. (12.1)	• As stated at point no. 12(i) above, the revised curriculum should spell out specified learning outcomes.

iii	The assessment methods must be scientific, designed to continuously improve learning and test the application of knowledge. (12.1)	• The entire assessment process should be revised to make it more transparent and formative in nature to assess continuous improvements and learning and the ability for application of knowledge by the students.
iv	Development of capacities that promote student wellness such as fitness, good health, psycho-social well-being, and sound ethical grounding are also critical for high-quality learning. (12.1)	• The University may strengthen the mechanism for promotion of student wellness such as physical and mental health, psycho-social well-being and sound ethical grooming. These components may be made the integral parts of the revised curriculum.
v	Along with providing suitable resources and infrastructure, such as quality libraries, classrooms, labs, technology, sports/recreation areas, student discussion spaces, and dining areas, a number of initiatives will be required to ensure that learning environments are engaging and supportive, and enable all students to succeed. (12.1)	• In addition to curriculum, pedagogical and other related reforms, the University shall also be required to enrich technological support, sports/recreation facilities, student discussion forums and other initiatives to make the learning environment more engaging, supportive and lively. The University shall orient the teachers to leverage technology in the best possible way.
vi	In order to promote creativity, institutions and faculty will have the autonomy to innovate on matters of curriculum, pedagogy, and assessment within a broad framework of higher education qualifications that ensures consistency across institutions and programmes and across the ODL, online, and traditional 'in-class' modes. (12.2)	• The faculty of the University may be provided more autonomy to innovate on matters of curriculum, pedagogy and assessment for traditional 'in-class' modes and online education. • The University should promote the teachers to grow as a good researcher, thinker and a reflective intellectual. • General Elective courses may be offered through blended mode of learning and subsequently the GECs may be offered in the form of MOOCs.
vii	All assessment systems shall also be decided by the HEI,	• It is already in practice.

	including those that lead to final certification. (12.2)	
viii	The Choice Based Credit System (CBCS) will be revised for instilling innovation and flexibility. HEIs shall move to a criterion-based grading system that assesses student achievement based on the learning goals for each programme, making the system fairer and outcomes more comparable. (12.2)	• The University may revise the CBCS to make it more innovative and flexible, promoting more continuous and comprehensive evaluation.
ix	Each institution will integrate its academic plans ranging from curricular improvement to quality of classroom transaction - into its larger Institutional Development Plan (IDP). (12.3)	• The University may initiate the process to develop IDP stating long term vision for academic, research, innovation, infrastructure development and other areas of vital importance.
x	Each institution will create strong internal systems for supporting diverse student cohorts in academic and social domains both inside and outside formal academic interactions in the classroom. (12.3)	• The University should create various informal platforms to support diverse student groups through various activities to be planned under discussion forums, clubs, cells etc.
xi	HEIs will have mechanisms and opportunities for funding of topic-centred clubs and activities organized by students with the help of faculty and other experts as needed, such as clubs and events dedicated to science, mathematics, poetry, language, literature, debate, music, sports, etc. (12.3)	• The University may develop a mechanism to fund the topic centred clubs and activities organized by students with the help of faculty and other experts and annual allocation may be planned for each club to run its activities in the areas of science, mathematics, poetry, language, literature, debate, music, sports, etc. • Promoting creativity among the students, the university shall integrate extra-curricular activities and hobbies as integral components of curriculum.

xii	Students from socio-economically disadvantaged backgrounds require encouragement and support to make a successful transition to higher education. Universities will thus be required to set up high-quality support centres and will be given adequate funds and academic resources to carry this out effectively. (12.4)	• The NEP 2020 focuses on 'Learning opportunities for all' with target of 50% GER by 2035 to realize the desired objectives, it is crucial to promote the students belonging to socio-economically disadvantaged groups by way of implementing the recommended steps given at 14.4.2 of NEP 2020 document.
xiii	There will also be professional academic and career counselling available to all students, as well as counsellors to ensure physical, psychological and emotional well-being. (12.4)	• In addition to the steps to be taken by the University mentioned at 12(iv) above, the University will strengthen the practice of professional academic and career counselling for all the students at every level.
xiv	ODL and online education provide a natural path to increase access to quality higher education. In order to leverage its potential completely, ODL will be renewed through concerted, evidence-based efforts towards expansion while ensuring adherence to clearly articulated standards of quality. ODL programmes will aim to be equivalent to the highest quality in-class programmes available. (12.5)	• The University may initiate the process of starting Online/Open Distance Learning Programmes after having accreditation from the concerned agency.
xv	All programmes, courses, curricula, and pedagogy across subjects, including those inclass, online, and in ODL modes as well as student support will aim to achieve global standards of quality. (12.6)	• As mentioned at 12(i) above, ODL and in class mode of learning will aim at achieving global standards of quality.

xvi	Courses and programmes in subjects, such as Indology, Indian languages, AYUSH systems of medicine, yoga, arts, music, history, culture, and modern India, internationally relevant curricula in the sciences, social sciences, and beyond, meaningful opportunities for social engagement, quality residential facilities and on-campus support, etc. will be fostered to attain this goal of global quality standards, attract greater numbers of international students, and achieve the goal of 'internationalization at home'. (12.7)	• As mentioned at point no. 10 (vii), the University shall make all efforts to start/ strengthen courses and programmes in subjects such as Indology, Indian languages, AYUSH systems of medicine, yoga, arts, music, history, culture, and modern India. • While revising the curriculum the University shall ensure that the course content is internationally relevant. • To realize the desired objectives, the University shall create meaningful opportunities for social engagement on-campus logistic and academic support and quality residential facility to attract international students.
xvii	India will be promoted as a global study destination providing premium education at affordable costs thereby helping to restore its role as a Vishwa Guru. (12.8)	• The steps taken by the University as mentioned at point no. 12(vii) shall help in restoring the role of the nation as a Vishwa Guru.
xviii	An International Students Office at each HEI hosting foreign students will be set up to coordinate all matters relating to welcoming and supporting students arriving from abroad. (12.8)	• The University may establish an International Student's Office to coordinate all matters relating to foreign students. • The University may also initiate the steps for excusive accommodation facility to attract the foreign students.
xix	Research/ teaching collaborations and faculty/ student exchanges with high-quality foreign institutions will be facilitated, and relevant mutually beneficial MOUs with foreign countries will be signed. (12.8)	• The Faculty of the University may be encouraged to enter in collaboration with high-quality foreign institutions for faculty/student exchange programme for research and teaching. • The University may also take necessary steps to sign mutually beneficial MOUs with

		foreign countries/foreign institutions.
xx	Credits acquired in foreign universities will be permitted, where appropriate as per the requirements of each HEI, to be counted for the award of a degree. (12.8)	• As stated at point no. 11(xv) above, the Academic Credit Bank of the University shall also count the credits acquired by the students from foreign Universities for the award of a degree. • To facilitate the easy transfer of credits and equivalence, the University may restructure its academic programmes in such a way that all the departments and the programmes follow a uniform and compatible credit pattern. • To begin with, the University may consider the universities with equal or higher NAAC/NAC grades as equivalent, and the credits earned by the students from such universities may be counted while awarding the degrees.
xxi	Vibrant campus life is essential for high-quality teaching-learning processes. Towards this end, students will be given plenty of opportunities for participation in sports, culture/arts clubs, eco-clubs, activity clubs, community service projects, etc. (12.9)	• Sports, culture/arts clubs, eco-clubs, activity clubs, community service projects, etc. may be integrated with curriculum.
xxii	In every education institution, there shall be counselling systems for handling stress and emotional adjustments. (12.9)	• The student wellness such as physical and mental health, psycho-social well-being and sound ethical grooming may be ensured through dedicated Students Counselling Portal and creative value-based curriculum.
xxiii	A systematized arrangement shall be created to provide the requisite support to students from rural backgrounds, including increasing hostel facilities as needed. (12.9)	• The University may strengthen the practice of professional, academic and career counselling for all the students, particularly the students from rural background, at every level. At the same time, hostel facilities may be further augmented.

xxiv	All HEIs will ensure quality medical facilities for all students in their institutions. (12.9)	• The University may initiate necessary steps towards creation of quality medical facilities for all students by hiring good number of competent health staff to provide 24x7 health services.
xxv	Financial assistance to students shall be made available through various measures. Efforts will be made to incentivize the merit of students belonging to SC, ST, OBC, and other SEDGs. The National Scholarship Portal will be expanded to support, foster, and track the progress of students receiving scholarships. (12.10)	• The University shall expand the horizon of Merit cum Means Scheme to fairly incentivise the meritorious students belonging to SC, ST, OBC, and other SEDGs. • Gradually, the University efforts towards promoting SEDGs shall be linked with National Scholarship Portal. • The University may earmark up to 15% of its internal resources for financial support to the deserving students belonging to Socio-economically Disadvantaged Groups (SEDGs) in different ways.
E. Motivated, Energised and Capable Faculty		
i	HEIs will be equipped with the basic infrastructure and facilities, including clean drinking water, clean working toilets, blackboards, offices, teaching supplies, libraries, labs, and pleasant classroom spaces and campuses, and every classroom shall have access to the latest educational technology that enables better learning experiences. (13.2)	The University may enhance information technological support to enable better learning experiences by initiating following steps: • One smart classroom with latest ICT facilities with sound technical support in each department. • Extension of wi-fi facility to the residential blocks. • Appropriate training at regular intervals. • The faculty of the university should be provided with basic ICT facilities like Desktop/laptop, Printer, and other facilities/gadgets required for online teaching.
ii	Teaching duties also will not be excessive, and student-teacher ratios not too high, so that the activity of teaching remains pleasant and there is	• The University may expedite the process of regular faculty appointments for better student-teacher ratio.

	adequate time for interaction with students, conducting research, and other university activities. (13.3)	
iii	Faculty will be appointed to individual institutions and generally not be transferable across institutions so that they may feel truly invested in, connected to, and committed to their institution and community. (13.3)	• To be executed at the level of Ministry/UGC
iv	Faculty will be given the freedom to design their own curricular and pedagogical approaches within the approved framework, including textbook and reading material selections, assignments, and assessments. (13.4)	• The faculty may be given the autonomy to design the curriculum, select the prescribed texts, devise the pedagogical approaches and the adopt the innovative formative assessment strategies.
v	Empowering the faculty to conduct innovative teaching, research, and service as they see best will be a key motivator and enabler for them to do truly outstanding, creative work. (13.4)	• The desired objective may be achieved by giving more autonomy to teachers in curricular, pedagogical and assessment activities within the broad framework. The innovations of the teachers may also be acknowledged by the University. • Considering the importance of the teacher as the catalyst for desired transformation, the University should develop the mechanism for transforming the teachers through opportunities for periodical trainings, autonomy in collaborative researches/extension activities and holistic professional development. • Motivating the faculty for quality publications and research by way of financial incentives, publicity and recognition in other forms. • Mechanism to highlight the quality research

		of the faculty through website, newsletters, departmental display boards and media.
vi	Excellence will be further incentivized through appropriate rewards, promotions, recognitions, and movement into institutional leadership. Meanwhile, faculty not delivering on basic norms will be held accountable. (13.5)	• The University may develop the mechanism to incentivise the excellence of faculty in curricular, pedagogical and research by institutionalizing annual awards.
vii	HEIs will have clearly defined, independent, and transparent processes and criteria for faculty recruitment. Whereas the current recruitment process will be continued, a 'tenure-track' i.e., suitable probation period shall be put in place to further ensure excellence. (13.6)	• The University shall adopt utmost transparency in accordance with the regulation/guidelines issued by NHEC/UGC/Ministry of Education.
viii	There shall be a fast-track promotion system for recognizing high impact research and contribution. A system of multiple parameters for proper performance assessment, for the purposes of 'tenure' i.e., confirmed employment after probation, promotion, salary increases, recognitions, etc., including peer and student reviews, innovations in teaching and pedagogy, quality and impact of research, professional development activities, and other forms of service to the institution and the community, shall be developed by each HEI and	• The high impact research contribution may be linked with fast track promotion system on receiving necessary guidelines from the Ministry/UGC/NHEC. • The University may devise rigorous performance assessment parameters for 'tenure', promotion, salary increase, recognition etc. • The performance parameters may also involve peer and student reviews, pedagogical innovations, quality and impact of research professional development activities, corporate contribution to the University, community service. The mechanism of assessment and recognition of faculty may form the part of Institutional Development Plan.

	clearly enunciated in its Institutional Development Plan (IDP). (13.6)	
ix	Excellent faculty with high academic and service credentials as well as demonstrated leadership and management skills will be identified early and trained through a ladder of leadership positions. (13.7)	• The faculty identified as 'excellent' may be given appropriate opportunities for further training and assigning of leadership positions.
F. Equity and Inclusion in Higher Education		
i	Making quality higher education opportunities available to all individuals must be among the highest priorities. This Policy envisions ensuring equitable access to quality education to all students, with a special emphasis on SEDGs. (14.1)	• The University may devise the policy to promote equitable access to quality education to all students irrespective of social, economic or linguistic backgrounds. • The DSW Office and Equal Opportunity Cell of the University may play a very active role in identifying the students requiring academic, financial or remedial support.
ii	Certain facets of exclusion must be addressed specifically. These facets include— lack of knowledge of higher education opportunities, economic opportunity cost of pursuing higher education, financial constraints, admission processes, geographical and language barriers, poor employability potential of many higher education programmes, and lack of appropriate student support mechanisms. (14.3)	As specified in NEP 2020, the University may initiate following steps- • Mitigate opportunity costs and fees for pursuing higher education; • Provide more financial assistance and scholarships to socio-economically disadvantaged students; • Conduct outreach on higher education opportunities and scholarships; • Make admissions processes more inclusive; • Make curriculum more inclusive; • Increase employability potential of higher education programmes; • Develop more degree courses taught in Indian languages and bilingually; • Ensure all buildings and facilities are wheelchair-accessible and disabled-friendly; • Develop bridge courses for students that

		come from disadvantaged educational backgrounds; • Provide socio-emotional and academic support and mentoring for all such students through suitable counselling and mentoring programmes; • Ensure sensitization of faculty, counsellor, and students on gender-identity issue and its inclusion in all aspects of the HEI, including curricula; • Strictly enforce all no-discrimination and anti-harassment rules; and • Develop Institutional Development Plans that contain specific plans for action on increasing participation from SEDGs, including but not limited to the above items
iii	To ensure inclusion in Higher Education. (14.4.2)	• The responsibilities of HEIs as listed at 14.4.2 may be adhered to in a time bound manner.
G. Teacher Education		
i	Teachers must be grounded in Indian values, languages, knowledge, ethos, and traditions including tribal traditions, while also being well-versed in the latest advances in education and pedagogy. (15.1)	• The curriculum of Teacher- Education programmes requires to be changed in sync with the suggestions contained in NEP 2020. • The University shall produce value-oriented teachers who may impart the appropriate set of values not only through teaching but also through their sound professional and ethical conduct as role models for learners.
ii	Teacher Education sector and its regulatory system are, therefore, in urgent need of revitalization through radical action, in order to raise standards and restore integrity, credibility, efficacy, and high quality to the teacher education system. (15.2)	• The content and delivery of curriculum and pedagogy of Teacher- Education programmes require immediate revamping.

iii	By 2030, only educationally sound, multidisciplinary, and integrated teacher education programmes shall be in force. (15.3)	• To be executed at the level of Ministry/UGC/NHEC.
iv	As teacher education requires multidisciplinary inputs, and education in high-quality content as well as pedagogy, all teacher education programmes must be conducted within composite multidisciplinary institutions. All multidisciplinary universities will aim to establish, education departments which, besides carrying out cutting-edge research in various aspects of education, will also run B.Ed. programmes, in collaboration with other departments such as psychology, philosophy, sociology, neuroscience, Indian languages, arts, music, history, literature, physical education, science and mathematics.	• The school of education may revise the curriculum and dissemination strategies to make it multidisciplinary in nature by establishing active collaboration with other departments such as psychology, philosophy, sociology, neuroscience, Indian languages, arts, music, history, literature, physical education, science, mathematics, etc.
v	The 4-year integrated B.Ed. offered by such multidisciplinary HEIs will, by 2030, become the minimal degree qualification for school teachers. The 4-year integrated B.Ed. will be a dual-major holistic Bachelor's degree, in Education as well as a specialized subject such as a language, history, music, mathematics, computer science, chemistry, economics, art, physical education, etc. (15.5)	• The School of Education may initiate the process to start 4-year integrated B.Ed programme as a dual- major holistic Bachelor's degree in Education as well as a specialised subject such as a language, history, music, mathematics, computer science, chemistry, economics, art, physical education, etc.

vi	Beyond the teaching of cutting-edge pedagogy, the teacher education will include grounding in sociology, history, science, psychology, early childhood care and education, foundational literacy and numeracy, knowledge of India and its values/ ethos/ art/ traditions, and more. (15.5)	• The School of Education may put in place cutting edge pedagogy grounded in sociology, history, science, psychology, early childhood care and education, foundational literacy and numeracy, knowledge of India and its values/ ethos/ art/ traditions, and more.
v	The HEI offering the 4-year integrated B.Ed. may also run a 2-year B.Ed., for students who have already received a Bachelor's degree in a specialized subject. A 1-year B.Ed. may also be offered for candidates who have received a 4-year undergraduate degree in a specialized subject. (15.5)	• The School of Education may also offer 2-year B.Ed. for students who have already received a Bachelor's degree in a specialised subject. • Besides, a one-year B.Ed. may also be offered for candidates who have received a 4-year undergraduate degree in a specialized subject.
vi	Scholarships for meritorious students will be established for the purpose of attracting outstanding candidates to the 4-year, 2-year, and 1-year B.Ed. programmes. (15.5)	• The University may offer various scholarships for meritorious students to attract outstanding candidates to the three different types of B.Ed. programmes.
vii	HEIs offering teacher education programmes will ensure the availability of a range of experts in education and related disciplines as well as specialized subjects. Each higher education institution will have a network of government and private schools to work closely with, where potential teachers will teach student along with participating in other activities	• The School of Education may create a pool of experts in education, specialized subjects and related disciplines for appropriate academic support. • The School of Education may also liaise with neighboring government/private schools for teaching internships, collaborative community engagement, adult and vocational education related activities. • The concept of Life Long Learning may be practiced by encouraging the learners irrespective of their age.

	such as community service, adult and vocational education, etc. (15.6)	
viii	In order to maintain uniform standards for teacher education, the admission to pre-service teacher preparation programmes shall be through suitable subject and aptitude tests conducted by the National Testing Agency, and shall be standardized keeping in view the linguistic and cultural diversity of the country. (15.7)	• The University may participate in national level entrance/ admission tests/ aptitude tests to attract the students from diverse linguistic and cultural backgrounds.
ix	The faculty profile in Departments of Education will necessarily aim to be diverse where teaching/field/research experience will be highly valued. Faculty with training in areas of social sciences that are directly relevant to school education e.g., psychology, child development, linguistics, sociology, philosophy, economics, and political science as well as from science education, mathematics education, social science education, and language education programmes will be attracted and retained in teacher education institutions, to strengthen multidisciplinary education of teachers. (15.8)	• The School of Education may ensure that the faculty of the school possess diverse teaching/field/research experience to promote and strengthen multidisciplinary education of teachers.
x	All fresh Ph.D. entrants, irrespective of discipline, will be required to take credit-based courses in teaching/ education/	• The departments of the University offering Ph.D programmes may make necessary revisions to make it mandatory for Ph.D. students to take credit-based courses in

	pedagogy/ writing related to their chosen Ph.D subject during their doctoral training period. (15.9)	teaching/education/pedagogy/writing related to their Ph.D. subject during their doctoral training period.
xi	In case of Ph.D programme, exposure to pedagogical practices, designing curriculum, credible evaluation systems, communication, and so on will be ensured since many research scholars will go on to become faculty or public representatives/communicators of their chosen disciplines. (15.9)	• The revised Ph.D. course work curriculum shall give exposure to pedagogical practices, designing curriculum, credible evaluation systems, communication.
xii	Ph.D students will also have a minimum number of hours of actual teaching experience gathered through teaching assistantships and other means. Ph.D. programmes at universities around the country will be reoriented for this purpose. (15.9)	• The University may make the provision to offer teaching assistantship to the Ph.D. students after successful completion of one-year after the course work to provide them the exposure to actual teaching experience.
xiii	In-service continuous professional development for university teachers will continue through the existing institutional arrangements and ongoing initiatives. These initiatives will be strengthened and substantially expanded to meet the needs of enriched teaching-learning processes for quality education. (15.10)	• The University shall take all necessary steps for minimum 50 hours of continuous Professional Development to each teacher every year, to orient them towards innovative curricular, pedagogical practices.
H. Reimagining Vocational Education		
i	The 12th Five-Year Plan (2012–2017) estimated that less than 5% of the Indian	• The University may contribute by introducing

	workforce in the age group of 19–24 received formal vocational education. These numbers only underline the urgency of the need to hasten the spread of vocational education in India. (16.1)	some more certificate, diploma, UG/PG programmes in vocational education under Department of Vocational Education and Skill Development. Gradually, research programmes may also be introduced.
ii	Vocational education is perceived to be inferior to mainstream education and meant largely for students who are unable to cope with the latter. It is a serious concern that can only be dealt with by a complete re-imagination of how vocational education is offered to students in the future. (16.3)	• The University shall revise the curriculum of vocational Education programmes to integrate with general/professional education programmes to re-establish the prominence of vocational education with mainstream education. • General education may also include credits in the courses of related streams, entrepreneurial competencies, communication, soft skills, critical thinking, problem solving, decision making abilities and value education. The skill courses for skill component shall be as per the norms of respective Industry partners/ sector skill council of each programme. • Department of Vocational Studies and Skill Development shall review the courses periodically in accordance with the changing requirements of the industry and regional / national economic priorities. Skilling the youth is possible with more of application-based learning, experience-based learning, on- the-job training with specific job roles. • The University shall spread the awareness of vocational programmes under the Department of Vocational Studies and Skill Development in the country because more occupation specific education is beneficial for employment, but very small segment of the society knows about these programmes which are very significant for skilling the youth in higher education.
iii	This policy aims to overcome the social status hierarchy	• Revision of curriculum so as to integrate employable vocational and professional skill

	associated with vocational education and requires integration of vocational education programmes into mainstream education in all education institutions in a phased manner. (16.4)	sets in all the programmes of study.

iv	By 2025, at least 50% of learners through the school and higher education system shall have exposure to vocational education, for which a clear action plan with targets and timelines will be developed which will help to realise the full potential of India 's demographic dividend. (16.5)	• The Department of Vocational Education and Skill Development may prepare on action plan with targets and timelines to promote Vocational Educational Programmes in the University.
		• The University may also initiate following steps to increase the exposure of vocational education and realise the full potential of India's demographic dividend:
		  ◦ Mitigating fees for pursuing vocational programmes.
		  ◦ Providing more financial assistance and scholarships to socio-economically disadvantaged students pursuing vocational programmes.
		• Conduct outreach on vocational education opportunities and scholarships.

v	Higher education institutions will offer vocational education either on their own or in partnership with industry and NGOs. The B.Voc. Degrees introduced in 2013 will continue to exist, but vocational courses will also be available to students enrolled in all other Bachelor's degree programmes, including the 4-year multidisciplinary Bachelor's programmes. (16.5)	• The Department of Vocational Education and Skill Development shall enter into partnership with industry and NGOs for necessary expertise and support. • The department may also introduce short-term add-on Vocational Certificate/Diploma courses even for the students enrolled in other Bachelor's degree programme.

vi	HEIs will also be allowed to conduct short-term certificate courses in various skills including soft skills. 'Lok Vidya', i.e., important vocational knowledge developed in India, will be made accessible to students through integration into vocational education courses. (16.6)	• The Department of Vocational Education and Skill Development may introduce various short-term skill based Certificate courses to promote 'Lok Vidya' and integration of Vocational Component with general education. • Realising the importance of skills to be more important than the grades, the University may set an example before the industry as to how important it is to delink jobs/placements from marks and grades.
vii	Vocational education will be integrated into all school and higher education institutions in a phased manner over the next decade. Focus areas for vocational education will be chosen based on skills gap analysis and mapping of local opportunities. (16.6)	• The Department of Vocational and Skill Education shall develop an action plan to integrate vocational education with professional/general education programmes in a phased manner, keeping in view of the skill gap analysis. • In order to make vocational education more relevant and to create "industry fit" skilled workforce, Department of Vocational Studies and Skill Development shall develop constant dialogue with the industry partners to remain updated on the requirements of the workforce for the economy of the country.
viii	MHRD will constitute a National Committee for the Integration of Vocational Education (NCIVE), consisting of experts in vocational education and representatives from across Ministries, in collaboration with industry, to oversee this effort. (16.6)	• To be executed at the level of Ministry/UGC/NHEC
ix	Individual institutions that are early adopters must innovate to find models and practices that work and then share these with other institutions through mechanisms set up by NCIVE,	• The Department of Vocational Studies and Skill development may set an example for other Universities by devising its Action Plan to extend the reach of Vocational education at the earliest.

	so as to help extend the reach of vocational education. (16.7)	
x	Different models of vocational education, and apprenticeships, will also be experimented by higher education institutions. Incubation centres will be set up in higher education institutions in partnership with industries. (16.8)	• The department may initiate concerted efforts for establishment of Incubation Centres in partnership with industries/Sector-Skill Council.
xi	The National Skills Qualifications Framework will be detailed further for each discipline vocation and profession. Further, Indian standards will be aligned with the International Standard Classification of Occupations maintained by the International Labour Organization. This Framework will provide the basis for Recognition of Prior Learning. Through this, dropouts from the formal system will be reintegrated by aligning their practical experience with the relevant level of the Framework. The credit-based Framework will also facilitate mobility across 'general' and vocational education. (16.8)	• The first Para pertains to the domain of Ministry/NCEH/UGC. • On notification of revised National Skills Qualifications Framework (NSQF) by the concerned agency/ministry, the University shall make necessary provision to facilitate the dropouts from the formal system to align their practical experience with the relevant level of the NSQF. It will also facilitate mobility across 'general' and 'vocational education' programmes.
I. Catalysing Quality Academic Research in All Fields through National Research Foundation		
i	Expansion of research capabilities and output across disciplines. (17.2)	The University may promote multidisciplinary and cross- disciplinary research by- • Earmarking thrust areas of multidisciplinary research at University level.

		• Promoting the participation of faculty in cross- disciplinary researches. • The University may create research and development promotion cell for the effective implementation of research policies at university level. • University can think of establishing a multidisciplinary research centre to act as a bridge between university and industries, and to enhance the multidisciplinary research. • University Research Foundation (URF) may be initiated with well-articulated policy for mentoring/training researchers, guiding for fellowships, creating forum of top-notch experts to mentor/review research progress, guiding on availing grants, funding for research projects, undertaking research works of national importance in core and allied domains of knowledge, etc. • Introducing basic, intermediate and advanced short-term programmes in partnership with the specialised research institutes to provide best training on understanding the advanced dimensions of research methodology, tool and techniques used in research, etc. • Venturing into inter and intra-institutional collaborative research works.
ii	Inclusion of research and internships in the undergraduate curriculum, faculty career management systems that give due weightage to research, and the governance and regulatory changes that encourage an environment of research and innovation. (17.8)	• The University may include the component of research and internship in the Under-Graduate curriculum. • The high impact research contribution may be linked with fast track promotion system on receiving necessary guidelines from the Ministry/UGC/NHEC. • The University may tie-up with MNCs to depute the best performing students to avail internships and also the University may collaborate with research and development organisations of national/international repute

		to chart a right career path for the students • The University may focus on research and innovation by setting up start-up incubation centres, technology development centres, centres in frontier areas of research with greater industry-academic linkages and interdisciplinary research. • The University may make a provision for Industry Expert in Departmental Research Committees of Sciences, Management, Engineering and other such departments having requirement of industrial support in planning the research priorities.
iii	Suitable incentives for and recognition of outstanding research, and by undertaking major initiatives to seed and grow research. (17.9)	• The University may promote the funded seed research in Universities by incentivising the young faculty earning handsome grants and research fellowships.
J. Transforming the Regulatory System of Higher Education		
i	Strict compliance measures with stringent action, including penalties for false disclosure of mandated information, will be ensured so that Higher Education Institutions are conforming to the basic minimum norms and standards. (18.10)	• Periodical Internal audits of each department/branch may be carried out. This will help achieve strict compliance measures of NHERC/ NAC/HEGC/GEC/HECI, etc.
ii	HEIs performing exceptionally well will be helped by Central and State governments to expand their institutions, and thereby attain larger numbers of students and faculty as well as disciplines and programmes. (18.11)	• Periodical audits, target-based research projects societal relevance, publishing papers, internal training programmes for continuous improvement of faculty/staff, mentoring exceptionally well performing faculty/staff, etc. all may lead to maintaining high standards and thus achieve get further assistance from Central and State governments to expand our institution/activities.

iii	Public Philanthropic Partnership models for HEIs may also be piloted with the aim to further expand access to high-quality higher education. (18.11)	• Our University may collaborate with NGOs of regional, national and international scope (following Public Philanthropic Partnership models) to work collaboratively to expand access to high-quality higher education.
iv	There will be transparent public disclosure of all these financial matters with recourse to grievance-handling mechanisms to the general public. (18.12)	• The University may further strengthen archiving/uploading of all public disclosure of all these financial matters on its website. It may also have updated grievance-handling mechanisms with necessary disclosures including RTIs to the general public in order to maintain utmost transparency of the system.
L. Effective Governance and Leadership for Higher Education Institutions		
i	Outstanding leaders will be identified and developed early, working their way through a ladder of leadership positions. 19.4	• Leadership programmes based on the competency skill-based matrix from the senior faculty may be sought. Accordingly, they may be trained with the help of Corporate sector/industry experts/ National/international organisations. They may be further mentored to find suitable positions in the institutions of repute.
ii	Each institution will make a strategic Institutional Development Plan on the basis of which institutions will develop initiatives, assess their own progress, and reach the goals set therein, which could then become the basis for further public funding. The IDP shall be prepared with the joint participation of Board members, institutional leaders, faculty, students, and staff (19.5)	• Institutional Development Plan of both short-term (of 5 years) and long term (of 10 years) may be prepared involving all the stakeholders of the University. This Plan may be prepared based on the 7 Criteria of NAAC assessment as to make the plan exhaustive, covering almost all the aspects of academia. Inputs for the plan may be sought from each Department/Sections to make the consolidated and complete Institutional Development Plan. This target-oriented plans listed in Institutional Development Plan may come handy during audits and availing of funds. • The university shall identify the best practices being followed by the best of the institutions

		across the world, and shall integrate them in its Institutional Development Plan with actionable timelines and strategies for implementation.
K. Professional Education		
i	The curricula for legal studies must reflect socio-cultural contexts along with, in an evidence-based manner, the history of legal thinking, principles of justice, the practice of jurisprudence, and other related content appropriately and adequately. State institutions offering law education must consider offering bilingual education for future lawyers and judges - in English and in the language of the State in which the institution is situated. (20.4)	• The School of Law may revisit the curriculum so as to incorporate socio cultural contexts in an evidence based manner, history of legal thinking, principles of justice, the practice of jurisprudence, and other related content. The School may also explore the possibilities of bilingual education for future lawyers and judges in English and in the language of the state.
ii	Closer collaborations between industry and higher education institutions to drive innovation and research in these fields. (20.6)	• The School of Engineering and Technology may explore the possibilities of collaborations with industry and other HEIs for promotion of innovation and research in the Engineering disciplines. • The University may tie up with research institutions for internship and research activities.
M. Adult Education and Life-Long Learning		
i	Adult Education Centres (AECs) could also be included within other public institutions such as HEIs, vocational training centres, etc. (21.6)	• The Department of Life Long Learning may establish adult education centre in tune with the spirit of NEP 2020. The University Library shall provide print and online resources to cater to the needs and interest of all the students including persons with disabilities and other differently abled persons.

ii	This Policy recommends that all communities and educational institutions - schools, colleges, universities and public libraries - will be strengthened and modernized to ensure an adequate supply of books that cater to the needs and interests of all students, including persons with disabilities and other differently-abled persons. (21.9)	• To promote Indian languages, arts and culture the University should procure high quality learning and print materials in the Indian languages. The University may also start a project with the Departments of Languages for update of vocabulary and dictionaries of Indian languages. • To promote the regional languages, the interested faculty may take up the project to develop the corpus of technical terminology of various disciplines in as many languages as possible. The departments of languages may collaborate with other universities and Commission for Scientific and Technical Terminology, Government of India for developing multilingual glossary of various subjects. The Department of Translation Studies and Interpretation may coordinate such projects. • Steps may be taken to translate the popular e-content in regional languages. The faculty involved in e-content development may align with language departments for translation in various other languages.
N. Promotion of Indian Languages, Arts and Culture		
i	For languages to remain relevant and vibrant, there must be a steady stream of high-quality learning and print materials in these languages including textbooks, workbooks, videos, plays, poems, novels, magazines, etc. Languages must also have consistent official updates to their vocabularies and dictionaries, widely disseminated. (22.6)	• To make the process of language teaching more interesting the faculty may use the languages taught for conversation also instead of merely as a medium of classroom teaching.

ii	Language-teaching too must be improved to be more experiential and to focus on the ability to converse and interact in the language and not just on the literature, vocabulary, and grammar of the language. Languages must be used more extensively for conversation and for teaching-learning. (22.7)	• The School of Humanities and Social Sciences should include traditional India knowledge including tribal knowledge in the curriculum. The relevant components of traditional Indian knowledge may also be incorporated across the disciplines including Sciences, Fine Arts, Sports etc.
iii	Accurate inclusion of traditional Indian knowledge including tribal and other local knowledge throughout into the curriculum, across humanities, sciences, arts, crafts, and sports, whenever relevant; and a much greater flexibility in the curriculum, especially in secondary schools and in higher education, so that students can choose the ideal balance among courses for themselves to develop their own creative, artistic, cultural, and academic paths. (22.8)	• The School of Humanities and Social Sciences is required to introduce/develop departments and programmes in Indian languages, comparative literature, creative writing, arts, music, philosophy etc. • Great Indian modern scientists/thinkers who have established the relevance of ancient Indian knowledge system may be introduced in the curriculum of each programme depending upon their relevance.
iv	Strong departments and programmes in Indian languages, comparative literature, creative writing, arts, music, philosophy, etc. will be launched and developed across the country, and degrees including 4- year B.Ed. dual degrees will be developed in these subjects. (22.9)	• The School of Education may also introduce 4-year B.Ed. dual degree in these subjects.
v	Every higher education institution and even every school or school complex will aim to have Artist(s)-in-	• The University may institutionalise artist(s)/writer(s)-in-residence programme to expose the students to art, creativity and the rich heritage of the region/country.

	Residence to expose students to art, creativity, and the rich treasures of the region/country. (22.9)	
vi	More HEIs, and more programmes in higher education, will use the mother tongue/local language as a medium of instruction, and/or offer programmes bilingually, in order to increase access and GER and also to promote the strength, usage, and vibrancy of all Indian languages. (22.10)	• The University should explore the possibility to offer at least some of the programmes with mother tongue/local language as a medium of instruction or bilingually to promote the strength, usage and vibrancy of Indian languages.
vii	. High-quality programmes and degrees in Translation and Interpretation, Art and Museum Administration, Archaeology, Artefact Conservation, Graphic Design, and Web Design within the higher education system will also be created. (22.11)	• The University may introduce department of translation studies to offer high quality programmes and degrees in translation and interpretation. The University may also introduce the programmes/degrees in art and museum administration artefact conservation, graphic design and web design.
viii	Towards this direction under 'Ek Bharat Shrestha Bharat', 100 tourist destinations in the country will be identified where educational institutions will send students to study these destinations and their history, scientific contributions, traditions, indigenous literature and knowledge, etc., as a part of augmenting their knowledge about these areas. (22.12)	• The University shall promote the students to visit the earmarked tourist destinations under *'Ek Bharat Shrestha Bharat'* initiative of the Government to study their history, scientific contribution, tradition, indigenous literature and knowledge.
ix	Sanskrit will be mainstreamed with strong offerings in school - including as one of the language options in the three-	• The University may promote Sanskrit as one of the language options in the 3-language formula in Higher Education. The Teaching of Sanskrit may not be performed in isolation

	language formula - as well as in higher education. It will be taught not in isolation, but in interesting and innovative ways, and connected to other contemporary and relevant subjects such as mathematics, astronomy, philosophy, linguistics, dramatics, yoga, etc. (22.15)	but in connection with other relevant subjects such as Mathematics, Astronomy, Philosophy, Linguistics, dramatics, Yoga etc.
x	Sanskrit teachers in large numbers will be professionalized across the country in mission mode through the offering of 4-year integrated multidisciplinary B.Ed. dual degrees in education and Sanskrit. (22.15)	• The School of Education may offer 4-year integrated multidisciplinary B.Ed. dual degrees in education and Sanskrit.
xi	India will similarly expand its institutes and universities studying all classical languages and literature, with strong efforts to collect, preserve, translate, and study the tens of thousands of manuscripts that have not yet received their due attention. (22.16)	• The Department of Sanskrit and other Indian Languages may actively participate in the process of collection, preservation, translation and study of rare manuscripts which have not yet received due attention.
xii	Classical language institutes will aim to be merged with universities, while maintaining their autonomy, so that faculty may work, and students too may be trained as part of robust and rigorous multidisciplinary programmes. Universities dedicated to languages will become multidisciplinary, towards the same end; where relevant, they may then also offer B.Ed. dual degrees in	• The University shall take necessary steps to coordinate with classical language Institutions for appropriate support and training of the students and faculty. Gradually, the University shall also setup institutes/centres for Pali, Persian and Prakrit languages.

	education and a language, to develop outstanding language teachers in that language. Further, it is also proposed that a new institution for Languages will be established. National Institute (or Institutes) for Pali, Persian and Prakrit will also be set up within a university campus. (22.16)	
xiii	Universities and their research teams will work with each other and with communities across the country towards enriching the web-based platform/portal/wiki, in order to preserve endangered and all Indian languages and their associated rich local arts and culture. (22.19)	• The Departments of Indian Languages may work rigorously towards preserving the endangered and other Indian languages along with local arts and culture.
xiv	Scholarships for people of all ages to study Indian Languages, Arts, and Culture with local masters and/or within the higher education system will be established. (22.20)	• The University may start special scholarships for people of all ages to study Indian languages, arts and culture.
xv	Proficiency in Indian languages will be included as part of qualification parameters for employment opportunities. (22.20)	• Gradually, the University may consider proficiency in Indian Languages as desirable qualification for employment opportunities.

PART-II

Key Strategic Initiatives to Achieve the Desired Academic Goals Envisaged in NEP-2020

PART-II

Key Strategic Initiatives to Achieve the Desired Academic Goals Envisaged in NEP-2020

A. Curricular and Pedagogical Aspects:

A.1. Vision and Mission of the University may be aligned with the spirit of NEP-2020, and the vision of each department should be in sync with the vision of the University.

A.2. Revision of syllabi of all the academic programmes to integrate multidisciplinary aspect skill component, value education and contemporary relevance for community, society and the Nation.

A.3. Each programme and course offered by a department should articulate learning outcomes.

A.4. General elective courses in communication skill, behavioral science, environment education, social and moral awareness and community engagement for the Graduate and Post Graduate students.

A.5. The process of curricular revision may be completed within six months so that the revised syllabus is displayed on University website well in advance before the commencement of Academic Session (2021-22).

A.6. The Academic Council may authorise the departments to make necessary revisions in the syllabi with the approval of Departmental Committee, and the same may be reported to the Board of Studies and the School Board to avoid delay in the process of revision/updation.

A.7. Establishment of various clubs for sports, dance, music, photography, fine arts, theatre activities, extension activities, literary activities, animation and designing etc. for up-skilling of the students.

A.8. Student feedback/inputs during the process of revision of curriculum, pedagogy and assessment.

A.9. More freedom to the student to earn the credits not only from various departments of the University but also from Institutes of Higher learning located in India and Abroad.

A.10. Incorporating the relevant Indian classical text in each course in the form of background reading for historical understanding of course/subject.

A.11. Prescribing the texts like *Bhagavad Gita*, Kautilya's *Arthashastra*, *Charaka-Samhita*, *Patanjali Yoga Sutras* and other seminal text in each programme of study to impart essential understanding of rich Indian traditions.

A.12. Autonomy to the faculty in designing of curriculum, pedagogical approaches, selection of study material and the stages of formative assessment.

A.13. Identifying set of professional/life skills to be imparted to all the students across the disciplines. These may include ethics of social engagement, soft skills, communication and respect for Indian value system.

A.14. Offering of bilingual academic programmes, wherever relevant

A.15. Starting the process to restructure the academic programmes by creating combination of disciplines for study.

A.16. Flexible entry and exit points by removing rigid boundaries to facilitate new possibilities for lifelong learning.

A.17. The academic programmes of the University may be revised in consonance with global citizenship education to make the learners aware of global issues so that they become active promoters of more peaceful, tolerant, inclusive, secure and sustainable societies.

A.18. Opportunities for internships with local industry, businesses, artists, craft persons as well as research internship with other HEIs/research Institutions.

A.19. Restructuring the academic programmes to integrate Arts, Humanities, Professional Courses, Science, Technology, Engineering and Mathematics (STEM) in tune with the spirit of the policy to impart multidisciplinary and holistic education.

A.20. While revising the curriculum, the university may make the skill component necessary for Science, Engineering and Professional Courses, and an appropriate ratio for academic and skill components may be fixed.

A.21. The project-work/dissertation/internships may be conducted in collaboration with industry, other Universities/research organisations.

A.22. While revising the curriculum, the University may develop a mechanism to offer basket of three different types of courses namely, Core Courses, Discipline-centric Electives and Generic/Open Electives.

A.23. Awarding 1-2 credits for Seva/Service/Community Service programmes in tune with the existing provisions of Swachh Bharat Summer Internship programme.

A.24. The Department of Life Skills, Department of Yoga and School of Education may plan Generic Elective Courses on Life Skills as compulsory for all UG and PG students.

A.25. Strengthening the mechanism for promotion of student wellness such as physical and mental health, psycho-social well-being and sound ethical grooming. These components may be made the integral parts of the revised curriculum.

A.26. Promoting creativity among the students, the university may integrate extra-curricular activities and hobbies as integral components of curriculum.

A.27. Efforts to start/ strengthen courses and programmes in subjects such as Indology, Indian languages, AYUSH systems of medicine, yoga, arts, music, history, culture, and modern India.

A.28. To facilitate the easy transfer of credits and equivalence, the University may restructure its academic programmes in such a way that all the departments and the programmes follow a uniform and compatible credit pattern.

A.29. To begin with, the University may consider the universities with equal or higher NAAC/NAC grades as equivalent, and the credits earned by the students from such universities may be counted while awarding the degrees.

A.30. The school of education may revise the curriculum and dissemination strategies to make it multidisciplinary in nature by establishing active collaboration with other departments such as Psychology, Philosophy, Sociology, Neuroscience, Indian languages, Arts, Music, History, Literature, Physical Education, Science and Mathematics.

A.31. The School of Education may create a pool of experts in education, specialised subjects and related disciplines for appropriate academic support.

A.32. The revised Ph.D. course work curriculum shall give exposure to pedagogical practices, designing curriculum, credible evaluation systems, communication, etc.

A.33. Promoting the teachers to take the fullest advantage of SWAYAM/DIKSHA platforms for online training by considering such trainings/workshops for CAS promotions.

A.34. Coordination with National Mission for Mentoring for necessary support in teaching in Indian languages to University teachers.

A.35. Introducing some more certificate, diploma, UG/PG programmes in vocational education under Department of Vocational Education and Skill Development. Gradually, research programmes may also be introduced.

A.36. Revising the curriculum of vocational programmes to integrate the general education component /skill component of programmes to re-establish the prominence of Vocational studies with mainstream education and to fulfil this purpose, general education shall include credits in the courses of related streams, entrepreneurial competencies, communication, soft skills, critical thinking, problem solving, decision making abilities and value education. The skill courses for skill component shall be as per the norms of respective Industry partners/ sector skill council of each programme.

A.37. Department of Vocational Studies and Skill Development shall review the courses periodically in accordance with the changing requirements of the industry and regional / national economic priorities. Skilling the youth is possible with more of application-based learning, experience-based learning, on-the-job training with specific job roles.

A.38. The department may also introduce short-term add-on Vocational Certificate/Diploma courses even for the students enrolled in other Bachelor's degree programme.

A.39. The Department of Skill Development and Vocational Education may introduce various short-term skill based Certificate courses to promote 'Lok Vidya' and integration of Vocational Component with general education.

A.40. Including the component of research and internship in the Undergraduate curriculum.

A.41. The School of Humanities and Social Sciences should include traditional Indian knowledge including tribal knowledge in the curriculum. The relevant components of traditional Indian knowledge may also be incorporated across the disciplines including Sciences, Fine Arts, Sports, etc.

A.42. The University may start special scholarships for people of all ages to study Indian languages, arts and culture.

B. Restructuring of Institutional Priorities for Multidisciplinary Teaching and Research:

B.1. Restructuring the academic programmes to integrate Arts, Humanities, Professional courses, Science, Technology, Engineering and Mathematics (STEM) in tune with the spirit of the policy to impart multidisciplinary and holistic education.

B.2. Constitution of a University-level Moderation Committee to suggest and recommend the multidisciplinary courses/programmes and their credits.

B.3. Academic Credit Bank of the University shall also count the credits acquired by the students from foreign Universities for the award of a degree.

B.4. Introducing the departments of study like Music, Philosophy, Indology, Fine Arts, Translation and Interpretation, and Comparative Literature.

B.5. Switching over to 4-year multidisciplinary bachelor programmes. Such 4-year programme may also lead to a degree 'with research' if the student completes a rigorous research project in the major areas of study as specified by the University.

B.6. A University-level committee consisting of Deans/Senior faculty to devise the pattern of examinations and to develop model question papers in tune with NEP-2020.

B.7. Provision to offer Teaching Assistantship to the Ph.D. students after successful completion of one-year after the course work to provide them the exposure to actual teaching experience.

B.8. The School of Humanities and Social Sciences is required to introduce/develop departments and programmes in Indian languages, Comparative Literature, Creative Writing, Arts, Music, Translation, Philosophy etc.

B.9. The University may institutionalise artist(s)/writer(s)-in-residence programme to expose the students to art, creativity and the rich heritage of the region/country.

B.10. The University may introduce Department of Translation Studies to offer high quality programmes and degrees in translation and interpretation. The University may also introduce the programmes/degrees in Art and Museum Administration, artefact conservation, graphic design and web design.

B.11. The University may promote Sanskrit as one of the language options in the 3-language formula in Higher Education. The Teaching of Sanskrit may not be performed in isolation but in connection with other relevant subjects such as Mathematics, Astronomy, Philosophy, Linguistics, Dramatics, Yoga, etc.

B.12. The University shall take necessary steps to coordinate with classical language Institutions for appropriate support and training of the students and faculty. Gradually, the University shall also setup institutes/centres for Pali, Persian and Prakrit languages.

B.13. Bridge courses for students that come from disadvantaged educational backgrounds.

B.14. Enhancing online accessibility of books in library with remote access, suiting to the needs of learners with disability.

B.15. Partnership with the Ministries/Organisations/Institutions such as Ministry of Social Justice and Empowerment, NCERT,NCTE, RCI, Ministry of Skill Development and Entrepreneurship etc**.** focused on specific skills and curricular requirements for differently-abled persons for appropriate support at regular intervals.

B.16. Multidisciplinary Research Centre to act as a bridge between university and industries to enhance the multidisciplinary research.

B.17. The University may also introduce four year Teacher Training Programme with component of research orientation in the last year.

B.18. The University may make it a policy to consider only Ph.D. candidates for appointment as Assistant Professor.

B.19. The University may devise a mechanism to promote multidisciplinary research, consultancy and funded research projects for which a Research Manual of the University may be prepared.

B.20. The University may take the lead to undertake research in areas of infectious diseases, Epidemiology, Virology, Diagnostics, Instrumentation, Vaccinology and other relevant areas to combat epidemics and pandemics.

B.21. Promoting the culture of cross-disciplinary and interdisciplinary research by allowing the students to register for Ph.D. programmes in the subjects other than their core subjects.

B.22. Promoting resource sharing amongst the departments and other universities.

B.23. Identifying and adopting some neighbouring HEIs for academic support

B.24. Annual calendar of activities for community engagement and extension activities in collaboration with HEIs.

B.25. Adopting the School Complexes to provide them with essential support for quality education at school level.

B.26. Imparting faculty development facilities to the neighbouring HEIs

B.27. Identifying schools for demonstration and nurturing of best practices being introduced in B.Ed/M.Ed programmes

B.28. Regular interaction of B.Ed/M.Ed students and faculty with real life curriculum and pedagogical activities in schools.

B.29. The University may prepare a manual of 'University Social Responsibilities' with specific mention of the community engagement activities to be carried out during a year. Similarly, each department can plan its 'Departmental Social Responsibilities' by identifying such areas/issues where students and teachers of the department can contribute significantly.

B.30. The Department of Environmental Studies may introduce a basic course on Environment Education covering climate change, pollution, waste management, sanitation, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living as Generic Elective Courses for all the students.

B.31. The School of Education may offer a course on value-based education including the development of humanistic, ethical, Constitutional, and universal human values of truth (*satya*), righteous conduct (*dharma*), peace (*shanti*), love (*prem*), nonviolence (*ahimsa*), scientific temper, citizenship values, and also life-skills as Generic Elective Course for all the students of the University.

B.32. The Department of Life Skills, Department of Yoga and School of Education may plan Generic Elective Courses on Life Skills as compulsory for all UG and PG students.

B.33. Competitions on students' innovation activities at regular intervals and annual Innovation awards may be institutionalised.

B.34. Innovation on local/ethnic/regional foods/ dress to promote local area culture.

B.35. Initiating the process to develop Institutional Development Plan stating long term vision for academic, research, innovation, infrastructure development and other areas of vital importance.

B.36. Discontinuation of M.Phil. Programme.

B.37. Developing a mechanism to fund the topic centred clubs and activities organized by students with the help of faculty and other experts. Annual allocation may be planned for each club to run its activities in the areas of science, mathematics, poetry, language, literature, debate, music, sports, etc.

B.38. Strengthening the practice of professional academic and career counselling for all the students at every level.

B.39. Establishing an International Students' Office to coordinate all matters relating to foreign students.

B.40. The University may also initiate the steps for exclusive accommodation facility to attract the foreign students.

B.41. Entering in collaboration with high-quality foreign institutions for faculty/student exchange programme for research and teaching.

B.42. The university may earmark up to 15% of its internal resources for financial support to the deserving students belonging to Socio-economically Disadvantaged Groups (SEDGs) in different ways.

B.43. One smart classroom with latest ICT facilities with sound technical support in each department.

B.44. Transforming the teachers through opportunities for periodical trainings, autonomy in collaborative researches and adequate financial support for research and extension activities (national/international level) for holistic professional development.

B.45. Autonomy to the Principal Investigators/Researchers in the process of utilisation of project grants.

B.46. The University shall take all necessary steps for minimum 50 hours of Continuous Professional Development to each teacher every year, to orient them towards innovative curricular, pedagogical practices.

B.47. Incentivising the excellence of faculty in curricular, pedagogical and research activities by institutionalizing annual awards.

B.48. The high impact research contribution may be linked with fast track promotion system on receiving necessary guidelines from the Ministry/UGC/NHEC.

B.49. The University may devise rigorous performance assessment parameters for 'tenure', promotion, salary increase, recognition etc.

B.50. The performance parameters may also involve peer and student reviews, pedagogical innovations, quality and impact of research professional development activities, corporate contribution to the University, and community service.

B.51. The faculty identified as 'excellent' may be given appropriate opportunities for further training and assigning of leadership positions.

B.52. Sensitization of faculty, counsellor, and students on gender-identity issue and its inclusion in all aspects of the University, including curricula.

B.53. 4-year integrated B.Ed programme as a dual- major holistic Bachelor's degree in Education as well as a specialised subject such as a language, History, Music,

Mathematics, Computer Science, Chemistry, Economics, Art, Physical Education, etc.

B.54. School of Education may train in cutting edge pedagogy grounded in Sociology, History, Science, Psychology, Early Childhood Care and Education, Foundational Literacy and Numeracy, knowledge of India and its values/ ethos/ art/ traditions, and more.

B.55. Besides, a one-year B.Ed. may also be offered for candidates who have received a 4-year undergraduate degree in a specialized subject.

B.56. Various scholarships for meritorious students to attract outstanding candidates to the three different types of B.Ed. programmes.

B.57. The School of Education may also liaise with neighbouring government/private schools for teaching internships, collaborative community engagement, adult and vocational education related activities.

B.58. The Department of Vocational Education and Skill Development may introduce various short-term skill based Certificate courses to promote 'Lok Vidya' and integration of Vocational Component with general education.

B.59. Establishment of IPR Cell and Research Promotion Cell to promote the culture of quality research in the university.

B.60. University Research Foundation (URF) may be initiated with well-articulated policy for mentoring/training researchers, guiding for fellowships, creating forum of top-notch experts to mentor/review research progress, guiding on availing grants, funding for research projects, undertaking research works of national importance in core and allied domains of knowledge, etc.

B.61. Collaboration with NGOs of regional, national and international scope (following Public Philanthropic Partnership models) to work collaboratively to expand access to high-quality higher education.

B.62. The School of Engineering and Technology may explore the possibilities of collaborations with industry and other HEIs for promotion of innovation and research in the Engineering disciplines.

B.63. The Department of Life Long Learning may establish Adult Education Centre in tune with the spirit of NEP 2020.

B.64. Artist/writer(s)-in-residence programme to expose the students to art, creativity and the rich heritage of the region/country.

B.65. The Department of Sanskrit and other Indian Languages may actively participate in the process of collection, preservation, translation and study of rare manuscripts which have not yet received due attention.

B.66. Promoting the students to visit the earmarked tourist destinations under *'Ek Bharat Shrestha Bharat'* initiative of the Government to study their history, scientific contribution, tradition, indigenous literature and knowledge.

C. Necessary Steps for Implementation of the Recommendations:

C.1. Constitution of a High Power Coordination Committee and area-wise Sub-Committees for time-bound implementation of the recommendations.

C.2. Necessary administrative support for implementation of the recommendations.

C.3. Timely approval of the recommendations by the competent authorities.

PART-III

Abstract of Action Plan with Defined Responsibility and Indicative Timeline for Major Academic Reforms

PART-III

A. Abstract of Action Plan with Defined Responsibility and Indicative Timeline for Major Academic Reforms

Sr. No.	Action & Implementation Plan	Responsibility	Timeline
1.1	a) Aligning the vision and Mission of the University with the spirit of NEP-2020; b) Vision of each department in sync with the vision of the University.	Deans and HoDs	3 Months
1.2	Revision of syllabi of all the academic programmes to integrate multidisciplinary skill component, value education and contemporary relevance for community, society and the nation.	Deans and HoDs	6 months
1.3	Each programme and course offered by a department should articulate learning outcomes.	Deans and HoDs	6 months
1.4	General elective courses in communication skill, behavioral science, environment education, social and moral awareness and community engagement for the Graduate and Postgraduate students.	Department of Psychology, English and Foreign Languages, School of Education and Department of Sociology	6 months
1.5	Curriculum revision within six months so that the revised syllabus is displayed on University website well in advance before the commencement of Academic Session (2021-22).	Deans and HoDs	6 months
1.6	The Academic Council may authorise the departments to make necessary revisions in the syllabi with the approval of Departmental Committee, and the same may be reported to the Board of Studies and the School Board to avoid delay in the process of revision/updation.	Academic Council (through Academic Branch)	3 months
1.7	Establishment of various clubs for sports, dance, music, photography, fine arts, theatre activities, extension activities, literary	Dean Students Welfare (DSW)	3 months

	activities, animation and designing etc. for up-skilling of the students.		
1.8	Student feedback/inputs during the process of revision of curriculum, pedagogy and assessment.	Deans and HoDs	6 months
1.9	More freedom to the student to earn the credits not only from various departments of the University but also from Institutes of Higher learning located in India and Abroad.	Deans, HoDs and Controller of Examination	1 year
1.10	Incorporating the relevant Indian classical text in each course in the form of background reading for historical understanding of course/subject.	Deans and HoDs	6 months
1.11	Prescribing the texts like *Bhagavad Gita*, Kautilya's *Arthashastra, Charaka-samhita*, *Patanjali Yoga Sutras* and other seminal texts in each programme of study to impart essential understanding of rich Indian traditions.	Deans and HoDs	6 months
1.12	Autonomy to the faculty in designing of curriculum, pedagogical approaches, selection of study material and the stages of formative assessment.	Academic Council	3 months
1.13	Identifying set of professional/life skills to be imparted to all the students across the disciplines. These may include ethics of social engagement, soft skills, communication and respect for Indian value system.	Deans	6 months
1.14	Offering of bilingual academic programmes, wherever relevant	Deans and HoDs	6 months
1.15	Starting the process to restructure the academic programmes with creating combination of disciplines for study.	Deans and HoDs	1 year
1.16	Flexible entry and exit points by removing rigid boundaries to facilitate new possibilities for lifelong learning.	Deans and HoDs	1 year
1.17	The academic programmes of the University may be revised in consonance with global citizenship education to make the learners aware of global issues so that they become active promoters of more peaceful, tolerant, inclusive, secure and sustainable societies.	Deans and HoDs	1 year
1.18	Opportunities for internships with local industry, businesses, artists, craft persons as	Dean, SOET; Dean, School	1 year

	well as research internship with other HEIs/research Institutions.	of Management and Business Studies; and Dean Research	
1.19	Restructuring the academic programmes to integrate Arts, Humanities, Professional courses, Science, Technology, Engineering and Mathematics (STEM) in tune with the spirit of the policy to impart multidisciplinary and holistic education.	Deans and HoDs	1 year
1.20	While revising the curriculum, the university may make the skill component necessary for Science, Engineering and Professional Courses, and an appropriate ratio for academic and skill components may be fixed.	Dean, SOET; Dean, School of Management and Business Studies; Dean, School of Law; Dean, School of Education; Dean, School of Applied Life Sciences; and HoD, Department of Vocational Studies and Skill Development	6 months
1.21	The project-work/dissertation/internships may be conducted in collaboration with industry, other Universities/research organisations.	Deans and HoDs	6 months
1.22	While revising the curriculum, the University may develop a mechanism to offer basket of three different types of courses namely, Core Courses, Discipline-centric Electives and Generic/Open Electives.	Deans and HoDs	6 months
1.23	Awarding 1-2 credits for Seva/Service/Community Service programmes in tune with the existing provisions of Swachh Bharat Summer Internship programme.	Dean Students Welfare (DSW)	6 months
1.24	The School of Life Long Learning, Department of Yoga and School of Education may plan	School of Education,	6 months

	Generic Elective Courses on Life Skills as compulsory for all UG and PG students.	Department of Yoga, and School of Life Long Learning	
1.25	Strengthening the mechanism for promotion of student wellness such as physical and mental health, psycho-social well-being and sound ethical grooming. These components may be made the integral parts of the revised curriculum.	School of Education; Department of Psychology; and Department of Physical Education	6 months
1.26	Promoting creativity among the students, the university shall integrate extra-curricular activities and hobbies as integral components of curriculum.	Dean Students Welfare (DSW)	6 months
1.27	Efforts to start/ strengthen courses and programmes in subjects such as Indology, Indian languages, AYUSH systems of medicine, yoga, arts, music, history, culture, and modern India.	Dean, School of Humanities and Social Sciences	1year
1.28	To facilitate the easy transfer of credits and equivalence, the University may restructure its academic programmes in such a way that all the departments and the programmes follow a uniform and compatible credit pattern.	Deans and HoDs	I year
1.29	To begin with, the University may consider the universities with equal or higher NAAC/NAC grades as equivalent, and the credits earned by the students from such universities may be counted while awarding the degrees.	Deans, HoDs and Examination Branch	I year
1.30	The school of education may revise the curriculum and dissemination strategies to make it multidisciplinary in nature by establishing active collaboration with other departments such as Psychology, Philosophy, Sociology, Neuroscience, Indian languages, Arts, Music, History, Literature, Physical Education, Science and Mathematics.	School of Education	1 year
1.31	The School of Education may create a pool of experts in education, specialised subjects and related disciplines for appropriate academic support.	School of Education	6 months

1.32	The revised Ph.D. course work curriculum shall give exposure to pedagogical practices, designing curriculum, credible evaluation systems, communication, etc.	Deans and HoDs	1 year
1.33	Promoting the teachers to take the fullest advantage of SWAYAM/DIKSHA platforms for online training, and considering such trainings/workshops for CAS promotions.	FDP Cell	6 months
1.34	Coordination with National Mission for Mentoring for necessary support in teaching in Indian languages to University teachers.	School of Humanities and Social Sciences	1 year
1.35	Introducing some more certificate, diploma, UG/PG programmes in vocational education under Department of Vocational Education and Skill Development. Gradually, research programmes may also be introduced.	Respective Schools and departments	1 year
1.36	Revising the curriculum of vocational programmes to integrate the general education component /skill component of programmes to re-establish the prominence of vocational studies with mainstream education. To fulfil this purpose, general education shall include credits in the courses of related streams, entrepreneurial competencies, communication, soft skills, critical thinking, problem solving, decision making abilities and value education. The skill courses for skill component shall be as per the norms of respective Industry partners/ sector skill council of each programme.	Department of Vocational Studies and Skill Development	6 months
1.37	Department of Vocational Studies and Skill Development shall review the courses periodically in accordance with the changing requirements of the industry and regional / national economic priorities. Skilling in the youth is possible with more of application based learning, experience based learning, on-the-job training with specific job roles, and more credibility would be created for skill programmes in this way.	Department of Vocational Studies and Skill Development	6 months
1.38	The department may also introduce short-term add-on Vocational Certificate/Diploma courses	Department of Vocational	1 year

	even for the students enrolled in other Bachelor's degree programmes.	Studies and Skill Development	
1.39	The Department of Skill Development and Vocational Education may introduce various short-term skill based Certificate courses to promote 'Lok Vidya' and integration of Vocational Component with general education.	Department of Vocational Studies and Skill Development	1 year
1.40	Including the component of research and internship in the Undergraduate curriculum.	All the Schools and Departments	1 year
1.41	The School of Arts, Humanities and Social Sciences should include traditional Indian knowledge including tribal knowledge in the curriculum. The relevant components of traditional Indian knowledge may also be incorporated across the disciplines including Sciences, Fine Arts, Sports etc.	Deans and HoDs	1 year
1.42	The University may start special scholarships for people of all ages to study Indian languages, arts and culture.	Deans and HoDs	1 year

B. Restructuring of Institutional Priorities for Multidisciplinary Teaching and Research:

2.1	Restructuring the academic programmes to integrate Arts, Humanities, Professional courses, Science, Technology, Engineering and Mathematics (STEM) in tune with the spirit of the policy to impart multidisciplinary and holistic education.	Deans and HoDs	1 year
2.2	Constitution of a University-level Moderation Committee to suggest and recommend the multidisciplinary courses/programmes and their credits.	Dean Academic and Academic Branch	3 months
2.3	Academic Credit Bank of the University shall also count the credits acquired by the students from foreign Universities for the award of a degree.	Examination Branch and Academic Branch	6 months
2.4	Introducing the departments of study like Music, Philosophy, Indology, Fine arts, Translation and Interpretation, and Comparative Literature.	School of Humanities and Social Sciences	1 year
2.5	Switching over to 4- year multidisciplinary	Deans and	1 year

	bachelor programmes. Such 4-year programme may also lead to a degree 'with research' if the student completes a rigorous research project in the major areas of study as specified by the University.	HoDs	
2.6	A University-level Committee consisting of Deans/Senior faculty to devise the pattern of examinations based on formative assessment and to develop model question papers in tune with NEP-2020.	Dean Academic and Academic Branch	6 months
2.7	Provision to offer Teaching Assistantship to the Ph.D. students after successful completion of one-year after the course work to provide them the exposure to actual teaching experience.	Dean Academic, Dean Research and Academic Branch	1 year
2.8	The School of Arts, Humanities and Social Sciences is required to introduce/develop departments and programmes in Indian languages, Comparative Literature, Creative Writing, Arts, Music, Translation, Philosophy etc.	School of Humanities and Social Sciences	1 year
2.9	The University may institutionalize artist(s)/writer(s)-in-residence programme to expose the students to art, creativity and the rich heritage of the region/country.	Dean Academic and DSW	6 months
2.10	The University may introduce department of Translation Studies to offer high quality programmes and degrees in translation and interpretation. The University may also introduce the programmes/degrees in art and museum administration, artefact conservation, graphic design and web design.	School of Humanities and Social Sciences and Academic Branch	1 year
2.11	The University may promote Sanskrit as one of the language options in the 3-language formula in Higher Education. The Teaching of Sanskrit may not be performed in isolation but in connection with other relevant subjects such as Mathematics, Astronomy, Philosophy, Linguistics, Dramatics, Yoga etc.	Department of Sanskrit and School of Humanities and Social Sciences	1 year
2.12	The University shall take necessary steps to coordinate with classical language Institutions for appropriate support and training of the students and faculty. Gradually, the University	School of Humanities and Social Sciences and Registrar	1 year

	shall also setup institutes/centres for Pali, Persian and Prakrit languages.		
2.13	Bridge courses for students from disadvantaged educational backgrounds.	Equal Opportunity Cell and DSW	1 year
2.14	Enhancing online accessibility of books in Library with remote access, suiting to the needs of learners with disability.	University Library and Cell for Differently-abled Persons	3 months
2.15	Partnership with the Ministries/Organisations/Institutions such as Ministry of Social Justice and Empowerment, NCERT, NCTE, RCI, Ministry of Skill Development and Entrepreneurship etc. focused on specific skills and curricular requirements for differently-abled persons for appropriate support at regular intervals.	Differently-abled Cell	6 months
2.16	Multidisciplinary Research Centre to act as a bridge between university and industries, and to enhance the multidisciplinary research.	Dean Academic	6 months
2.17	The University may also introduce four year teacher training programme with component of research orientation in the last year.	School of Education	1 year
2.18	The University may make it a policy to consider only Ph.D. candidates for appointment as Assistant Professor.	Registrar	6 months
2.19	The University may devise a mechanism to promote multidisciplinary research, consultancy and funded research projects for which a Research Manual of the University may be prepared.	Dean Research	6 months
2.20	The University may take the lead to undertake research in areas of infectious diseases, epidemiology, virology, diagnostics, instrumentation, vaccinology and other relevant areas to combat epidemics and pandemics.	Dean Research and School of Interdisciplinary and Applied Life Sciences	1 year
2.21	Promoting the culture of cross-disciplinary and interdisciplinary research by allowing the students to register for Ph.D. programmes in the subjects other than their core subjects.	Dean Academic and Academic Branch	1 year
2.22	Promoting resource sharing amongst the departments and other Universities.	Deans and HoDs	6 months
2.23	Identifying and adopting some neighboring	Registrar and	6 months

	HEIs for academic support	Dean Students Welfare (DSW)	
2.24	Annual calendar of activities for community engagement and extension activities in collaboration with HEIs.	Dean Students Welfare (DSW)	6 months
2.25	Adopting the School complexes to provide them with essential support for quality education at school level.	School of Education and Dean Students Welfare (DSW)	6 months
2.26	Imparting faculty development facilities to the neighbouring HEIs	School of Education	1 year
2.27	Identifying schools for demonstration and nurturing of best practices being introduced in B.Ed/ M.Ed programmes	School of Education	6 months
2.28	Regular interaction of B.Ed/M.Ed students and faculty with real life curriculum and pedagogical activities in schools.	School of Education	6 months
2.29	The University may prepare a manual of 'University Social Responsibilities' with specific mention of the community engagement activities to be carried out during a year. Similarly, each department can plan its 'Departmental Social Responsibilities' by identifying such areas/issues where students and teachers can contribute significantly.	Dean Students Welfare (DSW) And all the Departments of Study	6 months
2.30	The department of Environmental Studies may introduce a basic course on Environment Education covering climate change, pollution, waste management, sanitation, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living as GEC for all the students.	Department of Environmental Studies	6 months
2.31	The School of Education may offer a course on value-based education including the development of humanistic, ethical, Constitutional, and universal human values of truth (satya), righteous conduct (dharma), peace (shanti), love (prem), nonviolence (ahimsa), scientific temper, citizenship values, and also life-skills as Generic Elective Course for all the students of the University.	School of Education	6 months
2.32	The Department of Life Skills, Department of	Respective	6 months

	Yoga and School of Education may plan Generic Elective Courses on Life Skills as compulsory for all UG and PG students.	Departments	
2.33	Competitions on students' innovation activities at regular intervals and annual Innovation awards may be institutionalized.	Centre for Innovation, Skill and Entrepreneurship Development (CISED)	6 months
2.34	Innovation on local/ethnic/regional foods/ dress to promote local area culture.	Centre for Innovation skill and Entrepreneurship Development (CISED)	3 months
2.35	Initiating the process to develop Institutional Development Program stating long term vision for academic, research, innovation, infrastructure development and other areas of vital importance.	Dean Academic, Dean Research and Dean Planning	6 months
2.36	Discontinuation of M.Phil. Programme	Registrar	6 Months
2.37	Developing a mechanism to fund the topic centered clubs and activities organized by students with the help of faculty and other experts, and annual allocation may be planned for each club to run its activities in the areas of science, mathematics, poetry, language, literature, debate, music, sports, etc.	Dean Students Welfare and all HoDs	6 months
2.38	Strengthening the practice of professional, academic and career counselling for all the students at every level.	Deans and HoDs	3 months
2.39	Establishing an International Student Office to coordinate all matters relating to foreign students.	International Students Cell DSW	3 months
2.40	The University may also initiate the steps for exclusive accommodation facility to attract the foreign students.	Provosts and Infra Section	6 months
2.41	Entering in collaboration with high-quality foreign institutions for faculty/student exchange programme for research and teaching.	Dean Research and Dean Academic	1 year
2.42	The university may earmark up to 15% of its internal resources for financial support to the	DSW	6 months

	deserving students belonging to Socio-economically Disadvantaged Groups (SEDGs) in different ways.		
2.43	One smart classroom with latest ICT facilities with sound technical support in each department.	ICT Cell	1 year
2.44	Transforming the teachers through opportunities for periodical trainings, autonomy in collaborative researches and adequate financial support for research and extension activities (national/international level) for holistic professional development.	FDP Cell and Dean Research	6 months
2.45	Autonomy to the Principal Investigators/Researchers in the process of utilisation of project grants.	Dean Research	6 months
2.46	The University shall take all necessary steps for minimum 50 hours of continuous Professional Development to each teacher every year, to orient them towards innovative curricular, and pedagogical practices.	FDP Cell	6 months
2.47	Incentivising the excellence of faculty in curricular, pedagogical and research by institutionalizing annual awards.	Internal Quality Assurance Cell (IQAC)	6 months
2.48	The high impact research contribution may be linked with fast track promotion system on receiving necessary guidelines from the Ministry/UGC/NHEC.	Dean Research, Dean Academic and Registrar	1 year
2.49	The University may devise rigorous performance assessment parameters for 'tenure', promotion, salary increase, recognition etc.	Internal Quality Assurance Cell (IQAC)	1 year
2.50	The performance parameters may also involve peer and student reviews, pedagogical innovations, quality and impact of research professional development activities, corporate contribution to the University, and community service.	Internal Quality Assurance Cell (IQAC)	1 year
2.51	The faculty identified as 'excellent' may be given appropriate opportunities for further training and assigning of leadership positions.	Internal Quality Assurance Cell (IQAC)	1 year
2.52	Sensitization of faculty, counsellors, and students on gender-identity issues and its inclusion in all aspects of the University,	Women Empowerment Cell	6 months

	including curricula.		
2.53	4-year integrated B.Ed programme as a dual-major holistic Bachelor's degree in Education as well as a specialised subject such as a language, History, Music, Mathematics, Computer Science, Chemistry, Economics, Art, Physical Education, etc.	School of Education	1 year
2.54	School of Education may train in cutting edge pedagogy grounded in Sociology, History, Science, Psychology, Early Childhood Care and Education, Foundational Literacy And Numeracy, Knowledge Of India and its Values/ Ethos/ Art/ Traditions, and more.	School of Education	1 year
2.55	Besides, a one-year B.Ed. may also be offered for candidates who have received a 4-year undergraduate degree in a specialized subject.	School of Education	1 year
2.56	Various scholarships for meritorious students to attract outstanding candidates to the three different types of B.Ed. programmes.	Academic Branch and School of Education	1 year
2.57	The School of Education may also liaise with neighbouring government/private schools for teaching internships, collaborative community engagement, adult and vocational education related activities.	School of Education	6 months
2.58	The Department of Vocational Education and Skill Development may introduce various short-term skill based Certificate courses to promote 'Lok Vidya' and integration of Vocational Component with general education.	Department of Vocational Studies and Skill Development	1 year
2.59	Establishment of IPR Cell and Research Promotion Cell to promote the culture of quality research in the university.	Dean Research	6 months
2.60	University Research Foundation (URF) may be initiated with well-articulated policy for mentoring/training researchers, guiding for fellowships, creating forum of top-notch experts to mentor/review research progress, guiding on availing grants, funding for research projects, undertaking research works of national importance in core and allied domains of knowledge, etc.	Dean Research	6 months
2.61	Collaboration with NGOs of regional, national	Dean Academic	1 year

	and international scope (following Public Philanthropic Partnership models) to work collaboratively to expand access to high-quality higher education.	and Dean Research	
2.62	The School of Engineering and Technology may explore the possibilities of collaborations with industry and other HEIs for promotion of innovation and research in the Engineering disciplines.	Dean SOET	6 months
2.63	The School of Life Long Learning may establish Adult Education Centre in tune with the spirit of NEP 2020.	School of Lifelong Learning	1 year
2.64	Artist/writer(s)-in-residence programme to expose the students to art, creativity and the rich heritage of the region/country.	Deans, HoDs and Dean Students Welfare (DSW)	1 year
2.65	The Department of Sanskrit and other Indian Languages may actively participate in the process of collection, preservation, translation and study of rare manuscripts which have not yet received due attention.	Department of Sanskrit and Department of History and Archaeology	1 year
2.66	Promoting the students to visit the earmarked tourist destinations under *'Ek Bharat Shrestha Bharat'* initiative of the Government to study their history, scientific contribution, tradition, indigenous literature and knowledge.	Dean Students Welfare (DSW)	6 months

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Abstract of Action Plan with Defined Levels for Execution

Abstract of Action Plan with Defined Levels for Execution of Major Academic Reforms and Restructuring of Institutional Priorities for Multidisciplinary Teaching and Research

I. Ministry of Education/ UGC:

Sr. No.	Action and Implementation Plan

1. Faculty will be appointed to individual institutions and generally not be transferable across institutions so that they may feel truly invested in, connected to, and committed to their institution and community. (13.3)
2. Whereas the current recruitment process will be continued, a 'tenure-track' i.e., suitable probation period shall be put in place to further ensure excellence. (13.6)
3. The high impact research contribution may be linked with fast track promotion system.
4. By 2030, only educationally sound, multidisciplinary, and integrated teacher education programmes shall be in force.
5. MHRD will constitute a National Committee for the Integration of Vocational Education (NCIVE), consisting of experts in vocational education and representatives from across Ministries, in collaboration with industry.
6. The National Skills Qualifications Framework will be detailed further for each discipline vocation and profession. Further, Indian standards will be aligned with the International Standard Classification of Occupations maintained by the International Labour Organization. This Framework will provide the basis for Recognition of Prior Learning. (16.8)

II. Vice-Chancellor and the University Authorities

1. Aligning the vision and Mission of the University with the spirit of NEP-2020.
2. The Academic Council may authorise the departments to make necessary revisions in the syllabi with the approval of Departmental Committee, and the same may be reported to the Board of Studies and the School Board to avoid delay in the process of revision/updation.
3. Autonomy to the faculty in designing of curriculum, pedagogical approaches, selection of study material and the stages of formative assessment.
4. Establishing partnership with the Ministries/ Organisations/ Institutions such as Ministry of Social Justice and Empowerment, NCERT, NCTE, RCI, Ministry of Skill Development and Entrepreneurship etc**.** focused on specific skills and curricular requirements for differently-abled persons for appropriate support at regular intervals.
5. There will be a fair and transparent system for determining increased levels of public funding support for public HEIs. HEIs delivering education of the highest quality as laid down in this Policy will be incentivized in expanding their capacity. (10.9)
6. The project-work/dissertation/internships may be conducted in collaboration with industry, other Universities/research organisations.
7. Introduction of programmes in subjects such as Indology, Indian languages, AYUSH systems of medicine, yoga, arts, music, history, culture, and modern India.

8. To begin with, the University may consider the universities with equal or higher NAAC/NAC grades as equivalent, and the credits earned by the students from such universities may be counted while awarding the degrees.
9. The University may start special scholarships for people of all ages to study Indian languages, arts and culture.
10. The University may make it a policy to consider only Ph.D. candidates for appointment as Assistant Professor.
11. Discontinuation of M.Phil. Programme.
12. Constitution of a University-level Moderation Committee to suggest and recommend the multidisciplinary courses/programmes and their credits.
13. Academic Credit Bank of the University shall also count the credits acquired by the students from foreign Universities for the award of a degree.
14. Introducing the departments of study like Music, Philosophy, Indology, Fine arts, Translation and Interpretation, and Comparative Literature.
15. A University-level Committee consisting of Deans/Senior faculty to devise the pattern of examinations based on formative assessment and to develop model question papers in tune with NEP-2020.
16. Provision to offer Teaching Assistantship to the Ph.D. students after successful completion of one-year after the course work to provide them the exposure to actual teaching experience.
17. The University shall take necessary steps to coordinate with classical language Institutions for appropriate support and training of the students and faculty. Gradually, the University shall also setup institutes/centres for Pali, Persian and Prakrit languages.
18. Multidisciplinary Research Centre to act as a bridge between university and industries, and to enhance the multidisciplinary research.
19. Identifying and adopting some neighbouring HEIs for academic support.
20. The University may introduce department of Translation Studies to offer high quality programmes and degrees in translation and interpretation. The University may also introduce the programmes/degrees in art and museum administration, artefact conservation, graphic design and web design.
21. Introducing departments and programmes in Indian languages, Comparative Literature, Creative Writing, Arts, Music, Translation, Philosophy etc.
22. Adopting the School complexes to provide them with essential support for quality education at school level.
23. The School of Life Long Learning may establish Adult Education Centre in tune with the spirit of NEP 2020.
24. Establishing an International Foreign Students Office to coordinate all matters relating to foreign students.
25. Initiating the process to develop Institutional Development Program stating long term vision for academic, research, innovation, infrastructure development and other areas of vital importance.
26. The university may earmark up to 15% of its internal resources for financial support to the deserving students belonging to Socio-economically Disadvantaged Groups (SEDGs) in different ways.
27. Establishment of IPR Cell and Research Promotion Cell to promote the culture of quality research in the university.
28. University Research Foundation (URF) may be initiated with well-articulated policy for mentoring/training researchers, guiding for fellowships, creating forum of top-notch experts to mentor/review research progress, guiding on availing grants, funding for

research projects, undertaking research works of national importance in core and allied domains of knowledge, etc.

29. Collaboration with NGOs of regional, national and international scope (following Public Philanthropic Partnership models) to work collaboratively to expand access to high-quality higher education.

III. Concerned Deans/Heads and other Officers

1.	Vision of each department in sync with the vision of the University.	Deans and HoDs
2.	Revision of syllabi of all the academic programmes to integrate multidisciplinary skill component, value education and contemporary relevance for community, society and the nation.	Deans and HoDs
3.	Each programme and course offered by a department should articulate learning outcomes.	Deans and HoDs
4.	General elective courses in communication skill, behavioural science, environment education, social and moral awareness and community engagement for the Graduate and Postgraduate students.	Department of Psychology, English and Foreign Languages, School of Education and Department of Sociology
5.	Curriculum revision within six months so that the revised syllabus is displayed on University website well in advance before the commencement of Academic Session (2021-22).	Deans and HoDs
6.	Establishment of various clubs for sports, dance, music, photography, fine arts, theatre activities, extension activities, literary activities, animation and designing etc. for up-skilling of the students.	Dean Students Welfare (DSW)
7.	Student feedback/inputs during the process of revision of curriculum, pedagogy and assessment.	Deans and HoDs
8.	More freedom to the student to earn the credits not only from various departments of the University but also from Institutes of Higher learning located in India and Abroad.	Deans, HoDs and Controller of Examination
9.	Incorporating the relevant Indian classical text in each course in the form of background reading for historical understanding of course/subject.	Deans and HoDs
10.	Prescribing the texts like *Bhagavad Gita*, Kautilya's *Arthashastra, Charaka-samhita, Patanjali Yoga Sutras* and other seminal texts in each programme of study to impart essential understanding of rich Indian traditions.	Deans and HoDs
11.	Identifying set of professional/life skills to be imparted to all the students across the disciplines. These may include ethics of social engagement, soft skills, communication and respect for Indian value system.	Deans
12.	Offering of bilingual academic programmes, wherever relevant.	Deans and HoDs
13.	Starting the process to restructure the academic programmes with	Deans and HoDs

	creating combination of disciplines for study.	
14.	Flexible entry and exit points by removing rigid boundaries to facilitate new possibilities for lifelong learning.	Deans and HoDs
15.	The academic programmes of the University may be revised in consonance with global citizenship education to make the learners aware of global issues so that they become active promoters of more peaceful, tolerant, inclusive, secure and sustainable societies.	Deans and HoDs
16.	Opportunities for internships with local industry, businesses, artists, craft persons as well as research internship with other HEIs/research Institutions.	Dean, SOET; Dean, School of Management and Business Studies; and Dean Research
17.	Restructuring the academic programmes to integrate Arts, Humanities, Professional courses, Science, Technology, Engineering and Mathematics (STEM) in tune with the spirit of the policy to impart multidisciplinary and holistic education.	Deans and HoDs
18.	While revising the curriculum, the university may make the skill component necessary for Science, Engineering and Professional Courses, and an appropriate ratio for academic and skill components may be fixed.	Dean, SOET; Dean, School of Management and Business Studies; Dean, School of Law; Dean, School of Education; Dean, School of Applied Life Sciences; and HoD, Department of Vocational Studies and Skill Development
19.	While revising the curriculum, the University may develop a mechanism to offer basket of three different types of courses namely, Core Courses, Discipline-centric Electives and Generic/Open Electives.	Deans and HoDs
20.	Awarding 1-2 credits for Seva/Service/Community Service programmes in tune with the existing provisions of Swachh Bharat Summer Internship programme.	Dean Students Welfare (DSW)
21.	The School of Life Long Learning, Department of Yoga and School of Education may plan Generic Elective Courses on Life Skills as compulsory for all UG and PG students.	School of Education, Department of Yoga, and School of Life Long Learning
22.	Strengthening the mechanism for promotion of student wellness such as physical and mental health, psycho-social well-being and sound ethical grooming. These components may be made the integral parts of the revised curriculum.	School of Education; Department of Psychology; and

		Department of Physical Education
23.	Promoting creativity among the students, the university shall integrate extra-curricular activities and hobbies as integral components of curriculum.	Dean Students Welfare (DSW)
24.	To facilitate the easy transfer of credits and equivalence, the University may restructure its academic programmes in such a way that all the departments and the programmes follow a uniform and compatible credit pattern.	Deans and HoDs
25.	The school of education may revise the curriculum and dissemination strategies to make it multidisciplinary in nature by establishing active collaboration with other departments such as Psychology, Philosophy, Sociology, Neuroscience, Indian languages, Arts, Music, History, Literature, Physical Education, Science and Mathematics.	School of Education
26.	The School of Education may create a pool of experts in education, specialised subjects and related disciplines for appropriate academic support.	School of Education
27.	The revised Ph.D. course work curriculum shall give exposure to pedagogical practices, designing curriculum, credible evaluation systems, communication, etc.	Deans and HoDs
28.	Promoting the teachers to take the fullest advantage of SWAYAM/DIKSHA platforms for online training, and considering such trainings/workshops for CAS promotions.	FDP Cell
29.	Coordination with National Mission for Mentoring for necessary support in teaching in Indian languages to University teachers.	School of Humanities and Social Sciences
30.	Introducing some more certificate, diploma, UG/PG programmes in vocational education under Department of Vocational Education and Skill Development. Gradually, research programmes may also be introduced.	Respective Schools and departments
31.	Revising the curriculum of vocational programmes to integrate the general education component /skill component of programmes to re-establish the prominence of vocational studies with mainstream education. To fulfil this purpose, general education shall include credits in the courses of related streams, entrepreneurial competencies, communication, soft skills, critical thinking, problem solving, decision making abilities and value education. The skill courses for skill component shall be as per the norms of respective Industry partners/ sector skill council of each programme.	Department of Vocational Studies and Skill Development
32.	Department of Vocational Studies and Skill Development shall review the courses periodically in accordance with the changing requirements of the industry and regional / national economic priorities. Skilling in the youth is possible with more of application based learning, experience based learning, on- the-job training with specific job roles, and more credibility would be created for skill programmes in this way.	Department of Vocational Studies and Skill Development

33.	The department may also introduce short-term add-on Vocational Certificate/Diploma courses even for the students enrolled in other Bachelor's degree programmes.	Department of Vocational Studies and Skill Development
34.	The Department of Skill Development and Vocational Education may introduce various short-term skill based Certificate courses to promote 'Lok Vidya' and integration of Vocational Component with general education.	Department of Vocational Studies and Skill Development
35.	Including the component of research and internship in the Undergraduate curriculum.	All the Schools and Departments
36.	The School of Arts, Humanities and Social Sciences should include traditional Indian knowledge including tribal knowledge in the curriculum. The relevant components of traditional Indian knowledge may also be incorporated across the disciplines including Sciences, Fine Arts, Sports etc.	Deans and HoDs
37.	Restructuring the academic programmes to integrate Arts, Humanities, Professional courses, Science, Technology, Engineering and Mathematics (STEM) in tune with the spirit of the policy to impart multidisciplinary and holistic education.	Dean Academic
38.	Switching over to 4- year multidisciplinary bachelor programmes. Such 4-year programme may also lead to a degree 'with research' if the student completes a rigorous research project in the major areas of study as specified by the University.	School of Education
39.	The University may institutionalize artist(s)/writer(s)-in-residence programme to expose the students to art, creativity and the rich heritage of the region/country.	DSW
40.	The University may promote Sanskrit as one of the language options in the 3-language formula in Higher Education. The Teaching of Sanskrit may not be performed in isolation but in connection with other relevant subjects such as Mathematics, Astronomy, Philosophy, Linguistics, Dramatics, Yoga etc.	Department of Sanskrit and School of Humanities and Social Sciences
41.	Bridge courses for students from disadvantaged educational backgrounds.	Equal Opportunity Cell and DSW
42.	Enhancing online accessibility of books in Library with remote access, suiting to the needs of learners with disability.	University Library and Cell for Differently-abled Persons
43.	Partnership with the Ministries/Organisations/Institutions such as Ministry of Social Justice and Empowerment, NCERT, NCTE, RCI, Ministry of Skill Development and Entrepreneurship etc. focused on specific skills and curricular requirements for differently-abled persons for appropriate support at regular intervals.	Differently-abled Cell
44.	The University may also introduce four year teacher training programme with component of research orientation in the last year.	School of Education
45.	The University may devise a mechanism to promote multidisciplinary research, consultancy and funded research	Dean Research

	projects for which a Research Manual of the University may be prepared.	
46.	The University may take the lead to undertake research in areas of infectious diseases, epidemiology, virology, diagnostics, instrumentation, vaccinology and other relevant areas to combat epidemics and pandemics.	Dean Research and School of Interdisciplinary and Applied Life Sciences
47.	Promoting the culture of cross-disciplinary and interdisciplinary research by allowing the students to register for Ph.D. programmes in the subjects other than their core subjects.	Dean Academic and Academic Branch
48.	Promoting resource sharing amongst the departments and other Universities.	Deans and HoDs
49.	Annual calendar of activities for community engagement and extension activities in collaboration with HEIs.	Dean Students Welfare (DSW)
50.	Imparting faculty development facilities to the neighbouring HEIs.	School of Education
51.	Identifying schools for demonstration and nurturing of best practices being introduced in B.Ed/ M.Ed programmes	School of Education
52.	Regular interaction of B.Ed/M.Ed students and faculty with real life curriculum and pedagogical activities in schools.	School of Education
53.	The University may prepare a manual of 'University Social Responsibilities' with specific mention of the community engagement activities to be carried out during a year. Similarly, each department can plan its 'Departmental Social Responsibilities' by identifying such areas/issues where students and teachers can contribute significantly.	Dean Students Welfare (DSW) And all the Departments of Study
54.	The department of Environmental Studies may introduce a basic course on Environment Education covering climate change, pollution, waste management, sanitation, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living as GEC for all the students.	Department of Environmental Studies
55.	The School of Education may offer a course on value-based education including the development of humanistic, ethical, Constitutional, and universal human values of truth (satya), righteous conduct (dharma), peace (shanti), love (prem), nonviolence (ahimsa), scientific temper, citizenship values, and also life-skills as Generic Elective Course for all the students of the University.	School of Education
56.	One smart classroom with latest ICT facilities with sound technical support in each department.	ICT Cell
57.	Transforming the teachers through opportunities for periodical trainings, autonomy in collaborative researches and adequate financial support for research and extension activities (national/international level) for holistic professional development.	FDP Cell and Dean Research
58.	Autonomy to the Principal Investigators/Researchers in the process of utilisation of project grants.	Dean Research
59.	The University shall take all necessary steps for minimum 50 hours of continuous Professional Development to each teacher	FDP Cell

	every year, to orient them towards innovative curricular, and pedagogical practices.	
60.	Incentivizing the excellence of faculty in curricular, pedagogical and research by institutionalizing annual awards.	Internal Quality Assurance Cell (IQAC)
61.	The high impact research contribution may be linked with fast track promotion system on receiving necessary guidelines from the Ministry/UGC/NHEC.	Dean Research, Dean Academic and Registrar
62.	The University may devise rigorous performance assessment parameters for 'tenure', promotion, salary increase, recognition etc.	Internal Quality Assurance Cell (IQAC)
63.	The performance parameters may also involve peer and student reviews, pedagogical innovations, quality and impact of research professional development activities, corporate contribution to the University, and community service.	Internal Quality Assurance Cell (IQAC)
64.	The faculty identified as 'excellent' may be given appropriate opportunities for further training and assigning of leadership positions.	Internal Quality Assurance Cell (IQAC)
65.	Sensitization of faculty, counsellors, and students on gender-identity issues and its inclusion in all aspects of the University, including curricula.	Women Empowerment Cell
66.	4-year integrated B.Ed programme as a dual- major holistic Bachelor's degree in Education as well as a specialised subject such as a language, History, Music, Mathematics, Computer Science, Chemistry, Economics, Art, Physical Education, etc.	School of Education
67.	School of Education may train in cutting edge pedagogy grounded in Sociology, History, Science, Psychology, Early Childhood Care and Education, Foundational Literacy And Numeracy, Knowledge Of India and its Values/ Ethos/ Art/ Traditions, and more.	School of Education
68.	Besides, a one-year B.Ed. may also be offered for candidates who have received a 4-year undergraduate degree in a specialized subject.	School of Education
69.	Various scholarships for meritorious students to attract outstanding candidates to the three different types of B.Ed. programmes.	Academic Branch and School of Education
70.	The School of Education may also liaise with neighbouring government/private schools for teaching internships, collaborative community engagement, adult and vocational education related activities.	School of Education
71.	The Department of Vocational Education and Skill Development may introduce various short-term skill based Certificate courses to promote 'Lok Vidya' and integration of Vocational Component with general education.	Department of Vocational Studies and Skill Development
72.	The School of Engineering and Technology may explore the possibilities of collaborations with industry and other HEIs for promotion of innovation and research in the Engineering disciplines.	Dean SOET
73.	Artist/writer(s)-in-residence programme to expose the students to art, creativity and the rich heritage of the region/country.	Deans, HoDs and Dean Students

		Welfare (DSW)
74.	The Department of Sanskrit and other Indian Languages may actively participate in the process of collection, preservation, translation and study of rare manuscripts which have not yet received due attention.	Department of Sanskrit and Department of History and Archaeology
75.	Promoting the students to visit the earmarked tourist destinations under *'Ek Bharat Shrestha Bharat'* initiative of the Government to study their history, scientific contribution, tradition, indigenous literature and knowledge.	Dean Students Welfare (DSW)

Appendices

Appendix-1

हरियाणा केंद्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF HARYANA

(संसद के अधिनियम संख्या-25 (2009) के तहत स्थापित, नैक से 'ए' ग्रेड प्राप्त)
(Established vide Act No. 25 (2009) of Parliament, Accredited 'A' Grade by NAAC)
जिला महेंद्रगढ़, हरियाणा - 123031
District Mahendergarh, Haryana

No.: CUH/Reg./Notification/2020/1123 Date: 31.08.2020
01.09

अधिसूचना/Notification

The Vice-Chancellor is pleased to constitute a Committee, consisting of the following as Task Force to prepare a roadmap for implementation of National Education Policy (NEP), 2020:

Internal Members:

1. Prof. Sanjiv Kumar, Dept. of English & Foreign Languages.
2. Prof. Sarika Sharma, School of Education.
3. Prof. Rajesh Malik, Dept. of Law.
4. Prof. Satish Kumar, Dept. of Biotechnology.
5. Prof. Rajbir Singh, Dept. of Political Science.
6. Dr. Santosh, University Librarian.
7. Dr. Anand Sharma, Dept. of Management Studies.
8. Dr. Kalpana Chauhan, Dept. of Electrical Engineering, SoET.
9. Dr. Vinod Kumar, Dept. of Chemistry.
10. Dr. Pawan Kumar Maurya, Dept. of Bio-Chemistry.
11. Dr. Dinesh Chahal, School of Education.
12. Dr. Jaswant, Dept. of Physics & Astrophysics.
13. Dr. Namrata Dhaka, Dept. of Biotechnology.
14. Dr. Ajay Pal, Dept. of Yoga.
15. Dr. Amit Yadav, Chemistry under SoET.
16. Dr. Suyash Mishra, Dept. of Vocational Studies & Skill Development.

External Experts:

1. Prof. Pawan Sharma, Dept. of Chemistry, KUK.
2. Prof. Savitri Kadloor, Dept. of Political Science, Jamia Millia Islamia.
3. Prof. SVS Chaudhary, School of Education, IGNOU.
4. Prof. Sathans, Dept. of Electrical Engineering, NIT, Kurukshetra.
5. Prof. Prince Sharma, PU, Chandigarh.
6. Dr. Avichal Kapur, JS, UGC, New Delhi.

1/9/2020
Registrar (I/C)

Copy to:

i. All Members of the above Task Force.
ii. Vice-Chancellor's Secretariat, (for information of the Vice-Chancellor), CUH.

Registrar (I/C)

Appendix-2

हरियाणा केंद्रीय विश्वविद्यालय
CENTRAL UNIVERSITY OF HARYANA

(संसद के अधिनियम संख्या-25 (2009) के तहत स्थापित, नैक से 'ए' ग्रेड प्राप्त)
(Established vide Act No. 25 (2009) of Parliament, Accredited 'A' Grade by NAAC)
जिला महेंद्रगढ़, हरियाणा - 123031
District Mahendergarh, Haryana

No.: CUH/Reg./Notification/2020/ 1166 Date: 17.11.2020

अधिसूचना/Notification

The Vice-Chancellor is pleased to add the following members to the Task Force constituted vide Notification no. CUH/Reg./Notification/2020/1123 dated 01.09.2020 to prepare a roadmap for implementation of National Education Policy (NEP), 2020:

Internal Members:

1. Prof. Neelam Sangwan, Dept of Biochemistry.
2. Prof. Dinesh Kumar Gupta, Dept. of Library & Information Science.
3. Dr. Ajay Bansal, Dean, School of Engineering & Technology.
4. Dr. Rajesh Kumar Gupta, Dept. of Mathematics.
5. Dr. Ranjan Aneja, Dept. of Economics.
6. Dr. Ajay Kumar, Dept. of Management Studies.
7. Dr. Tejpal Dhewa, Dept. of Nutrition Biology.
8. Dr. Amit Kumar, Dept. of Hindi.
9. Dr. Prakash Kanoo, Dept. of Chemistry.

External Experts:

1. Dr. Aditya Saxena, Deshbandhu College, University of Delhi.

17-11-2020
Registrar (I/C)

Copy to:

i. All new Members of the above Task Force.
ii. Vice-Chancellor's Secretariat, (for information of the Vice-Chancellor), CUH.

17-11-2020
Registrar (I/C)

F.No. 58-6/2018-CU.III
Government of India
Ministry of Education
Department of Higher Education
*****

New Delhi, the 17th March, 2021

To

The Registrar,
Central University of Haryana,
Jant-Pali, Mahendergarh,
Haryana-123029.

Subject:- Addition/amendment to Ordinances/statutes of the University.

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Sir,

Please refer to your letters No. CUH/20/A&C/354,356 & 357 dated 10.7.2020, on the above subject.

2. UGC has no objection to the proposals submitted by the University except the following Ordinances/Statutes:-

Ord./Statute	Subject	Comments of UGC
Ordinance IV-B	Career Advancement Scheme 1(B) Career Advancement Scheme (CAS) 2018	Clause 3 may be reframed strictly as per UGC Regulations on "Minimum Qualifications for Appointment of Teachers and other Academic Staff in Universities and Colleges and Measures for the Maintenance of Standards in Higher Education, 2018"
Ordinance-II-A	Degree of Doctor of Philosophy (Ph.D)	
Clause 2.4	--	University may be asked to reframe this ordinance in accordance with UGC (Minimum Standards and Procedure for Award of M.Phil/Ph.D Degree) Regulations, 2016.
Clause 2.5	--	UGC has no objection on the proposed amendment. Notwithstanding anything contained in these Regulations or any other Rule or Regulation, for the time being in force, no university shall conduct M.phil and Ph.D Programmes through distance education mode.

		Parti-time Ph.D will be allowed provided all the conditions mentioned in the extant Ph.D Regulations are met.
Ordinance XVII	Assignment of Departments to the Schools	UGC has no objection on the proposed amendment, subject to the condition that university may obtain the prior approval of the MoE/Ministry of Finance before starting any new School/Centre/Deptt. and manpower as per instructions issued by MoE vide D.O. No. F.61-1/2018-Desk(U) dated 16th June, 2020.
Statute-15(1): Clause (b) shall be amended.	Departments of Studies	UGC has no objection on the proposed amendment, subject to the condition that university may obtain the prior approval of the MoE/Ministry of Finance before starting any new School/Centre/Deptt. and manpower as per instructions issued by MoE vide D.O. No. F.61-1/2018-Desk(U) dated 16th June, 2020.
Statute-11 : Clause (iii) shall be amended	--	UGC has no objection on the proposed amendment, subject to the condition that university may obtain the prior approval of the MoE/Ministry of Finance before starting any new School/Centre/Deptt. and manpower as per instructions issued by MoE vide D.O. No. F.61-1/2018-Desk(U) dated 16th June, 2020.

3. It is requested that the Ordinances/Statutes may be revised as per the above comments of UGC and re-submitted to this Department for further necessary action.

Yours faithfully,

(C.P. Ratnakaran)
Under Secretary to the Govt. of India

Copy to the Vice Chancellor, Central University of Haryana.

DEPARTMENT OF MATHEMATICS

Scheme & Syllabi
Ph.D. course work in Mathematics

W.E.F. 2020-21

CENTRAL UNIVERSITY OF HARYANA
JANT-PALI, MAHENDERGARH
HARYANA-123031
www.cuh.ac.in

Department of Mathematics

Central University of Haryana
Mahendergarh, Haryana-123031

Scheme and Syllabus of Ph.D. Mathematics
(CHOICE BASED CREDIT SYSTEM)

……

Course Type

Core Course (C)
Discipline Centric Elective Course (E) of subject specific.

Total Credit: 14

Each candidate is required to take core courses and one elective course of subject specific.

S. No.	Course Code	Course Title	Credits	Course Type
1.	SBS MAT 02 01 01 C 6006	Research Methodology	6	Core
2.	SBS MAT 02 01 02 C 2002	Research and Publication Ethics	2	Core
3.	SBS MAT 02 01 01 E 5106	Topics in Pure Mathematics	6	Elective
4.	SBS MAT 02 01 02 E 5106	Topics in Applied Mathematics	6	Elective
5.	SBS MAT 02 01 03 E 5106	Topics in Advanced Mathematics	6	Elective

Research Methodology

(SBS MAT 02 01 01 C 6006)

End SemesterExamination:60
Internal Assessment:40
Total:100

Course Objectives:
To familiarize the students with general techniques of performing analysis of data and modelling using various simulation techniques. This course will enable students to design experiments and methods to extract data.

Learning Outcomes:

- To motivate students for research in different fields of Physics, Mathematics and Statistics.
- To teach students different techniques of research modelling, data collection, designing and planning of experiments.
- To enable to analyze data and write report based on data analyzed.

UNIT I

Research Problems: Meaning, Motivation, Objectives and types of research, Significance of research, Research proposals and aspects, Criteria of good research, Research formulation and hypotheses, Selection and necessity of defining the problem, Literature review, Primary and secondary sources, Reviews, Treatise, Monographs, Patents.

UNIT II

Research Design: Need, Problem Definition, Variables, Research design concepts, Research design process, Research Modeling: Types of models, Model building and stages, Data collection, processing and analysis, Simulation techniques using computer software(s).

UNIT III

Design and Planning of Experiments: Aims and objectives, expected outcome, methodology to be adopted, importance of reproducibility of research work, Interpolation, Extrapolation, Types of errors (rounding, truncation, machine and random), Error analysis and least square curve fitting. Analysis of Variance components (ANOVA) for fixed effect model, Objectives and basic principles of designs of experiments. Complete randomized design (CRD), Randomized block design (RBD) and Latin square design (LSD).

UNIT IV

Data mining and Report Writing: Library resources, Internet, Scientific search engines, Introduction to Latex/Google docs, Structure and component of research paper, Presenting the research paper/thesis, Journal impact factor, Citation index, References and bibliography, Copyright, Plagiarism and ethics in research, Communication and presentation.

Suggested Readings:

1. Kothari, C. R. and Garg, G., Research Methodology: Methods and Techniques, 3rd edition, New Age International Publishers, New Delhi, 2014.
2. Prathapan, K., Research Methodology for Scientific Research, IK International, New Delhi, 2014.
3. Montgomery, D.C., Design and Analysis of Experiments, 8thedition, Wiley India, 2013.
4. Pannerselvan, R., Research Methodology, Prentice Hall of India, New Delhi, 2009.
5. Singh, Y.K., Fundamental of Research Methodology and Statistics, New Age International Publishers, New Delhi, 2008.

Research and Publication Ethics

(SBS MAT 0**2** 01 02 C 2002)

End Semester Examination: 60

Internal Assessment: 40

Total: 100

Course Objectives:

The course aimed is to aware the students about the basic ethics of research and publication. The contents will serve as basic tools to groom the students about plagiarism in research.

Learning Outcomes:

On completion of the course, the student should be able to:

- Understand the basic ethics of research.
- Maintain the research integrity and intellectual honesty.
- Understand the scientific misconduct and proper citations.
- Acquire knowledge of databases and software's.

Theory

RPE 01: Philosophy and Ethics (3 hrs.)

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgements and reactions

RPE 02: Scientific Conduct (5 hrs.)

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

RPE 03: Publication Ethics (7 hrs.)

1. Publication ethics: definition, introduction and importance
2. Best practices / standards setting initiatives and guidance: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types
5. Violation of publication ethics, authorship and contributorship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

Practice

RPE 04: Open Access Publishing (4 hrs.)

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving polices
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

RPE 05: Publication Misconduct (4 hrs.)

A. Group Discussion (2 hrs.)

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

B. Software tools (2 hrs.)

1. Use of plagiarism software like Turnitin, Urkund and other open source software tools

RPE 06: Databases and Research Metrics (7 hrs.)

A. Databases (4 hrs,)

1. Indexing databases Research Metrics
2. Citation databases: Web of Science, Scopus, etc.

B. Research Metrics (3 hrs.)

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IIP, Cite Score
2. Metrics: h index, g index, i10 index, almetrics

Suggested Readings:

1. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance, 2019, ISBN:978-81-939482-1-7. http://www.insaindia.res.in/pdf/Ethics_Book.pdf

2. Chaddah, P., Ethics in Competitive Research: Do not get scooped; do not get plagiarized 2018, ISBN:978-9387480865.
3. Beall, J. Predatory publishers are corrupting open access, Nature, 489 (7415), 179-179, 2012. https://doi.org/10.1038/489179a

4. Resnik, D. B., What is ethics in research and why is it important, National Institute of Environmental Health Sciences, 1-10. Retrived from https://www.neihs.nih.gov/research/resources/bioethics/whatis/index.cfm 2011.
5. National Academy of Sciences, National Academy of Engineering and Institute of Medicine, On Being a Scientist: A Guide to Responsible Conduct in Research: 3rd edition , National Academics Press 2009.
6. Bird, A., Philosophy of Science, Routledge 2006.
7. MacIntyre, A., A Short History of Ethics, London 1967.

Topics in Pure Mathematics

(SBS MAT 02 01 01 E 5106)

End Semester Examination: 60
Internal Assessment: 40
Total: 100

Course Objectives:
To familiarize the students about the general concepts of pure mathematics including some advanced topics. To provide an understanding of measure theory, advanced complex analysis, Banach spaces and C*-algebra.

Learning Outcomes:
On completion of the course, the students should be able to:

- Learn and apply the Lebesgue integration, Fatou's lemma and Radon-Nikodym theorem.
- Understand the complete characterization of analytic functions.
- Use Hahn-Banach theorem and its applications to various concepts.
- Understand the basic of Gelfand mapping, Banach-algebra and C*-algebra.

UNIT I

Concept of measure, Lebesgue outer measure and measurable sets, sigma algebra, Borel sets, G_δ and F_σ –sets, outer and inner regularity of Lebesgue measure, the Lebesgue integration of a measurable function, integration with respect to a measure, convergence in measure, Fatou's lemma, monotone and dominated convergence theorems, Jensen's inequality, Radon-Nikodym theorem, Fubini's theorem.

UNIT II

Hadamard's three circles theorem, Phragmen-Lindelof theorem, the space of continuous functions, spaces of analytic functions, the Riemann mapping theorem, Weierstrass factorization theorem, Gamma function, Reimann zeta function, Harmonic functions on a disk, Jensen's formula, Bloch's theorem, the Little Picard theorem, Schottky's theorem, the Great Picard theorem.

UNIT III

Banach space definition and some examples, continuous linear transformations, the Hahn-Banach theorem, the natural imbedding of *N* in *N***, the open mapping theorem, conjugates of an operator, Hilbert space definition and some properties, orthogonal properties and linear operators.

UNIT IV

Definition and some examples of Banach algebra, regular and singular elements spectrum, formula for spectral radius, the radical and semi simplicity, the structure of commutative Banach algebras, the Gelfand mapping, involutions in Banach algebras, the Gelfand-Neumark theorem, ideal in C(X) and Banach-Stone theorem, commutative C*-algebra.

Suggested Readings:

1. Royden, H. L., Real Analysis, MacMillan Publishing Co., Inc., New York, 8th edition, 2018.
2. Ahlfors, L.V., Complex Analysis, McGraw-Hill, 3rd edition, 2017.
3. Mathews, J. H. and Howell, R. W., Complex Analysis for Mathematics and Engineering, Jones & Bartlett Publishers, 2012.
4. Barra, G.de.,Measure Theory and Integration, New Age International (P) Ltd., 2009.
5. Rana, I. K., An Introduction to Measure and Integration, Narosa Publishing House, 2nd edition 2004.
6. Conway J. B. Functions of One Complex Variable, Springer, 1978.

Topics in Applied Mathematics

(SBS MAT 02 01 02 E 5106)

End SemesterExamination:60
Internal Assessment:40
Total:100

Course Objectives:
The course is aimed to develop the basic mathematical skills of research students in applied mathematics. The topics introduced will serve as basic tools for specialized studies in many fields of applied mathematics.

Learning Outcomes:
On completion of the course, the students should be able to:

- Differentiate between finite element and finite difference methods.
- Use the concept of shape functions in solutions of boundary value problems.
- Implement advanced aspects of various mathematical transforms.
- Understand the concepts of linear programming problems.

UNIT I

Review of finite difference method, introduction to finite element methods, difference between finite element and finite difference methods, method of weighted residuals: collocation, method of least squares, Galerkin's method, Ritz method.

UNIT II

Linear, quadratic and higher order elements, construction of shape functions: Linear elements (One dimensional bar element, two dimensional-Triangular and rectangular elements, three dimensional tetrahedron element). Assembly of element equations and their solution, application of finite element methods for solving various boundary value problems.

UNIT III

Integral transform: basic concepts of integral transforms. Laplace transform, Fourier transform, Mellin transforms, Hankel transform, Hermite transform, Hartley transform, Radon transform and wavelet transform.

UNIT IV

Linear Programming Problem: Simplex algorithm- two Phase method, the Big-M method, dual simplex method, duality in linear programming, sensitivity analysis. Transportation problem: mathematical model, variations in transportation problem, maximization & transshipment problems, integer programming problem, limitations of integer programming, Advantage of integer programming.

Suggested Readings:

1. Gupta, R. K.,Numerical Methods: Fundamentals and Applications, Cambridge University Press, 2019.
2. Lokenath, D. and Dambaru, B., Integral Transforms and Their Applications, 3rd edition, CRC Press, 2014.
3. Larson, M. G. and Bengzon, F., The Finite Element Method: Theory, Implementation, and Applications, Springer, 2013.
4. Davies, B., Integral Transforms and Their Applications, Springer New York, 2013.
5. Taha, H. A., Operations Research-An Introduction, , 9th edition, Prentice Hall, 2010.
6. Hughes, T. J. R., The Finite Element Method, Courier Corporation, 2007.
7. Jain, M. K., Numerical Solution of Differential Equations. New Age International (P) Ltd, 2003.
8. Hadley, G., Linear Programming, Reprint, Narosa, 2002.
9. Zienkiewicz, O. C. and Taylor, R. L., The Finite Element Method: The Basis. Butterworth-Heinemann, 2000.

Topics in Advanced Mathematics

(SBS MAT 02 01 03 E 5106)

End SemesterExamination:60
Internal Assessment:40
Total:100

Course Objectives:
To familiarize the students about recent advancements in mathematics including graph theory, wavelets and reliability theory.

Learning Outcomes:

On completion of the course, the student should be able to:

- Understand the concepts of Lattice, Boolean algebras and graph theory.
- Use the concept of wavelet theory in signal and image processing.
- Develop reliability models for different configurations along with reliability assessment.

UNIT I

Lattices and Boolean algebra, lattices as a partially ordered sets, some properties of lattices, lattices as algebraic systems, sublattices, direct product and homomorphism special lattices Boolean algebra, Boolean functions, representation and minimization of Boolean functions, graphs isomorphism, sub graphs, Euler graphs, Hamiltonian paths and circuits travelling salesman problem.

UNIT II

Trees, properties of trees, spanning trees, minimal spanning trees, Kruzkal's algorithm, Premis algorithm, Dijkstra's algorithm, cut-sets and cut-vertices, planar graph, duality in planner graphs, matrix representation of graphs incidence matrix, adjacent matrix path matrix, circuit matrix, cut set matrix, transitive closure or a graph Warshall's algorithm, coloring covering and partitioning, chromatic number, chromatic partitioning, chromatic polynomial matching, coverings the four color problem.

UNIT III

Introduction stationary and non-stationary signals, signal representation using basis and frames, time-frequency analysis. Bases of time frequency: orthogonal, filter banks. Multi resolution formulation: wavelets from filters, classes of wavelets: Haar, Daubechies. Matrix decomposition techniques: LU decomposition, Cholesky decomposition, QR decomposition, singular value decomposition.

UNIT IV

Definition of reliability: definition of terms used in reliability, component reliability, hazard rate, derivation of the reliability function in terms of the hazard rate, hazard models, bath tub curve, effect of preventive maintenance.

Measures of reliability: mean time to failure and mean time between failures, evaluation of reliability/unreliability, series systems, parallel systems- series-parallel systems, partially redundant systems with examples.

Suggested Readings:

1. Rosen, K. H.,Discrete Mathematics and Its Applications, 7th edition, Tata McGraw Hill, 2017.
2. Ram, B., Discrete Mathematics, Pearson Education, 2012.
3. Goswami, J.C. and Chan, A.K., Fundamentals of Wavelets: Theory, Algorithms, and Applications, 2nd edition, Wiley, 2011.
4. Misiti, M., Misiti, Y., Oppenheim, G. and Poggi, J. M., Wavelets and Their Applications, John Wiley & Sons, 2010.
5. Balagurusamy, E., Reliability Engineering, Tata McGraw-Hill Publishing Company Limited, 2002.
6. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, S. Chand and Sons, 2000.
7. Trembley, J. P. and Manohar, R., A First Course in Discrete Structure with Applications to Computer Science, Tata McGraw Hill, 1999.
8. Trefethen, L. N. and Bau, D., Numerical Linear Algebra, Society for Industrial and Applied Mathematics, 1997.
9. Agarwal, K. K., Reliability Engineering-Kluwer Academic Publishers, 1993.
10. Billinton, R. and Allan, R. N., Reliability Evaluation of Engineering Systems, Plenum Press, 1983.

CENTRAL UNIVERSITY OF HARYANA

Mahendergarh

Department of Computer Science & Information Technology

Minutes of BOS Meeting held on 02.Sept.2020

An online meeting of BOS in Department of Computer Science and Information Technology was held on 02.09.2020 at 11:15 am using Googlemeet.

Following members attended the meeting:

1. Prof. Deepak Pant — Chairman
   Dean, School of Basic Science and Head, CS&IT
   Central University of Haryana,Mahendergarh

2. Prof. Yudhvir Singh — Subject Expert(External)
   Computer Sci. & Engg Dept.
   Maharshi Dayanand University,
   Rohtak, Haryana

3. Prof. AnitaSinghrova, — Subject Expert(External)
   Computer Sci. & Engg Dept.
   Deenbandhu Chottu Ram University of Sc. and Tech.
   Murthal, Sonipat, Haryana.

4. Dr. Rakesh Kumar — Invited Member
   TIC, CS & IT,
   Central University of Haryana,Mahendergarh

5. Dr. Suraj Arya — Member
   Assistant Professor,
   Computer Science & Information Technology
   Central University of Haryana, Mahendergarh

According to the BOS agenda the scheme and syllabi of MCA two year program for all semesters is approved and recommended [**Annexure 1**]. The meeting ended with the vote of thanks.

02/09/2020

Dr. Suraj Arya | Dr. Rakesh Kumar | Prof. Anita Singhrova

02/09/2020

Prof. Yudhvir Singh | Prof. Deepak Pant

हरियाणा केन्द्रीय विश्वविद्यालय
Central University of Haryana
(Established under Central Universities Act 2009)
Jant-Pali, Mahendergarh 123031, Haryana

Minutes of First School Board of the School of Basic Sciences

An online meeting (Meeting ID: https://meet.google.com/edy-gsoo-uvt) of the **First School Board of School of Basic Sciences** was held on **14/12/2020** at **11:30 PM**.

Following members were attended the meeting:-

1. **Prof. Deepak Pant** – Dean, School of School of Basic Sciences, Central University of Haryana, Haryana (Chairman)
2. **Prof. Pawan Kumar Sharma**, Department of Chemistry, Kurukshetra University, Kurukshetra, Haryana (Member)
3. **Prof. Sukhdip Singh**, Department of Computer Science and Engineering, DCRUST, Murthal, Sonipat (Member)
4. **Prof. R.B.Singh,** Professor (Retd.), Department of Geography, University of Delhi, Delhi (Member)
5. **Dr. Rajesh Kumar Gupta**, Head, Department of Mathematics, Central University of Haryana, Haryana (Member)
6. **Dr. Suneel Kumar**, Head, Department of Physic and Astrophysics, Central University of Haryana, Haryana (Member)
7. **Dr. Vinod Kumar**, Associate Professor, Department of Chemistry, Central University of Haryana, Haryana (Member)
8. **Dr. Manoj Kumar Gupta**, Assistant Professor, Department of Chemistry, Central University of Haryana, Haryana (Member)
9. **Sh. Suraj Arya,** Assistant Professor, Department of Computer Science and Information Technology, University of Haryana, Haryana (Member)

10. **Dr. Manish Kumar**, TIC, Department of Geography, Central University of Haryana, Haryana (Member)
11. **Dr. Rakesh Kumar**, Assistant Professor, Department of Physic and Astrophysics, Central University of Haryana, Haryana (Member)
12. **Dr. Kapil Kumar**, Assistant Professor, Department of Statistics, Central University of Haryana, Haryana (Member)
13. **Dr. Rakesh Kumar,** Associate Professor, Department of Computer Science and Information Technology, University of Haryana, Haryana **(Special invitee)**

Prof. Deepak Pant, Dean, School of Basic Sciences welcomed all the members.

Following Decision were taken in the school Board meeting:

1. Approved the minutes of Board of Studies of Department of Mathematics held on 09.09.2020 and 19.11.2020 in the Central University of Haryana with the following recommendations:

   1.1 The board suggested that course objective and course outcome should be included in the course curriculum

   1.2 References should be arranged in chronological order.

2. Approved the minutes of Board of Studies of Department of Physics and Astrophysics held on 26.09.2020 in the Central University of Haryana.

3. Approved the minutes of Board of Studies of Department of Computer Science and Information Technology held on 02.09.2020 in the Central University of Haryana with the following recommendations:

   3.1 Department plan some more industrial training in addition to existing, after 1st Semester.

4. The school board were given the following additional suggestions for the academic improvement in the school:

   4.1. In general, number of elective courses should be more extensive for Ph.D students and courses of interdisciplinary nature should be increased.

   4.2 The pattern of syllabus for PG and Ph.D. courses should be uniform. Learning Outcome-based Curriculum Framework (LOCF) should be adopted.

   4.3 School of basic sciences is recommended to constitute committee for forwarding the patents of the faculties of the school.

Dr. Manish Kumar, TIC, Department of Geography has been authorized for preparing the draft for this purpose.

The following member could not attend the meeting due to their pre occupations:

1. **Prof. Vinay Gupta**, Department of Physic and Astrophysics, North Campus, University of Delhi (Member). Minutes will be sending to him for approval.
2. **Prof. Chandra K. Jaggi**, Department of Operational Research, Faculty of Mathematical Sciences, University of Delhi (Member). Minutes will be sending to him for approval.

The meeting ended with a vote of thanks.

CENTRAL UNIVERSITY OF HARYANA
MAHENDERGARH

Department of Computer Science & Information Technology

(Scheme and Syllabi of Master of Computer Applications (MCA)-2years Programme)
With effect from the Academic Session 2020-21 as per the latest AICTE guidelines

Total Credit = 104
Semester Wise Distribution of Credits: 27 + 27 + 27 + 23

Eligibility for Admission to MCA 2-year Programme:

Passed BCA/ Bachelor Degree in Computer Science and Engineering or equivalent Degree.

OR

Passed B.Sc./ B.Com./ B.A. with Mathematics at 10+2 Level or at Graduation Level. Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination. ***The students admitted with this eligibility will have to simultaneously undertake additional Bridge Course(s) as prescribed by the University during the first semester.***

Bridge Course (Non Credit Course)

S.No	Course Name	Course Code	L	T	P	Credit
1	Fundamentals of Computer Science	SBS CS 01 01 01 E 3104	3	1	0	0
2	Internet Fundamentals	SBS CS 01 01 02 E 3104	3	1	0	0
3	Computer Programming using C	SBS CS 01 01 03 E 3104	3	1	0	0
4	Computer Programming using C -Lab-I	SBS CS 01 01 04 E 0021	0	0	2	0
					Total	0

Note: It is compulsory for each student to pass out Bridge Course(s) during the first semester only (three additional theory papers and one practical as prescribed in scheme of Bridge Course). Papers under Bridge Course will be taught only in the 1st semester of the MCA programme.

MCA 1st Semester

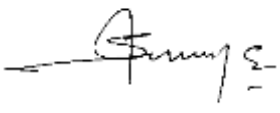
S.No	Course Name	Course Code	L	T	P	Credit
1	Data Structures	SBS CS 01 01 01 C 4004	4	0	0	4
2	Computer Networks	SBS CS 01 01 02 C 4004	4	0	0	4
3	Computer Organization and Architecture	SBS CS 01 01 03 C 4004	4	0	0	4
4	Discrete Mathematical Structures	SBS CS 01 01 04 C 4004	4	0	0	4
5	Operating System and Shell Programming	SBS CS 01 01 05 C 4004	4	0	0	4
6	**General Elective Course-I (To be taken from another department)**		4	0	0	4
7	Data Structures using C Lab-I	SBS CS 01 01 06 C 0021	0	0	2	1
8	Operating System and Shell Programming Lab -II	SBS CS 01 01 07 C 0021	0	0	2	1
9	Web Development using PHP Lab-III	SBS CS 01 01 08 C 0021	0	0	2	1
					Total	**27**

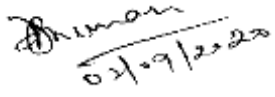
Students have to undergo two weeks in-house training (on any platform or software) during winter vacations and prepare its report which will be evaluated in 2nd semester.

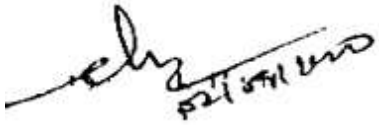
MCA 2nd Semester

S. No	Course Name	Course Code	L	T	P	Credit
1	Database Management System	SBS CS 01 02 09 C 4004	4	0	0	4
2	Computer Graphics	SBS CS 01 02 10 C 4004	4	0	0	4
3	Object Oriented Programming	SBS CS 01 02 11 C 4004	4	0	0	4
4	Software Engineering	SBS CS 01 02 12 C 4004	4	0	0	4
5	Design and Analysis of Algorithms	SBS CS 01 02 13 C 4004	4	0	0	4
6	**Departmental Elective Course-I**					
7	Database Management System Lab-I	SBS CS 01 02 14 C 0021	0	0	2	1
8	Object Oriented Programming using C++ Lab-II	SBS CS 01 02 15 C 0021	0	0	2	1
9	Design and Analysis of Algorithms Lab-III	SBS CS 01 02 16 C 0021	0	0	2	1
10	Evaluation of Open Source Training	SBS CS 01 02 17 C 0101	0	1	0	1
	List for Departmental Elective Courses-I					
	Mobile Communication	SBS CS 01 02 05 E 3003	3	0	0	3
	Management Information System and E-Commerce	SBS CS 01 02 06 E 3003	3	0	0	3
	Quantum Computing	SBS CS 01 02 07 E 3003	3	0	0	3
	Theory of Computation	SBS CS 01 02 08 E 3003	3	0	0	3
					Total	**27**

Students have to undergo four to six weeks training during summer vacations and prepare its report which will be evaluated in 3rd Semester.







MCA 3rd Semester

S. No	Course Name	Course Code	L	T	P	Credit
1	Complier Design	SBS CS 01 03 18 C 4004	4	0	0	4
2	Artificial Intelligence and Expert System	SBS CS 01 03 19 C 4004	4	0	0	4
3	Information and Network Security	SBS CS 01 03 20 C 4004	4	0	0	4
4	Internet and Java Programming	SBS CS 01 03 21 C 4004	4	0	0	4
5	**Departmental Elective Course-II**					
6	**General Elective Course-II (To be taken from another department)**		4	0	0	4
7	Internet and Java Programming Lab-I	SBS CS 01 03 22 C 0021	0	0	2	1
8	Artificial Intelligence with Python Lab-II	SBS CS 01 03 23 C 0021	0	0	2	1
9	Android Application Development Lab-III	SBS CS 01 03 24 C 0021	0	0	2	1
10	Evaluation of Training	SBS CS 01 03 25 C 0101	0	1	0	1
	List for Departmental Elective Courses-II					
	Network Programming	SBS CS 01 03 09 E 3003	3	0	0	3
	Machine and Deep Learning	SBS CS 01 03 10 E 3003	3	0	0	3
	Software Project Management	SBS CS 01 03 11 E 3003	3	0	0	3
	Digital Image Processing	SBS CS 01 03 12 E 3003	3	0	0	3
	Data Warehousing and Data Mining	SBS CS 01 03 13 E 3003	3	0	0	3
					Total	**27**

Students have to undergo two weeks in-house skill enhancement training during winter vacations, and prepare its report which will be evaluated in 4th Semester.

MCA 4th Semester

S. No	Course Name	Course Code	L	T	P	Credit
1	Data Science with R Programming	SBS CS 01 04 26 C 4004	4	0	0	4
2	Wireless Sensor Network and Internet of Things	SBS CS 01 04 27 C 4004	4	0	0	4
3	**Departmental Elective Course-III**					
4	Data Science with R Programming Lab-I	SBS CS 01 04 28 C 0021	0	0	2	1
5	Advance Java Programming Lab-II	SBS CS 01 04 29 C 0021	0	0	2	1
6	Project Work (In House)	SBS CS 01 04 30 C 00168	0	0	16	8
7	Evaluation of Open Source Training	SBS CS 01 04 31 C 0101	0	1	0	1
	List for Departmental Elective Courses-III					
	Distributed and Cloud Computing	SBS CS 01 04 14 E 3104	3	1	0	4
	Bioinformatics	SBS CS 01 04 15 E 3104	3	1	0	4
	Natural Language Processing and Speech Recognition	SBS CS 01 04 16 E 3104	3	1	0	4
	Computer Vision	SBS CS 01 04 17 E 3104	3	1	0	4
	Embedded Programming	SBS CS 01 04 18 E 3104	3	1	0	4
					Total	**23**

Note: Practical work of all compulsory labs will be based on the corresponding theoretical course.

List of General Elective Papers (Offered to the other departments)

S. No	Course Name	Course code	L	T	P	Credit
1	Fundamentals of Computer Science	SBS CS 01 01 01 E 3104	3	1	0	4
2	Internet Fundamentals	SBS CS 01 01 02 E 3104	3	1	0	4
3	Emerging Trends and Technologies in IT	SBS CS 01 02 19 E 3104	3	1	0	4

Fundamentals of Computer Science
Course Code: SBS CS 01 01 01 E 3104

L T P **Total Credits: 0(Bridge Course)/ 4(GEC)**
3 1 0

Course Objectives:
This course aims to give students an in-depth understanding of why computers are essential components in business, education and society. This course will provide hands-on use of Microsoft Office applications Word, Excel, Access and PowerPoint.

Course Level Learning Outcomes:
Upon successful completion of the course students will be able to:

- Explain principal differences in various operating systems
- Identify computer systems technical specifications
- Describe the working of internet technologies
- Perform tasks like compose, format and edit a word document and other office software.

UNIT-I

Overview of Computer System: Evolution of Computer Systems, Generations of Computers, Parts of Computer System, Categories of Computers, Computer System Characteristics, Computer Hardware. Working of input & output devices: keyboard, mouse, trackball, pen, touch screens, scanner, digital camera, monitor, and printer. Working of storage devices: magnetic tape, magnetic disk, CD, DVD.Software- System & Application.

UNIT-II

Computer Memory: RAM ROM, EROM, Volatile and Non Volatile Memory, Types of Memory, Primary and Secondary Memory Input, Output & Storage devices, Organization of Secondary storage media.

UNIT-III

Operating System: Role of an OS, Types of OS, Features of OS & functions of OS. Booting Procedure.
Graphical OS: Fundamentals of windows, types of windows, Anatomy of Windows, Windows explorer, customizing windows, control panel, taskbar setting.

UNIT-IV

Office Automation Tools Word Processing: Editing features, formatting features, saving, printing, table handling, page settings, spell-checking, macros, mail-merge, and equation editors.
Excel/Access Power Point Slides: Templates, views, formatting slide, slides with graphs, animation, using special features, presenting slide shows.

Suggested Readings:

1. Norton, P., *Introduction to Computers*, Mc-Graw-Hill, 2017.
2. Raja, Raman V., *Fundamental of Computers*, Prentice Hall of India, 2014.
3. Sanders, D. H., *Computer Today*, Mc-Graw Hill, 1988.
4. Sinha, P.K. and Sinha, P., *Computer fundamentals*, BPB Publications, 2010.
5. Vermaat, M.E., *Discovering Computers & Microsoft Office 2013: A Fundamental Combined Approach*, Cengage Learning, 2013.

Internet Fundamentals
Course Code: SBS CS 01 01 02 E 3104

L T P **Total Credits: 0(Bridge Course)/ 4(GEC)**
3 1 0

Course Objectives:
This course aims to introduce the building blocks of the internet and to provide the necessary skills to utilize the internet efficiently.

Course Level Learning Outcomes:
Upon successful completion of the course students will be able to:

- Describe how the Internet works.
- Summarize describe connections that need to be made in order to access the internet.
- Demonstrate internet tools technologies including current web-based applications, e-mail, and social networking tools.
- List the privacy & security protocols involved in the internet communication.

UNIT-I

Electronic Mail: Introduction, advantages and disadvantages, Userids, Pass words, e-mail addresses, message components, message composition, mailer features, E-mail inner workings, E-mail management, Mime types, Newsgroups, mailing lists, chat rooms.

UNIT-II

The Internet: Introduction to networks and internet, history, Working of Internet, Internet Congestion, Modes of Connecting to Internet, Internet Service Providers(ISPs), Internet addressing, comparison of IPv4 and IPv6.

UNIT-III

Languages and Servers: Basic and advanced HTML, XML basics. Introduction to Web Servers: PWS, IIS, Apache; Microsoft Personal Web Server. Accessing & using these servers.

UNIT-IV

Privacy and Security Topics: Introduction, Encryption schemes, Secure Web document, Digital Signatures, Firewalls.

Suggested Readings:

1. Castro, E., *HTML for the World Wide Web with XHTML and CSS: Visual QuickStart Guide*, Peachpit Press, 2006.
2. Comer, D.E. and Droms, R.E., *Computer Networks and Internets,* Prentice-Hall, Inc., 2003.
3. Deitel, H.M., Deitel, P.J. and Nieto, T.R., *Internet & World Wide Web How to Program*, Pearson Education, 2011.
4. Gralla, P., *How the Internet Works*, QUE Publication, 2006.
5. Greenlaw, R. and Hepp, E., *Inline/Online: Fundamentals of the Internet and The World Wide Web*, McGraw-Hill Higher Education, 2001.

Computer Programming using C
Course Code: SBS CS 01 01 03 E 3104

L T P **Total Credits: 0(Bridge Course)/ 4(GEC)**
3 1 0

Course Objectives:
The course is designed to provide knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future. Student will learn the fundamental programming concepts and methodologies

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Design programs connecting decision structures, loops and functions.
- Explain the difference between call by value and call by address.
- Understand the dynamic behaviour of memory by the use of pointers.
- Understand the arrays and difference between structure and union.

UNIT-I

Elements of C: character set identifier and keywords, data type, declaration and definition. Operators: arithmetic, relational, logical, bit wise, unary, assignment and conditional operators their hierarchy arid associativity.

UNIT-II

Control statements: sequencing, selection, if and switch statement; repetition / loop statements: for, while, and do while loops; break, continue and goto statements.

UNIT-III

Function: definition, declaration, and Calling, call by value, call by reference prototype, passing parameters, actual and formal parameters, recursion.

UNIT-IV

Data Structures: arrays, structure, structure members, access to structure members union, string, data files. Pointer: declaration, operation of pointers, array to pointers, pointers to arrays.

Suggested Readings:

1. Gottfried, B.S., *Programming with C*., McGraw Hill Education, 2018.
2. Hanly, J. R., Koffman, E.B. , *Problem Solving and Program Design in C*, 8th edition., Pearson Publications, 2015.
3. Kanetkar, Y., *Let Us C*, 16th Edition, BPB Publication, 2017.
4. Kelley, A., Pohl, I., *A Book on C: Programming in C*, Addison Wesley, 2000.
5. Kernighan, B.W. and Ritchie D., *The C Programming Language,* Pearson Publications, 2015.

Computer Programming using C -Lab-I
Course Code: SBS CS 01 01 04 E 0021

L T P **Total Credit: 0**
0 0 2

Course Objectives:
The major objective of this course is to provide the basic knowledge of C language with the understanding of code organization, data types and functional hierarchy. Students will understand a defensive programming concept. Ability to handle possible errors during program execution.

Course Level Learning Outcomes:
Upon successful completion of the course students will be able to:

- Understand the need of programing language
- Use various data types as per requirements
- Design programs connecting decision structures, loops and functions.
- Explain the difference between call by value and call by address.
- Understand the dynamic behaviour of memory by the use of pointers.
- Understand the arrays and difference between structure and union
- Work with textual information, characters and strings.
- Work with arrays of complex objects.
- Understanding a concept of object thinking within the framework of functional model.

Data Structures
Course Code: SBS CS 01 01 01 C 4004

L T P **Total Credits: 4**
4 0 0

Course Objectives:

Using computer science theory, students will construct and analyze various data structures and abstract data types including lists, stacks, queues, trees, and graphs. Students will implement various sorting, searching, and hashing algorithms. Students will build a substantial, complex data structure.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Design correct programs to solve problems.
- Choose efficient data structures and apply them to solve problems.
- Analyze the efficiency of programs based on time complexity.
- Prove the correctness of a program using loop invariants, preconditions and post conditions in programs.

UNIT-I

Introduction: Basic Terminology, Elementary Data Organization, Structure Operations, Algorithm, Complexity and Time-Space trade-off.

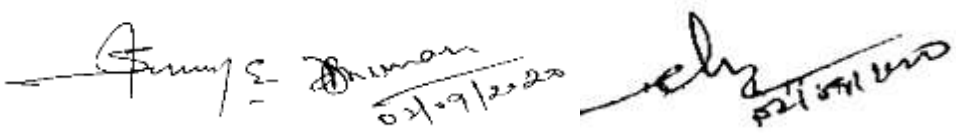
Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, Address Calculation, Application of Arrays.

UNIT-II

Stacks: Array Representation and Implementation of the stack, Operations on Stacks: Push & Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.

Queues: Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, D-queues and Priority Queues.

Linked list: Representation and Implementation of Singly Linked Lists, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly Linked List, Linked List in Array.



UNIT-III

Trees: Basic terminology, Binary Trees, Binary tree representation, Array and Linked Representation of Binary trees, Types of Binary Tree, Traversing Binary trees, Binary Search Tree (BST), Insertion and Deletion in BST, AVL Trees, Huffman algorithm.

Graphs: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

UNIT-IV

Searching and Hashing: Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

Sorting: Insertion Sort, Bubble Sorting, Selection Sort, Quick Sort, Merge Sort, Heap Sort, Linear time sorting, Practical consideration for Internal Sorting and External Sorting.

Suggested Readings:

1. Cormen, T.H., Leiserson, C.E., Rivest, R.L. and Stein, C., *Introduction to Algorithms,* MIT Press, 2010.
2. Goodrich, M.T., Tamassia, R. and Mount, D.M., *Data Structures and Algorithms in C++*, John Wiley & Sons, 2016.
3. Langsam, Y., Augenstein, M. and Tenenbaum, A.M., *Data Structures using C and C++,* Prentice Hall, 2015.
4. Lipschutz, S., *Schaum's Outline of Theory and Problems of Data Structures*, McGraw-Hill, 2014
5. Thareja, R., *Data Structures using C*, Oxford University Press, 2014.

Computer Networks
Course Code: SBS CS 01 01 02 C 4004

L T P **Total Credits: 4**
4 0 0

Course Objectives:
The main emphasis of this course is on the organization and management of local area networks (LANs). The course objectives include learning about computer network organization and obtaining a theoretical understanding of data communication and computer networks.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
- Discuss and identify deficiencies in existing protocols, and then go onto formulating new and better protocols.
- Analyze, specify and design the topological and routing strategies for an IP based networking infrastructure.
- Describe a working knowledge of datagram and internet socket programming.

UNIT-I

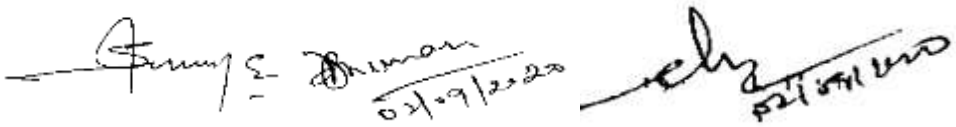
Introduction To Computer Networks: Definition of a Computer Network, The OSI Reference Model, The TCP/IP Reference Model, Protocols and Hardware involved in the OSI model, Comparison of the OSI & the TCP/IP.

Application Layer: Domain name space, DNS in internet, electronic mail, FTP, WWW, HTTP, SNMP, multimedia, network security

UNIT-II

Physical Layer: Introduction: Network topologies; Linear Bus Topology, Ring Topology, Star Topology, Hierarchical or Tree Topology, Topology Comparison, Considerations when choosing a Topology: Switching; Circuit switching, Message switching, Packet switching.

Transmission Medium: Introduction: Transmission medium; Guided & Unguided Transmission medium, Twisted pair, Coaxial cable, Optical fiber, Comparison of fiber



optics and copper wire: Wireless transmission; Electromagnetic spectrum, Radio transmission, Microwave transmission.

UNIT-III

Data Link Layer: Introduction; Goal of DLL: Design issues of DLL; Services provided to the Network layer, Framing, Error control, Flow control, ARQ strategies: Stop-and-Wait, RTT estimation, sliding window, Go-Back-N retransmission, Error Detection and correction: Parity bits, Single bit error correction or (n, m), Error Detection or Cyclic Redundant Code (CRC): Data Link layer protocols; Transmission control protocols, HDLC.

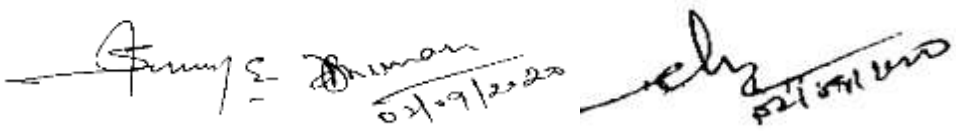
UNIT-IV

Network Layer: Introduction: Design issues of Network layer; Nature of the service provided, Internetworking: Principles of Routing; Types of routing algorithms, Properties of routing algorithms, Optimality principle: Routing algorithms; Shortest path algorithm, Flooding, Distance vector routing, Hierarchical routing, Link state routing, Congestion: Factors of congestion, Comparison of flow control and congestion control, General principles of congestion control, Closed loop solution: IP protocol (IPV4).

Transport Layer: Introduction: Services of Transport layer; Service primitives: Connection establishment: Connection Release: Transport Protocols; TCP protocol, UDP protocol

Suggested Readings:

1. Comer, D.E., and Droms, R.E., *Computer Networks and Internets,* Prentice-Hall Inc., 2018.
2. Forouzan, A.B., *Data Communications & Networking,* Tata McGraw-Hill Education, 2017.
3. Kundu, S., *Fundamentals of Computer Networks*, PHI Learning Pvt. Ltd., 2008.
4. Kurose, J.F., *Computer Networking: A Top-Down Approach Featuring the Internet,* Pearson Education India. 2016.
5. Stallings, W.S., *Data and Computer Communications,* Pearson Education India, 2013.



Computer Organization and Architecture

Course Code: SBS CS 01 01 03 C 4004

L T P **Total Credits: 4**
4 0 0

Course Objectives:

This course is intended to teach the basics involved in data representation and digital logic circuits used in the computer system. This includes the general concepts in digital logic design, including logic elements, and their use in combinational and sequential logic circuit design. This course will also expose students to the basic architecture of processing, memory and i/o organization in a computer system.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Describe the structure, function and characteristics of computer systems.
- Outline the design of the various functional units and components of computers.
- Define the function of each element of a memory hierarchy,
- Identify and compare different methods for computer I/O.

UNIT-I

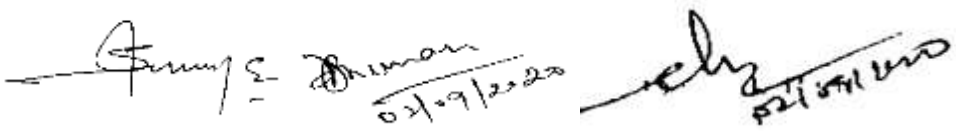
Information Representation: Number systems, BCD codes, character codes, error detecting and correcting codes, fixed-point and floating-point representation of information. Binary arithmetic operations, Booths multiplication. Binary Logic: Boolean algebra, Boolean functions, Truth Tables, Canonical and Standard forms, Simplification of Boolean functions, Digital logic gates.

UNIT-II

Combinational Logic: Design procedure, Adders, Subtractors, Encoders, Decoders, Multiplexers, De-multiplexers and Comparators.
Sequential Logic: Latches, Flip-Flops, Shift Registers and Counters.

UNIT-III

Memory System: Characteristics of memory system, Memory hierarchy, Cache Memory- Cache memory principles, Elements of cache design- cache address, size, mapping functions, replacement algorithms, write policy, Internal Memory- semiconductor memory, External Memory- Hard Disk organization.

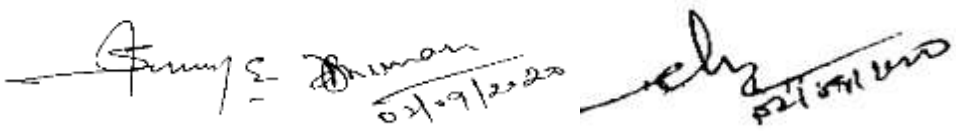


UNIT-IV

CPU Organizations: Processor organization, machine instructions, instruction cycles, instruction formats and addressing modes, microprogramming concepts, micro-program sequencer. I/O organization: I/O interface, interrupt structure, transfer of information between CPU/memory and I/O devices and IOPs. Case Study: Von-Neumann Architecture

Suggested Readings:

1. Hamacher, V.C., Vranesic, Z.G., Zaky, S.G., Vransic, Z. and Zakay, S., *Computer Organization,* McGraw-Hill, 2011.
2. Hayes, J.P., *Computer Architecture and Organization,* McGraw-Hill Inc., 2017.
3. Mano, M.M., *Computer System Architecture,* Prentice-Hall of India, 2017.
4. Sarangi, S.R., *Computer Organisation and Architecture,* McGraw-Hill, 2017.
5. Stallings, W., *Computer Organization and Architecture: Designing for Performance*, Pearson Education India, 2016.



Discrete Mathematical Structures

Course Code: SBS CS 01 01 04 C 4004

L T P **Total Credits: 4**
4 0 0

Course Objectives:

The objective of this course is to teach students how to think logically and mathematically. The course stresses on mathematical reasoning and describes different ways in which mathematical problems could be solved. There are two thematic areas covered in this course: mathematical reasoning and discrete structures.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Describe the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, and be able to apply them in problem solving.
- Apply the basics of discrete probability and number theory in problem solving.
- Apply algebraic techniques to analyse basic discrete structures and algorithms.
- Relate the properties of graphs and related discrete structures to practical examples.

UNIT-I

Set Theory: Definition of Sets, Venn Diagrams, complements, Cartesian products, power sets, counting principle, cardinality and countability (Countable and Uncountable sets), proofs of some general identities on sets, pigeonhole principle.

Relation: Definition, Types of relation, the composition of relations, domain and range of a relation, pictorial representation of a relation, properties of relation, partial ordering relation, Lattices, Hasse diagram.

UNIT-II

Algebraic Structure: Binary composition and its properties definition of algebraic structure.

Groups: Semi-group, Monoid Groups, Abelian group, properties of groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (definition and standard results).

UNIT-III

Propositional Logic: Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction, normal forms (conjunctive and disjunctive), modus Ponens and modus Tollens, validity, predicate logic, universal and existential quantification, Boolean expressions, Karnaugh map.

UNIT-IV

Graphs: Graph terminology, types of graph, connected graphs, components of the graph, Euler graph, Hamiltonian path and circuits, Graph coloring, Chromatic number.

Tree: Definition, Types of trees(rooted, binary), properties of trees, binary search tree, tree traversing (preorder, inorder, postorder).

Suggested Readings:

1. Kolman, B., Busby, R.C., and Ross, S.C., *Discrete Mathematical Structures*, Prentice-Hall, 2008.
2. Lipschutz, S., and Lipson, M.L., *Discrete Mathematics*, McGraw-Hill, 2017.
3. Liu, C.L., and Mohapatra, D.P., *Elements of Discrete Mathematics: A Computer Oriented Approach,* Tata McGraw-Hill, 2017.
4. Rosen, K.H., and Krithivasan, K., *Discrete Mathematics and Its Applications: With Combinatorics and Graph Theory*, Tata McGraw-Hill Education, 2017.
5. Sarkar, S.K., *A Textbook of Discrete Mathematics*, S. Chand Publishing, 2016.

Operating System and Shell Programming

Course Code: SBS CS 01 01 05 C 4004

L T P **Total Credits: 4**
4 0 0

Course Objectives:

A successful student will be able to understand the basic components of a computer operating system, and the interactions among the various components. The course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems. The students will implement solutions via C/C++ programs.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Demonstrate the important Linux library functions and system calls.
- Describe the inner workings of Linux operating systems.
- Write shell scripts to perform repetitive tasks using while and for loops.
- Design and implement shell functions.

UNIT-I

Operating System Introduction: function, characteristics, structures–simple batch, multiprogrammed, timeshared, personal computer, parallel, distributed systems, real-time systems, system components, operating system services, system calls, virtual machines.
Process and CPU Scheduling: Process concepts and scheduling, operation on processes, cooperating processes, threads and inter-process communication scheduling criteria, scheduling algorithm, multiple-processor scheduling, real time scheduling.

UNIT-II

Management and Virtual memory: logical versus physical address space, swapping, contiguous allocation, paging, segmentation, segmentation with paging. Demand paging, performance of denuding paging, page replacement, page replacement algorithm, allocation of frames, thrashing.

UNIT-III

File System Interface and Implementation: access methods, directory, structure, protection, file system structure, allocation methods, free space management, directory management, directory implementation, efficiency and performance.
I/O Management: I/O software and its types, disk scheduling.

Process Management and Synchronization: Critical section problem, synchronization, critical regions, monitors.

UNIT-IV

Deadlocks: system model, dead locks characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection and recovery from deadlock.

Shell Programming: vi editor, shell variables, I/O in shell, control structures, loops, subprograms, creating shell scripts. Basic system administration in Linux/Unix.

Suggested Readings:

1. Das, S., *Your UNIX: The Ultimate Guide*, McGraw-Hill Inc., 2012.
2. Goerzen, J., *Linux Programming Bible*, IDG, 2000.
3. Kanetkar, Y.P., *UNIX Shell Programming*, BPB Publications, 2003.
4. Prata, S., and Waite Group, *Advanced UNIX: A Programmer's Guide*, HW Sams, 1985.
5. Venkateshmurthy, M.G., *Introduction to Unix and Shell Programming,* Pearson Education India, 2009.

Database Management System
Course Code: SBS CS 01 02 09 C 4004

L T P **Total Credits: 4**

4 0 0

Course Objectives:

This course is intended to provide an introduction to the management of database systems. The course emphasizes the understanding of the fundamentals of relational systems including data models, database architectures, and database manipulations. The course uses a problem-based approach to learning.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Elaborate on different issues involved in the design and implementation of a database system. Study the physical and logical database designs, database modeling, relational, hierarchical, and network models.
- Analysis and Practice on data manipulation language to query, update and manage a database.
- Determine essential DBMS concepts such as database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
- Develop a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

UNIT-I

Basic Concepts: File Systems vs. DBMS, Characteristics of the Database Approach, Abstraction and Data Integration, Database users, Advantages and Disadvantages of a DBMS.

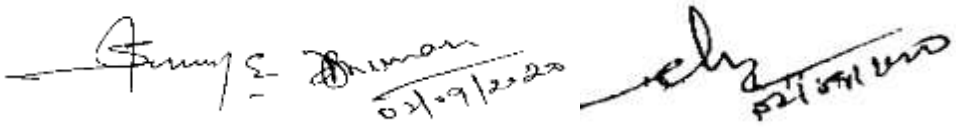
Database Systems Concepts and Architecture: Data Models, Schema and Instances, DBMS architecture and Data Independence, Database languages and Interfaces, DBMS functions and component modules.

UNIT-II

Entity-Relationship Model: Entity Types, Entity Sets, Attributes & keys, Relationships, Relationships Types, Roles and Structural Constraints, Design issues, E-R Diagrams, Design of an E-R Database Schema, Reduction of an E-R Schema to Tables.

Relational Data Model: Relational model concepts, Integrity constraints over Relations, Relational Algebra – Basic Operations.

SQL: DDL, DML, and DCL, views & Queries in SQL, Specifying Constraints & Indexes in SQL.



UNIT-III

Relational Database Design: Functional Dependencies, Decomposition, Normal forms based on primary keys (1 NF, 2 NF, 3 NF, & BCNF)
Transaction Processing Concepts: Introduction to Transaction Processing, Transaction & System Concepts, Properties of Transaction, Schedules and Recoverability, Serializability of Schedules.
Concurrency Control Techniques: Locking Techniques, Timestamp ordering, Multi-version Techniques, Optimistic Techniques, Granularity of Data items.

UNIT-IV

Databases for Advanced Applications: Active database concepts, Temporal database concepts, Spatial databases, Deductive databases; Emerging Database Technologies: Mobile databases, Multimedia Databases, Geographic information systems (GIS); XML and Internet Databases: Structured, Semi-structured and Unstructured Data, Introduction to web databases and XML, Structure of XML data.

Suggested Readings:

1. Bayross, I., *SQL, PL/SQL: The Programming Language of Oracle,* BPB Publications. 2010.
2. Connolly, T.M. and Begg, C.E., *Database Systems: A Practical Approach to Design, Implementation, and Management*, Pearson Education, 2019.
3. Date, C.J., *An Introduction to Database Systems*, Pearson Education India, 2012.
4. Elmasri, R., *Fundamentals of Database Systems*, Pearson Education India, 2015.
5. Silberschatz, A., Korth, H.F. and Sudarshan, S., *Database System Concepts,* McGraw-Hill, 2013.

Computer Graphics
Course Code: SBS CS 01 02 10 C 4004

L T P **Total Credits: 4**
4 0 0

Course Objectives:

The main objective of this course is to introduce the concepts of computer graphics to the students. It starts with an overview of interactive computer graphics, two-dimensional system and mapping, then it presents the most important drawing algorithm, two-dimensional transformation; Clipping, filling and an introduction to 3-D graphics.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Describe the basic concepts of computer graphics.
- Implement various scan conversion problems with programming.
- Demonstrate various transformations on the digital drawings.
- Apply various modelling techniques in multimedia object creation.

UNIT-I

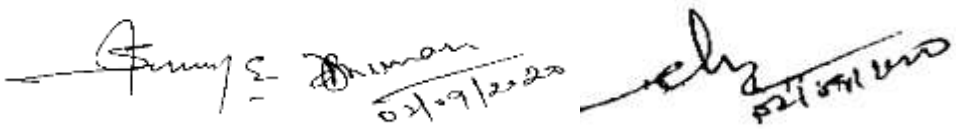
Introduction: Survey of computer Graphics and its applications; Interactive and passive graphics; display processors; Graphic Devices: Display systems-refresh CRTs, raster scan and random scan monitors, Grey shades, Interlacing, beam penetration shadow mask monitors, lookup tables, plasma panel, LED and LCD monitors, VGA and SVGA resolutions; Hard copy Devices-printers, plotters; Interactive Input Devices.

UNIT-II

Drawing Geometry: Coordinate system; resolution; use of the homogeneous coordinate system; scan conversion: symmetrical DDA, simple DDA, Bresenham's line drawing algorithm, Circle drawing using DDA and polar coordinates, Bresenham's circle drawing algorithm, generation of an ellipse. Curve Drawing

UNIT-III

2-D Transformations: Translation; rotation; scaling; mirror reflection; shearing; zooming; panning; input techniques-pointing, positioning, rubber band methods and dragging; tweening, Morphing. Graphic operations: Clipping-line clipping using Sutherland-Cohen and midpoint sub- division algorithm, Liang Barsky Line clippers algorithm, polygon clipping; window and viewport; windowing transformation; Filling algorithms.



UNIT-IV

3-D Graphics: 3D modelling of objects; 3D display techniques; coordinate system; 3D transformation matrices for translation, scaling and rotation; parallel projection; perspective projection; Hidden-surface removal - Z-buffer, back face, scan-line, depth-sorting, area subdivision; Shading - modelling light intensities, Gouraud shading, Phong shading.

Suggested Readings:

1. Enderle, G., Kansy, K. and Pfaff, G., *Computer Graphics Programming: GKS—The Graphics Standard,* Springer Science & Business Media. 2012.
2. Hearn, D., Baker, M.P. and Carithers, W.R., *Computer Graphics with OpenGL*, Prentice Hall, 2014.
3. Foley, J.D., Van, F.D., Van Dam, A., Feiner, S.K., Hughes, J.F., Angel, E. and Hughes, J., *Computer Graphics: Principles and Practice,* Addison-Wesley Professional. 2018.
4. Klinger, A., Fu, K.S. and Kunii, T.L., *Data Structures, Computer Graphics, and Pattern Recognition*, Academic Press. 2014.
5. Marschner, S. and Shirley, P., *Fundamentals of Computer Graphics,* CRC Press, 2015.

Object Oriented Programming
Course Code: SBS CS 01 02 11 C 4004

L T P **Total Credits: 4**
4 0 0

Course Objectives:

The objective of this course is to develop programming skills of students, using object-oriented programming concepts, learn the concept of class and object using C++ and develop classes for simple applications.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Analyze fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Discuss the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Summarize important topics and principles of software development.
- Practice on writing a computer program to solve specific problems.

UNIT-I

Object-Oriented Concepts: Data abstraction, Data Hiding, Encapsulation, polymorphism, modularity, hierarchy, typing, concurrency, persistence. C++ Basics: Classes and Objects, Data types, loops and decisions, structures and functions, Scope of class and its member, Nested Class, object arrays, Pointers, Constructor: parameterized constructor, multiple constructors, default constructor, copy constructor, implicit constructor, destructor function, dynamic allocation operators: new(), delete().

UNIT-II

Inheritance: Base and Derived Classes, Single inheritance, Multilevel inheritance, Hierarchical inheritance, Hybrid Inheritance, Multiple inheritance, Protected Members, Casting Base-Class Pointers to Derived- Class Pointers, Using Member Functions, Overriding Base–Class Members in a Derived Class, Public, Protected and Private Inheritance, Using Constructors and Destructors in derived Classes.

UNIT-III

Polymorphism: Compile time and Run time, Abstract class, Virtual class, Virtual base classes, pointers to base and derived classes, virtual functions, early and late binding, Pure virtual function, virtual destructor, virtual derivation. Friend function & Friend class, Inline functions, function overloading, Operator Overloading: Unary, Binary.

UNIT-IV

Generic Programming: Function Templates, Overloading Template Functions, Class Template, Class Templates and Non-Type Parameters.

Exception Handling: Try, Throw, Catch, Throwing an Exception, Catching an Exception, Re-throwing an Exception.

File Handling: Hierarchy of File Stream classes, Opening and Closing files, File modes, testing for errors, File pointers and their manipulations, ASCII & Binary files, Sequential and Random access files. files, opening & closing a file, read() & write() functions, File manipulation using seekg(), tellg() functions.

Suggested Readings:

1. Balaguruswami, E., *Object-Oriented Programming in C++*, McGraw Hill Education, 2017.
2. Kanetkar, Y.P., *Let us C++*, BPB Publications, 2019.
3. Lafore, R., *Object-oriented programming in C++*, Pearson Education, 2001.
4. Mothe, M., *C++ Programming: A Practical Approach,* Pearson Education India, 2011.
5. Schildt, H., *C++ The Complete Reference*, McGraw-Hill Osborne Media, 2014.
6. Stroustrup, B., *The C++ Programming Language*, Pearson Education India, 2013.

Software Engineering
Course Code: SBS CS 01 02 12 C 4004

L T P **Total Credits: 4**
4 0 0

Course Objectives:

The objective of this course is to provide a solid fundamental knowledge of software engineering. This course will help the students to utilize and exhibit strong communication and interpersonal skills, as well as professional and ethical principles when functioning as members and leaders of multi-disciplinary teams.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Interpret the problem statement for the software design.
- Analyze and specify the requirements of the software efficiently.
- Translate the requirements into the design model with modern tools.
- Write the test cases and analyze the software modules.

UNIT-I

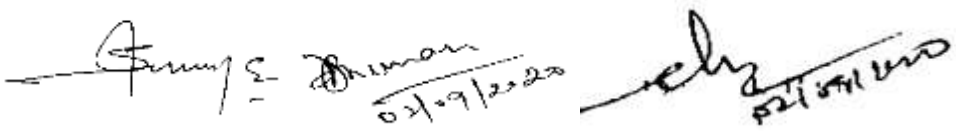
Software and Software Engineering: software characteristics, software crisis, software engineering paradigms. Planning a Software Project: software cost estimation, project scheduling, personal planning, team structure

UNIT-II

Software Configuration Management: quality assurance, project monitoring, risk management. Software Requirement Analysis: structured analysis, object-oriented analysis and data modeling, software requirement specification, validation.

UNIT-III

Design and Implementation of Software: software design fundamentals, design methodology (structured design and object-oriented design), design verification, monitoring and control, coding.
Software Reliability: metric and specification, fault avoidance and tolerance, exception handling, defensive programming.



UNIT-IV

Testing: testing fundamentals, white box and black box testing, software testing strategies; unit testing, integration testing, validation testing, system testing, debugging Software

Maintenance: maintenance characteristics, maintainability, maintenance side effects, CASE tools

Suggested Readings:

1. Aggarwal, K.K. and Singh, Y., *Software Engineering*, New Age International, 2001.
2. Fairley, R., *Software Engineering Concepts,* McGraw-Hill, 2017.
3. Jalote, P., *An Integrated Approach to Software Engineering,* Springer Science & Business Media, 2012.
4. Pressman, R.S., *Software Engineering: A Beginner's Guide,* McGraw-Hill, 2019.
5. Sommerville, I., *Software Engineering*, Pearson Education India, 2004.

Design and Analysis of Algorithms

Course Code: SBS CS 01 02 13 C 4004

L T P **Total Credits: 4**
4 0 0

Course Objectives:

The objective of this course is to reinforce basic design concepts (e.g., pseudo code, specifications, top-down design) and have the knowledge of algorithm design strategies. This course emphasizes mainly on the analysis of an algorithm w.r.t. time and space complexity.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate familiarity with major algorithms and data structures.
- Relate the real-life problems and their better solution.

UNIT-I

Introduction to analysis of algorithms: Analysis of algorithms, asymptotic notation-Big-O, Omega and Theta notations, recurrence relations, solving recurrences, Abstract data types, Linear Data Structures and their sequential storage representation: stacks, queues, priority queues, and their applications.

UNIT-II

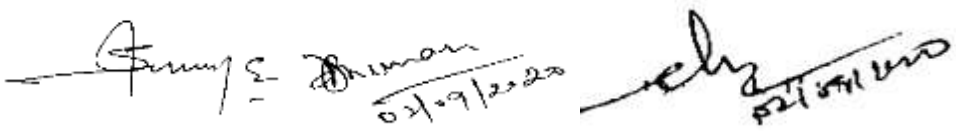
Divide and Conquer: General method, Binary Search, Exponentiation problem, Merge Sort, Quick Sort, Selection Sort, Strassen's Matrix Multiplication algorithms and analysis of algorithms for these problems.

Greedy Method: General method, Knapsack Problem, Job sequencing with deadlines, Minimum Spanning trees, Single source shortest path and analysis of these algorithms.

UNIT-III

Dynamic Programming: General method, 0/1 Knapsack problem, Optimal BST, All Pairs shortest path, Traveling Salesman Problem, Longest common subsequence(LCS).

Back Tracking: General method, 8 queen's problem, graph coloring, hamiltonian cycles and analysis of these problems.

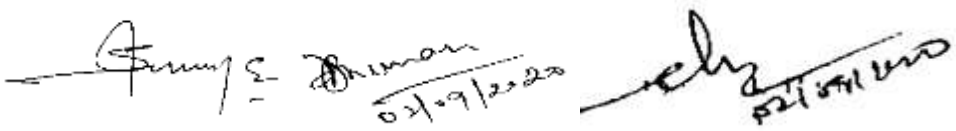


UNIT-IV

NP-Hard and NP-Complete Problems: P, NP, NP-Hard & NP-Complete Classes, Reductions: Vertex cover, Simple Max-Cut, Hamiltonian Circuit, Traveling salesman problem, kernel, 3- dimensional matching, and other NP-Complete Problems, Satisfiability and variations, Cook's theorem, examples of NP-Hard problems.

Suggested Readings:

1. Aho, A.V. and Hopcroft, J.E., *The Design and Analysis of Computer Algorithms,* Pearson Education India, 2002.
2. Cormen, T.H., Leiserson, C.E., Rivest, R.L. and Stein, C., *Introduction to Algorithms,* MIT Press. 2010.
3. Horowitz, E. and Sahni, S., *Fundamentals of Computer Algorithms,* Computer Science Press, 2008.
4. Kleinberg, J. and Tardos, E., *Algorithm Design,* Pearson Education India, 2013.
5. Sridhar, S., *Design and Analysis of Algorithms*, Oxford University Press, 2015.



Mobile Communication
Course Code: SBS CS 01 02 05 E 3003

L T P **Total Credits: 3**
3 0 0

Course Objectives:

This course will provide students with both broad and in-depth knowledge, and a critical understanding of mobile computing from different viewpoints: infrastructures, principles and theories, technologies, and applications in different domains. Student will understand the operation of mobile communications systems and their generation divisions.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Describe the fundamentals of wireless communications.
- Analyze security, energy efficiency, mobility, scalability, and their unique characteristics in wireless networks.
- Demonstrate basic skills for cellular networks design.
- Apply knowledge of TCP/IP extensions for mobile and wireless networking.

UNIT-I

Introduction to Mobile Communications and Computing: Mobile Computing (MC): Introduction to MC, novel applications, limitations, and architecture.

GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

(Wireless) Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

UNIT-II

Mobile Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

UNIT-III

Database Issues: Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues. Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, push based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

UNIT-IV

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs. **Protocols and Tools:** Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

Suggested Readings:

1. DasBit, S. and Sikdar, B.K., *Mobile Computing*, PHI Learning Pvt. Ltd., 2009.
2. Kamal, R., *Mobile Computing,* Oxford University Press, 2008.
3. Schiller, J.H., *Mobile Communications,* Pearson Education, 2004.
4. Stojmenovic, I., *Handbook of Wireless Networks and Mobile Computing,* Wiley, 2002.
5. Talukdar, A.K., *Mobile Computing,* Tata McGraw-Hill Education, 2010.

Management of Information System and E-Commerce
Course Code: SBS CS 01 02 06 E 3003

L T P **Total Credits: 3**
3 0 0

Course Objectives:

This course focuses on principles of e-commerce from a business perspective, providing an overview of business and technology topics, business models, virtual value chains and social innovation and marketing strategies. In addition, some of the major issues associated with e- commerce security, privacy, intellectual property rights, authentication, encryption, acceptable use policies, and legal liabilities will be explored. Students will build their own web presence and market it using an online platform.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Identify the relationship between the digital firm, electronic commerce, electronic business and internet technology.
- Analyze the relationship between organizations, information systems and business processes, including the processes for customer relationship management and supply chain management.
- Demonstrate an understanding of the foundations and importance of E-commerce
- Estimate the effect of changing technology on traditional business models and strategy;

UNIT-I

Introduction to the MIS concept- Definition, Role of the MIS, Impact of MIS, MIS and the user, Management as a control system, MIS support to the management, Management effectiveness and MIS, Organization as a system. MIS: organization effectiveness.

Decision Making and DSS- Decision making concepts, decision-making process, decision- making by analytical modelling, Behavioral concepts in decision making, organizational decision-making, Decision structure, DSS components, Management reporting alternatives.

UNIT-II

Enterprise Business system- Introduction, cross-functional enterprise applications, real-world case, Functional business system, Introduction, marketing systems, sales force automation, CIM, HRM, Customer relationship management, ERP, Supply chain management.

Client-Server Architecture and E-business Technology- Client-server architecture,

implementation strategies, Introduction to E-business, the model of E-business, Internet and World Wide Web, Intranet/Extranet, Electronic, Impact of Web on Strategic management, MIS in Web environment.

UNIT-III

Introduction to e-commerce, E-commerce Business Models and Concepts, Ecommerce Infrastructure: The Internet and World Wide Web, Web design, JavaScript Internet Information Server (IIS); Personal Web Server (PWS),

E-Commerce techniques and Issues- Introduction to Active Server Pages (ASP), Building an E-Commerce Web Site, E-Commerce Payment Systems, E-Commerce Marketing Techniques, Building product catalogue, Search Product catalogue, Web Spider and search agent, Ethical, Social and Political Issues in ECommerce.

UNIT-IV

Internet Communication- Transaction Systems, Shopping Carts, XML, E-Commerce Applications: Business-to-Consumer(B2C), Consumer-to-Consumer (C2C), Business- to-Business (B2B), Digital Government, Marketplaces, and Communities, Security and Encryption, Web Security.

Suggested Readings:

1. Jawadekar, W.S., *Management Information Systems: Text and Cases: A Global Digital Enterprise Perspective*, Tata McGraw-Hill Education, 2013.
2. Kalakota, R. and Whinston, A.B., *Electronic Commerce: A Manager's Guide,* Addison-Wesley Professional, 1997.
3. Laudon, K.C. and Laudon, J.P., *Management Information Systems,* Pearson, 2018.
4. Laudon, K.C. and Traver, C.G., *E-Commerce: Business, Technology, Society,* Pearson, 2016.
5. Rayport, J.F. and Jaworski, B.J., *Introduction to E-Commerce,* McGraw-Hill, 2003.

Quantum Computing
Course Code: SBS CS 01 02 07 E 3003

L T P **Total Credits: 3**
3 0 0

Course Objectives:

This course aims to introduce the fundamentals of quantum computation. This course provides an interdisciplinary introduction to the emerging field of quantum computer science, explaining basic quantum mechanics, quantum entanglement, its structure and its physical consequences and introduces quits.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Implement complex vector spaces.
- Apply quantum mechanics in quantum computing.
- Architecture the quantum algorithms.
- Learn fundamentals of quantum computation.

UNIT-I

Complex numbers and its geometrical representations, Complex vector spaces, inner products and Hilbert spaces, Hermitian and unitary matrices, Tensor products of vector spaces

UNIT-II

Deterministic Systems, Probabilistic descriptions and Quantum systems, Basics of Quantum theory, Schrodinger's time dependent equation, Wave nature of Particles, state vector, operators, postulates of quantum mechanics, Dirac formalism, Stern-Gerlach experiment, electron spin, superposition of states, entanglement

UNIT-III

Bits and Qubits, Classical gates versus quantum gates, single qubit gates, multiple qubit gates, design of quantum circuits, Deutsch's Algorithm, DeutschJozsa Algorithm, Simon's periodicity algorithm, Grover's search algorithm, Shor's Factoring algorithm

UNIT-IV

Quantum programming languages, Probabilistic and Quantum computations, introduction to quantum cryptography and quantum information theory, Comparison between classical and quantum information theory, Bell states, no cloning theorem, Quantum error correction.

Suggested Readings:

1. Griffiths, D.J. and Schroeter, D.F., *Introduction to Quantum Mechanics*, Cambridge University Press, 2018.
2. McMahon, D., *Quantum Computing Explained*, John Wiley & Sons, 2007.
3. Nielsen, M.A. and Chuang, I., *Quantum Computation and Quantum Information*, 2010.
4. Pittenger, A.O., *An Introduction to Quantum Computing Algorithms,* Springer Science & Business Media, 2012.
5. Yanofsky, N.S. and Mannucci, M.A., *Quantum Computing for Computer Scientists,* Cambridge University Press, 2008.

Theory of Computation
Course Code: SBS CS 01 02 08 E 3003

L T P **Total Credits: 3**
3 0 0

Course Objectives:

This course aims to provide a formal connection between algorithmic problem solving and the theory of languages and automata and develop them into a mathematical view towards algorithmic design and in general computation itself.

Course level learning outcome:

Upon successful completion of the course students will be able to:

- Relate practical problems to languages, automata, and computability.
- Apply mathematical and formal techniques for solving problems.
- Distinguish different computing languages and classify their respective types.
- Analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.

UNIT-I

Recursive Languages: Recursive definition, Alphabets, Language, Regular expression, definitions of Finite state machine, Transition graphs, Deterministic & non-deterministic finite state machines, Regular grammar, Left-linear and right linear, Thomson's construction to convert regular Expression to NDFA & subset algorithm to convert NDFA to DFA. Minimization of DFA, Finite state machine with output (Moore machine and Mealy Machine), conversion of Moore machine to Mealy machine & vice-versa.

UNIT-II

Properties of Regular Languages: Conversion of DFA to regular expression, Pumping lemma, Properties and limitations of finite state machine, Decision properties of regular languages, Application of finite automata.
Context Free Grammar: Context free grammar, Writing context free grammar for problems, Derivation tree and ambiguity, Application of context free grammars, Chomsky and Greibach Normal form, Conversion of CFG to CNF and GNF. Properties of context free grammar, CYK algorithm

UNIT-III

PDA: Push down stack machine, Design of deterministic and non-deterministic push-down stack, Parser design.
Turing Machine: Turing machine definition and design of Turing Machine, Church-

Turing Thesis, Variations of Turing Machines, combining Turing machine, Universal Turing Machine, Post Machine, Chomsky Hierarchy.

UNIT-IV

Incommutability: Halting problem, Turing enumerability, Turing acceptability and Turing decidability, Unsolvable problems about Turing machines.
Computation Complexity: P, NP and NP Complete Problems.

Suggested Readings:

1. Hopcroft, J.E., Motwani, R. and Ullman, J.D., *Introduction to Automata Theory, Languages, and Computation*, Pearson Education, 2008.
2. Kulkarni, V., *Theory of Computation*, Oxford University Press, 2013.
3. Linz, P., *An Introduction to Formal Languages and Automata*, Jones & Bartlett Learning, 2016.
4. Martin, J.C., *Introduction to Languages and the Theory of Computation,* McGraw-Hill, 2001
5. Sipser, M., *Introduction to the Theory of Computation,* Cengage Learning, 2014.

Compiler Design
Course Code: SBS CS 01 03 18 C 4004

L T P **Total Credits: 4**
4 0 0

Course Objectives:

The aim of this course is to provide students with the knowledge and abilities to design and implement compilers. It describes the steps of compilation starting with the scanner, and then, followed by the parser design and implementation. The course also provides information on semantic analysis and, local and global compiler optimization algorithms.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Apply the knowledge of lexical tool to develop a scanner & parser
- Separate the lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation
- Design and develop software system for backend of the compiler
- Comprehend and adapt to new tools and technologies in compiler design

UNIT-I

Compiler structure: Analysis-Synthesis model of compilation, Various phases of a compiler, Tool based approach to Compiler Construction.

Lexical analysis: Interface with input, Parser and Symbol table, Token, Lexeme and Patterns. Difficulties in Lexical Analysis. Error reporting. Implementation. Regular definition, Transition diagrams, LEX.

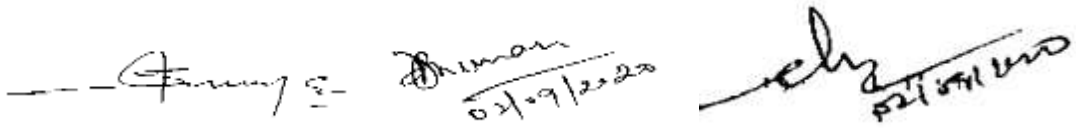
UNIT-II

Syntax analysis: CFGs, Ambiguity, Associativity, Precedence, Top Down Parsing, Recursive Descent Parsing, Transformation on the grammars, Predictive Parsing, Bottom Up Parsing, Operator Precedence grammars, LR parsers (SLR, LALR, LR), YACC.

Syntax directed definitions: Inherited and Synthesized Attributes, Dependency Graph, Bottom Up and Top Down Evaluation of Attributes, L- and S-Attributed Definitions.

UNIT-III

Type checking: Type System, Type Expressions, Structural and Name Equivalence of types, Type Conversion, Overloaded Functions and Operators.



Run time system: Storage Organization, Activation Tree, Activation Record, Parameter Passing, Symbol Table, Dynamic Storage Allocation.

UNIT-IV

Intermediate code generation: Intermediate Representations, Translation of Declarations, Assignments, Control Flow, Boolean Expressions and Procedure Calls.

Code generation and instruction selection: Issues, Basic Blocks and Flow Graphs, Register Allocation, Code Generation, DAG representation of programs, Code Generation from DAGS, Peep-Hole Optimization, Code Generators, Specifications of machine.

Suggested Readings:

1. Aho, A.V., Sethi, R. and Ullman, J.D., *Compilers: Principles, Techniques and Tools*, Pearson, 2008.
2. Appel, A.W., *Modern Compiler Implementation in C*, Cambridge University Press, 2004.
3. Dhamdhere, D.M., *Compiler Construction – Principles & Practice*, Macmillan India, 2008.
4. Fischer, C.N. and LeBlanc Jr, R.J., *Crafting a Compiler*, Pearson, 2011.
5. Holub, A.I., *Compiler Design in C*, PHI, 1992.

Artificial Intelligence and Expert System
Course Code: SBS CS 01 03 19 C 4004

L T P **Total Credits: 4**
4 0 0

Course Objectives:

The primary objective of this course is to introduce the basic principles, techniques, and applications of Artificial Intelligence. Emphasis will be placed on the teaching of these fundamentals and labs for the 'hands-on' approach for understanding, as well as a challenging avenue for exploration and creativity.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Choose problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- Examine a given problem in the language/framework of different AI methods
- Describe basic AI algorithms (e.g., standard search algorithms or resolution).
- Conclude and carry out an empirical evaluation of different algorithms on a problem formalization.

UNIT-I

Basic Concepts: AI and its importance, history of AI, applications areas, AI approach for solving problems. Problem representation: State space representation, problem reduction representation, bounding functions. Propositional logic: syntax and semantics. First order predicate logic (FOPL): syntax and semantics, conversion to clausal form, inference rules, unification, resolution principle, proof procedure, refutation.

UNIT-II

Search and Control Strategies: Strategies for state space search, data driven and goal driven search; Search algorithms- uninformed search (depth first, breadth first, depth first with iterative deepening) and informed search (Hill climbing, best first, A, A*, AO algorithm, mini-max etc.), computational complexity, Properties of search algorithms- Admissibility, Monotonicity, Optimality, Dominance, etc. , genetic algorithms.

UNIT-III

Expert System Architecture: Rule based architecture, Non-production system architecture. Components of Expert Systems, Stages of expert system development, Expert systems applications, Building Expert System and Shell. Knowledge acquisition and validation.

UNIT-IV

Managing uncertainty in expert systems: Bayesian probability theory, Stanford certainty factor algebra, No monotonic logic and reasoning with beliefs, Fuzzy logic, Dempster/Shaffer theory.

Suggested Readings:

1. Luger, G.F. and Stubblefield, W.A., *Artificial Intelligence and The Design of Expert Systems*, Benjamin-Cummings Publishing Co. Inc., 2008.
2. Nilsson, N.J., *Principles of Artificial Intelligence*, Morgan Kaufmann, 2014.
3. Patterson, D.W., *Introduction to Artificial Intelligence and Expert Systems*, Prentice-hall of India, 2007.
4. Rich, E.K. and Nair, S.B., *Artificial Intelligence*, New Delhi, 2009.
5. Russell, S., and Norvig, P., *Artificial Intelligence: A Modern Approach*, Prentice Hall, 2015.

Information and Network Security
Course Code: SBS CS 01 03 20 C 4004

L T P **Total Credits: 4**

4 0 0

Course Objectives:

The purpose of this course is to provide understanding of the main issues related to security in modern networked computer systems. This covers underlying concepts and foundations of computer security, basic knowledge about security-relevant decisions in designing IT infrastructures, techniques to secure complex systems and practical skills in managing a range of systems, from personal laptops to large-scale infrastructures.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Explore the concept of network security
- Introduce the concept of security in this information world.
- Identify malicious software and network threats.
- Apply different aspects of information security and its applications.

UNIT-I

Information Security Concepts- Introduction to Information Security, Meaning of security, attacks, Introduction to Information and Network Security, Integrity, and Availability, NIST FIPS 199 Standard, Assets and Threat Models, Examples

Least privilege, access control, operating system security- The principle of least privilege, Access control concepts, Operating system mechanisms, Unix, Windows, and Android examples.

UNIT-II

Cryptography: Algorithms for block and stream ciphers, private key encryption – DES, AES, RC4; Algorithms for public key encryption – RSA, DH Keyexchange, KERBEROS, elliptic curve cryptosystems.

UNIT-III

Network Security- Network concepts, Threats in Networks, Threats in Transit, TCP/IP security issues, Impersonation, DNS security issues and defenses, Network security tools, Secure protocols, Firewalls, VPNs, Tor, I2P, Intrusion Detection and filters, Host-Based IDS vs Network-Based IDS, Dealing with unwanted traffic: Denial of service attacks.

UNIT-IV

Malicious Software and Software Security- Malicious Web, Internet Security Issues, Types of Internet Security Issues, Viruses, Trojans, rootkits, worms, botnets, Spyware, Key-Loggers, Ransomware, Honeypot, Security policies, penetration testing, Sandboxing, buffer overflow vulnerability and attack, control hijacking attacks, mobile security, Repackaging attacks, Attacks on mobile apps, Whole-disk encryption.

Suggested Readings:

1. Goodrich, M.T. and Tamassia, R., *Introduction to Computer Security*, Pearson Publication, 2011.
2. Gupta, B., Agrawal, D.P. and Yamaguchi, S., *Handbook of Research on Modern Cryptographic Solutions for Computer and Cyber Security,* IGI Global, 2016.
3. Menezes, A.J., Katz, J., Oorschot, P.C.V. and Vanstone, S.A., *Handbook of Applied Cryptography*, CRC Press, 2018.
4. Perlman, R., Kaufman, C. and Speciner, M., *Network Security: Private Communication in a Public World*, Pearson Education, 2016.
5. Stallings, W., *Network Security Essentials: Applications and Standards*, Pearson Education India, 4th Edition, 2011.

Internet and Java Programming
Course Code: SBS CS 01 03 21 C 4004

L T P **Total Credits: 4**
4 0 0

Course Objectives:

The objective of this course is to teach students about programming in the Java language and the use of Java in a variety of technologies and on different platforms.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Describe the fundamental blocks of the Internet and TCP/IP.
- Identify classes, objects, members of a class and relationships among them needed for a specific problem
- Write Java application programs using OOP principles and proper program structuring
- Demonstrate the concepts of polymorphism, inheritance and error handling techniques using exception handling

UNIT-I

Internetworking with TCP / IP: Review of network technologies, Internet addressing, Address resolution protocols (ARP / RARP), Routing IP datagrams, Reliable stream transport service (TCP) TCP / IP over ATM networks, Internet applications - E-mail, Telnet, FTP, NFS, Internet traffic management.

UNIT-II

The overview of Java's architecture and the architecture of the Java Virtual Machine (JVM).
Methods: Method Declarations, this reference, Method Overloading, Constructors, The Default Constructor and Constructors overloading. Arrays, Anonymous Arrays, Multidimensional Arrays, The main() Method, Program Arguments.
Classes: Declaring Members (Fields and Methods), Instance Members, Static Members.
Objects: Class Instantiation, Reference Values, and References. Primitive Data Types, Variable Declarations, Initial Values for Variables, Class Declarations.

UNIT-III

Object-Oriented Programming: Single Implementation Inheritance, Overriding Methods, Hiding Members, The Object Reference super, Chaining Constructors Using this() and super().

Interfaces: Defining Interfaces, Abstract Method Declarations, Implementing Interfaces, Extending Interfaces, Interface References, Constants in Interfaces, Polymorphism and Dynamic Method Lookup.

UNIT-IV

Exception Handling: The try Block, the catch Block, the finally Block, the throw Statement, the throws Clause, Checked and Unchecked Exceptions, Defining New Exceptions.

Multithreading: Overview of Threads, the Main Thread, Thread Creation, Synchronization, Thread Transitions. Basics of Event Handling, Graphics Programming using AWT and Swing.

Suggested Readings:

1. Comer, D.E., Stevens, D.L. and Evangelista, M., *Internetworking with TCP/IP, Vol. III: Client-Server Programming and Applications*, Prentice Hall, 2001.
2. Deitel, P. and Deitel, H., *Java How to Program*, Pearson Education, 2015.
3. Eckel, B., *Thinking in Java*, Pearson Education, 2006.
4. Freeman, A. and Ince, D., *Programming the Internet with Java*, Addison-Wesley Longman Publishing Co. Inc., 1998.
5. Horstmann, C.S. and Cornell, G., *Core Java Volume I (Fundamentals)*, Pearson, 2019.

Network Programming
Course Code: SBS CS 01 03 09 E 3003

L T P **Total Credits: 3**
3 0 0

Course Objectives:

The objective of this course is to teach how to write network programs using an application program interface (or API), implement basics of socket programming using TCP Sockets. This course will guide the students to create client and server applications using the "Sockets" API and the implementation of Data link layer protocol and TCP layer.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Understand the key protocols that support the Internet.
- Have a detailed knowledge of the TCP/UDP Sockets.
- Learn advanced programming techniques such as Broadcasting, Multicasting.
- Analyse the security requirements of a networked programming environment and identify the issues to be solved.

UNIT-I

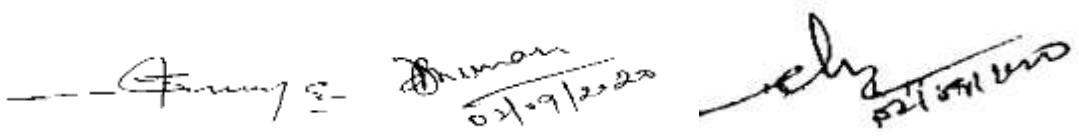
Introduction to Network Programming: OSI model, Unix standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application.

Sockets: Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

UNIT-II

TCP client server: Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.

I/O Multiplexing and socket options: I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server, getsockopt and setsockopt functions. Socket states, Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options.



UNIT-III

Elementary UDP sockets: Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP.

Elementary name and Address conversions: DNS, gethost by Name function, Resolver option, Function and IPV6 support, uname function, other networking information.

UNIT-IV

IPC: Introduction, File and record locking, Pipes, FIFOs streams and messages, Name spaces, system IPC, Message queues, Semaphores.
Remote Login: Terminal line disciplines, Pseudo-Terminals, Terminal modes, Control Terminals, rlogin Overview, RPC Transparency Issues.

Suggested Readings:

1. Chan, T., *Unix System Programming using C++*, Prentice Hall, 1999 .
2. Glass, G. and Ables, K., *UNIX for Programmers and Users*, Prentice Hall, 2003.
3. Richard, S.W., *Unix Network Programming. In The Sockets Networking API (Vol. 1)*, Pearson Education India, 2015.
4. Rochkind, M.J., *Advanced UNIX Programming*, Pearson Education, 2004.
5. Stevens, W.R., Rudoff, A.M. and Fenner, B., *UNIX Network Programming Volume 1: The Sockets Networking API (Vol. 3)*, Addison-Wesley Professional, 2003.

Machine and Deep Learning
Course Code: SBS CS 01 03 10 E 3003

L T P **Total Credits: 3**
3 0 0

Course Objectives:

This course will serve as a comprehensive introduction to various topics in machine learning. At the end of the course, the students should be able to design and implement machine learning solutions to classification, regression, and clustering problems; and be able to evaluate and interpret the results of the algorithms.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Apply supervised and unsupervised learning algorithms.
- Describe the fundamental concepts in machine learning and popular machine learning algorithms.
- Solve problems related to the application of machine learning algorithms with programming in Python/ MatLab.
- Describe the concept of Deep Learning

UNIT-I

Introduction: History of Machine Learning, Programs vs learning algorithms, Machine Learning definition, types of learning, hypothesis space and inductive bias, evaluation, cross-validation, Instance based learning, Feature reduction, Collaborative filtering-based recommendation, Gradient Descent learning.

UNIT-II

Supervised Learning: General notions - Bayes optimality, curse of dimensionality, overfitting and model, selection, bias vs. variance tradeoff, generative vs. discriminative for parameter estimation, feature selection, and etc Linear methods - linear, logistic regression and generalized linear models, naive Bayes, linear discriminant analysis, support vector machines

Nonlinear methods - kernel methods, nearest neighbor, decision trees, neural networks, and etc Ensemble learning - bagging, boosting, and etc.

UNIT-III

Unsupervised Learning: Clustering and density estimations - K-means/vector quantization, mixture models, Dimensionality reduction - linear and nonlinear methods, Principal components analysis.

Deductive Learning: Probability theory and Bayes rule. Naive Bayes learning algorithm. Parameter smoothing. Generative vs. discriminative training. Logistic regression. Bayes nets and Markov nets for representing dependencies.

UNIT-IV

Deep Learning: Artificial Neural Networks, Perceptron, Multilayer networks and Backpropagation algorithm, Introduction to Deep Neural networks, Recurrent Neural Networks (RNNs) and Convolutional Neural Networks (CNNs).

Suggested Readings:

1. Alpaydin, E., *Introduction to Machine Learning*, MIT Press, 2004.
2. Bishop, C.M., *Pattern Recognition and Machine Learning,* Springer, 2006.
3. Hastie, T., Tibshirani, R. and Friedman, J., *The Elements of Statistical Learning*, Springer, 2008.
4. Mitchell, T.M., *Machine Learning,* McGraw- Hill, 1997.
5. Russell, S. and Norvig, P., *Artificial Intelligence: A Modern Approach,* Prentice Hall, 2002.

Software Project Management
Course Code: SBS CS 01 03 11 E 3003

L T P **Total Credits: 3**
3 0 0

Course Objectives:

This course is aimed at introducing the important concepts of project management related to managing software development. Students will also get familiar with the different activities involved in Software Project Management. Further, they will also come to know how to successfully plan and implement a software project management activity, and to complete a specific project in time with the available budget.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Identify the need for Software Project Management.
- Identify different techniques for software cost estimation
- Understand activity planning and risk management
- Manage and control projects.

UNIT-I

Project Evaluation and Project Planning: Importance of Software Project Management, Activities Methodologies, Categorization of Software Projects, Setting objectives, Management Principles, Management Control, Project portfolio Management, Cost-benefit evaluation technology, Risk evaluation, Strategic program Management, Stepwise Project Planning.

UNIT-II

Project Life Cycle and Effort Estimation: Software process and Process Models, Choice of Process models, Mental delivery, Rapid Application development, Agile methods, Extreme Programming, SCRUM, Managing interactive processes, Basics of Software estimation, Effort and Cost estimation techniques, COSMIC Full function points, COCOMO II- A Parametric Productivity Model, Staffing Pattern.

UNIT-III

Activity Planning and Risk Management: Objectives of Activity planning, Project schedules, Activities, Sequencing and scheduling, Network Planning models, Forward Pass & Backward Pass techniques, Critical path (CRM) method, Risk identification, Assessment, Monitoring,

PERT technique, Monte Carlo simulation, Resource Allocation, Creation of critical patterns, Cost schedules.

UNIT-IV

Project Management and Control: Framework for Management and control, Collection of data Project termination, Visualizing progress, Cost monitoring, Earned Value Analysis, Project tracking, Change control, Software Configuration Management, Managing contracts, Contract Management.

Suggested Readings:

1. Futrell, R.T., Shafer, L.I. and Shafer, D.F., *Quality Software Project Management*, Prentice Hall, 2001.
2. Meredith, J.R., Shafer, S.M. and Mantel S.J., *Project Management: A Strategic Managerial Approach*, John Wiley & Sons, 2017.
3. Royce, W., *Software Project Management*, Pearson Education India, 1998.
4. Stellman, A. and Greene, J., *Applied Software Project Management*, O'Reilly Media, Inc., 2005.
5. Wysocki, R.K., *Effective Software Project Management*, John Wiley & Sons, 2010.

Digital Image Processing
Course Code: SBS CS 01 03 12 E 3003

L T P **Total Credits: 3**
3 0 0

Course Objectives:

In this course, students will understand the image fundamentals and mathematical transforms necessary for image processing. Study about the image enhancement techniques, image restoration procedures and image compression procedures. Students will learn about the image segmentation and representation techniques & pattern recognition and interpretation.

Course Level Learning Outcomes

On completion of the module the student will be able to:

- Explain and analyze the steps of image formation, sampling, quantization and representation digitally.
- Outline and examine how images are processed by discrete, linear, time-invariant systems.
- Summarize how images are perceived by humans and how colour is represented.
- Point out how image information can be modeled analytically and compare transform-domain representation of images (Fourier, DCT, Haar, WHT).

UNIT-I

Digital Image Fundamentals: Digital Image Processing, Origins of Digital Image Processing Application of Digital Image Processing, Steps in Digital Image Processing, Components of an Image Processing System, Image formation, Image transforms – Fourier transforms

UNIT-II

Image Enhancement Techniques: Histogram modification techniques - Image smoothening Image Sharpening - Image Restoration - Degradation Model – Noise models - Spatial filtering – Frequency domain filtering.

UNIT-III

Image Compression & Segmentation: Compression Models - Elements of information theory Error free Compression -Image segmentation –Detection of discontinuities , Region based segmentation - Morphology.

UNIT-IV

Representation and Description: Representation schemes- Boundary descriptors- Regional descriptors - Relational Descriptors.

Suggested Readings:

1. Christopher, R.M., *An Introduction to MATLAB for Behavioral Researchers.*, SAGE Publications, Inc., 2013
2. Forsyth, D., and Ponce, J., *Computer Vision: A Modern Approach.*, Pearson Education India., 2015.
3. Gonzalez, C., Rafael., E., and Woods, R., *Digital Image Processing*., Pearson Publication., 2007.
4. Gonzalez, R., Woods, R., and Eddins, S., *Digital Image Processing Using MATLAB*., McGraw Hill Education., 2017.
5. Jayaraman, S., Veerakumar, T., and Esakkirajan, S., *Digital Image Processing*., McGraw Hill Education., 2017.

Data Warehousing and Data Mining
Course Code: SBS CS 01 03 13 E 3003

L T P **Total Credits: 3**
3 0 0

Course Objectives:

The main objective of this course is to impart the knowledge on how to implement classical models and algorithms in data warehousing and data mining and to characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering. Data quality and methods and techniques for preprocessing of data.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Comprehend the various architectures and its application with data mining
- Design and develop data mining algorithms to analyze raw real world data
- Monitor and analyze to predict online digital activities
- Evaluate various mining techniques on complex data objects

UNIT-I

Basic Concepts, Data Warehousing Components, Building a Data Warehouse, Database Architectures for Parallel Processing, Parallel DBMS Vendors, Multidimensional Data Model, Data Warehouse Schemas for Decision Support, Concept Hierarchies, Characteristics of OLAP Systems, Typical OLAP Operations, OLAP and OLTP.

UNIT-II

Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, Applications, Data Objects and attribute types, Statistical description of data, Data Preprocessing, Cleaning, Integration, Reduction, Transformation and Discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT-III

Mining Frequent Patterns, Associations and Correlations, Mining Methods, Pattern Evaluation Method, Pattern Mining in Multilevel, Multi-Dimensional Space, Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

UNIT-IV

Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification by Back Propagation, Support Vector Machines, Lazy Learners, Model Evaluation and Selection, Techniques to improve Classification Accuracy, Clustering Techniques, Cluster analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods.

Suggested Readings:

1. Berson, A. and Smith, S.J., *Data Warehousing, Data Mining & OLAP*, Tata McGraw Hill, 2017.
2. Han, J., Pei, J. and Kamber, M., *Data Mining Concepts and Techniques*, Elsevier, 2011.
3. Pujari, A.K., *Data Mining Techniques*, Universities Press, 2010.
4. Soman, K.P., Diwakar, S. and Ajay, V., *Insight into Data Mining Theory and Practice,* PHI, 2009.
5. Witten, I.H. and Frank, E., *Data Mining: Practical Machine Learning Tools and Techniques*, Elsevier, 2016.

Data Science with R Programming
Course Code: SBS CS 01 04 26 C 4004

L T P **Total Credits: 4**
4 0 0

Course Objectives:

In this course, students will have knowledge on accessing, storing and manipulating the huge data from different resources. Students will understand the working environment of Pig and Hive for processing the structured and unstructured data. & differentiate the RDBMS and Hive architectures, and implement queries to process the data.

Course Level Learning Outcomes:

Upon completion of the module the student will be able to:

- Learn the main R data structures – vector and data frame and import external data into R for data processing and statistical analysis.
- Import, review, manipulate and summarize data-sets in R.
- Explore data-sets to create testable hypotheses and identify appropriate statistical tests.
- Apply R programming from a statistical perspective.

UNIT-I

Introduction of Data Science: Introduction to data science, Data collection, integration, management, modeling, analysis, visualization, prediction and informed decision making, Big data definition, structured and unstructured data. Exploratory data analysis Components of Hadoop Eco System- Data Access and storage, Data Intelligence, Data Integration, Data Serialization, Monitoring, Indexing

UNIT-II

R Programming: Basic commands, graphics, indexing data, loading data, Data types in R: Numeric/character/logical; real/integer/complex, creation of new variables, vectors, matrices, data frames, and lists, accessing elements of a vector or matrix.

UNIT-III

Operations with R: import and export of files, for loop, repeat loop, while loop, if command, if else command. Graphics in R: the plot command, histogram, bar-plot, box-plot, points, lines, segments, arrows, inserting mathematical symbols in a plot, pie diagram matrix operations such as addition, subtraction, multiplication, rank, eigenvalues, matrix inverse, generalized inverse, solution of linear equations.

UNIT-IV

Statistics Techniques and R: measures of central tendency and dispersion. Covariance, correlation, regression, some discrete and continuous probability z and t tests, F test for equality of variances, Chi-square tests.

Suggested Readings:

1. Braun, W.J. and Murdoch, D.J., *A First Course in Statistical Programming with R.*, Cambridge University Press., 2008.
2. Hadley, W., *Advanced R.*, Chapman and Hall/CRC Press, 2019.
3. Jones, O., Maillardet, R. and Robinson, A., *Introduction to Scientific Programming and Simulation Using R.*, Chapman and Hall/CRC., 2014.
4. Rhys, H.I., *Machine Learning with R, The Tidyverse, and MLR.*, Manning Publications., 2020.
5. Zumel, N., Mount, J. and Porzak, J., *Practical Data Science with R.*, Manning Publications., 2019.

Wireless Sensor Network and Internet of Things
Course Code: SBS CS 01 04 27 C 4004

L T P **Total Credits: 4**
4 0 0

Course Objectives:

The objective of this course is to impart comprehensive knowledge of the wireless networks needed for design and implementation of a typical IoT system. The course also aims at developing necessary skills required for efficient network infrastructure of an IoT. This course focuses on the latest microcontrollers with application development, product design and prototyping. This also focuses on interoperability in IoT along with various IoT Platforms for application development.

Course Level Learning Outcomes:

Upon completion of the module the student will be able to:

- Understand various concepts of ubiquitous sensing
- Apply Wireless Sensor Networks Principles in IoT
- Understand the role of Big Data, Cloud Computing and Data Analytics in a typical IoT system.
- Design a simple IoT system made up of sensors, wireless network connection, data analytics and display/actuators, and write the necessary control software.

UNIT-I

Introduction to Wireless Sensor Network: Wireless Sensor, Coverage & Placement, Topology Management in Wireless Sensor Network, Mobile WSNs, Medium Access Control in Wireless Networks, Routing in WSNs, Enabling Technologies for WSNs

UNIT-II

Architecture of Wireless Sensor Network: Sensor Network Scenarios, Optimization Goals, Figures of Merit, Design Principles for WSNs, Service Interfaces of WSNs Gateway Concepts Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments

UNIT-III

Internet of Things(IOT): Sensing, Actuation, Basics of Networking, Communication Protocols Sensor Networks, Machine to Machine Communications. Understanding of the IoT ecosystem, various layers in building an IoT application and interdependencies.

UNIT-IV

Applications of IOT & Arduino : IoT Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino, IoT platforms like PTC Thingworx and IoT

frameworks like MS Azure, usage of these platforms to build applications like Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Case Study: Agriculture, Healthcare

Suggested Readings:

1. Hersent, O., Boswarthick, D. and Elloumi, O., *Internet Of Things: Key Applications and Protocols.*, Wiley Publication., 2015.
2. Holler, J., Tsiatsis, V., Mulligan, C., Avesand, S., Karnouskos, S. and Boyle, D., *From Machine to Machine to the Internet of Things: Introduction to a New Age of Intelligence*., Academic Press., 2014.
3. Raj, P. and Raman, A.C., *The Internet of Things: Enabling Technologies, Platforms, and Use Cases.*, Auerbach Publications., 2017.
4. Yasuura, H., Kyung, C.M., Liu, Y. and Lin, Y.L., *Smart Sensors at the IoT Frontier.*, Springer Publication., 2018.
5. Zheng, J. and Jamalipour, A., *Wireless Sensor Networks: A Networking Perspective.*, Wiley Publication., 2014.

Distributed and Cloud Computing

Course Code: SBS CS 01 04 14 E 3104

L T P **Total Credits: 4**
3 1 0

Course Objectives:

Cloud computing is a key distributed systems paradigm that has grown popular in the last few years. Cloud technologies are pervasive, touching our daily lives any time we access the world wide web, use a mobile app, or make a retail purchase. The objective of this course is to teach the fundamental concepts of how and why Cloud systems works, as well as Cloud technologies that manifest these concepts such as Amazon AWS, Microsoft Azure and OpenStack etc.. Students will learn distributed systems concepts like virtualization, data parallelism.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Describe system models for distributed and cloud computing.
- Describe and distinguish different virtualization techniques.
- Explain cloud-enabling technologies, cloud mechanisms, and cloud architectures.
- Demonstrate the usage cloud application like AWS.

UNIT-I

Introduction to Distributed System: Models and Enabling Technologies, Computer Clusters for Scalable Parallel Computing, Virtual Machines and Virtualization of Clusters and Data centers.

UNIT-II

Introduction to Cloud Computing: Cloud Computing in a Nutshell System Model for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles, of Cloud Computing, Challenges and Risks, Service Models

UNIT-III

Virtual Machines and Virtualization of Cluster and Data Centres: Levels of Virtualization, Virtualization structures/Tools and Mechanism, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resources Management, Virtualization Data-Centre Automation

Service Oriented Architecture for Distributed Computing: Services & SOA, Message Oriented Middleware, Workflow in SOA.

UNIT-IV

Cloud Security, Data Security in the Cloud: An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud CryptDb: Onion Encryption layers- DET, RND, OPE, JOIN, SEARCH, HOM, and Homomorphism Encryption, FPE.

Suggested Readings:

1. Coulouris, G.F., Dollimore, J. and Kindberg, T., *Distributed Systems: Concepts and Design*, Pearson education, 2005.
2. Erl, T., Puttini, R. and Mahmood, Z., *Cloud Computing: Concepts, Technology, & Architecture*, Pearson Education, 2013.
3. Hwang, K., Dongarra, J. and Fox, G.C., *Distributed and Cloud Computing: From Parallel Processing to The Internet of Things*, Morgan Kaufmann, 2013.
4. Tanenbaum, A.S. and Van Steen, M., *Distributed systems: principles and paradigms*, Prentice-Hall, 2007.
5. Velte, T., Velte, A. and Elsenpeter, R., *Cloud Computing, A Practical Approach*, McGraw-Hill, Inc., 2009.

Bioinformatics
Course Code: SBS CS 01 04 15 E 3104

L T P **Total Credits: 4**
3 1 0

Course Objectives:

The unprecedented increase in the amount of available biological data ranging from protein sequences to biomedical images have rendered the use of computers and computational techniques for analysing and managing the biological data inevitable. This course aims to provide students with the basics of bioinformatics algorithms that have been applied over various types of biological data.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Describe about the different types of Biological databases.
- Describe about pairwise sequence alignment , algorithms and tools for pairwise alignment
- Describe about protein folding and its significance
- Apply algorithms and analysis methods to the real-world problems.

UNIT-I

Introduction to Bioinformatics: What is a Database, Types of Databases, Biological Databases, Pitfalls of Biological Databases, Information Retrieval from Biological Databases.

UNIT-II

Sequences: Problem statement, Edit distance and substitution matrices, HMMs and pairwise HMMs, Global and local alignments, Spliced alignment, Space-efficient sequence alignment, Multiple alignment, Database searching tools, Sequence by hybridization, Profile HMMs.

UNIT-III

Structures: Protein structure alignment, Protein Structure Prediction: Methods for predicting the secondary and tertiary structure of proteins. Techniques: neural networks, SVMs, genetic algorithms and stochastic global optimization.

UNIT-IV

Transcriptomics: Methods for analysing gene expression and microarray data. Techniques: clustering, SVMs. Agent-based Genome Analysis: Automation of genome analysis using intelligent software agents. Drug Discovery Informatics: Approaches to drug discovery using bioinformatics techniques.

Suggested Readings:

1. Compeau, P. and Pevzner, P.A., *Bioinformatics Algorithms: An Active Learning Approach*, Active Learning Publishers, 2018.
2. Jones, N.C., Pevzner, P.A. and Pevzner, P., *An Introduction to Bioinformatics Algorithms*, MIT press, 2004.
3. Krawetz, S.A. and Womble, D.D., *Introduction to Bioinformatics: A Theoretical and Practical Approach*, Springer Science & Business Media, 2003.
4. Lesk, A., *Introduction to bioinformatics*, Oxford University Press, 2019.
5. Mandoiu, I. and Zelikovsky, A., *Bioinformatics Algorithms: Techniques and Applications*, John Wiley & Sons, 2008.

Natural Language Processing and Speech Recognition

Course Code: SBS CS 01 04 16 E 3104

L T P **Total Credits: 4**

3 1 0

Course Objectives:

The objective of this course is to give students a clear understanding of linguistics methods, various tools and aspects of NLP like syntax and semantic analysis, parsing, machine translation, information retrieval and statistical discourse processing.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Describe the challenges involved in developing NLP solutions.
- Describe various recent statistical methods in natural language processing.
- Develop the linguistics and their application to part-of-speech tagging.
- Develop background to various tools and aspects of NLP like syntax and semantic analysis, parsing, machine translation, information retrieval and statistical discourse processing

UNIT-I

Introduction: NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation. The problem of ambiguity. The role of machine learning. Brief history of the field.

UNIT-II

N-gram Language Models: The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models.

Part of Speech Tagging and Sequence Labeling: Lexical syntax. Hidden Markov Models (Forward and Viterbi algorithms and EM training)

UNIT-III

Syntactic parsing: Grammar formalisms and treebanks. Efficient parsing for context-free grammars (CFGs). Statistical parsing and probabilistic CFGs (PCFGs). Lexicalized PCFGs. Neural shift-reduce dependency parsing

Semantic Analysis: Lexical semantics and word-sense disambiguation. Compositional semantics. Semantic Role Labeling and Semantic Parsing.

UNIT-IV

Mechanics of Speech: Speech Production Mechanism, Nature of Speech Signal, Discrete Time Modeling of Speech Production, Representation of Speech Signals, Classification of Speech Sounds, Phones, Phonemes, Phonetics, IPA and Phonetic Alphabets, Articulatory Features, Auditory Perceptions, Anatomical Pathways from Ear to the Perception of Sound Peripheral Auditory System.

Suggested Readings:

1. Jurafsky, D. and Martin, J.H., *Speech and Language Processing*, Pearson, 2020.
2. Lane, H., Howard, C. and Hapke, H., *Natural Language Processing in Action*, Manning Publications, 2019.
3. Manning, C. and Schutze, H., *Foundations of Statistical Natural Language Processing*, MIT Press, 1999.
4. Rabiner, L.R. and Juang, B.H., *Fundamentals of Speech Recognition*, Pearson, 2009
5. Thanaki, J., *Python Natural Language Processing*, Packt, 2017.

Computer Vision
Course Code: SBS CS 01 04 17 E 3104

L T P **Total Credits: 4**
3 1 0

Course Objectives:

The objectives of this course are to develop the understanding of the basic principles and techniques of image processing and image understanding, and to develop your skills in the design and implementation of computer vision software. This course will explore some of the basic principles and techniques from these areas which are currently being used in real-world computer vision systems and the research and development of new systems.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Describe image representation and basics of computer vision.
- Implement fundamental image processing for vision application.
- Implement the pattern recognition methods.
- Develop various applications using computer vision.

UNIT-I

Digital image representation, image acquisition, storage and processing. fundamental steps in image processing, Introduction to Image Processing, Computer Vision and Computer Graphics, Monocular imaging system, basics of Image Formation, Radiance, Irradiance, BRDF, color etc. Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading and Photometric Stereo.

UNIT-II

Introduction, definition, Active vision system, Machine vision components, hardware's and algorithms, segmentation, data reduction, feature extraction, edge detection, image recognition and decisions, identification, Triangulation geometry, resolution passive and active stereo imaging, optical scanners, interfacing machine vision system, vision system calibration.

UNIT-III

Structure of the human eye, image formation, brightness adaptation and discrimination, a simple image model, uniform and non-uniform sampling and quantization, distance measures, Fourier and wavelet descriptors, Multiresolution analysis, Hough transforms and other simple object recognition methods, PCA, HMM and GMM.

UNIT-IV

Face detection and Face recognition, Eigen faces, Active appearance and 3D shape models of faces. Surveillance – foreground-background separation, particle filters, Chamfer matching, tracking, and occlusion, combining views from multiple cameras, human gait analysis.

Suggested Readings:

1. Davies, E. R., *Computer & Machine Vision,* 4th Edition, Academic Press, 2012.
2. Forsyth, D.A. and Ponce, J., *Computer Vision: A Modern Approach*. Prentice Hall Professional Technical Reference, 2002.
3. Mark, N.A.S., *Feature Extraction & Image Processing for Computer Vision*, 3rd Edition, Academic Press, 2012.
4. Prince, S.J., *Computer Vision: Models, Learning, and Inference*, Cambridge University Press, 2012.
5. Szeliski, R., *Computer Vision: Algorithms and Applications (CVAA)*. Springer Science and Business Media, 2010.

Embedded Programming

Course Code: SBS CS 01 04 18 E 3104

L T P **Total Credits: 4**
3 1 0

Course Objectives:

In this course, Student will understand the architecture of embedded processors, microcontrollers, and peripheral devices and appreciate the nuances of programming micro-controllers in assembly for embedded systems. The challenges in developing operating systems for embedded systems. Students will learn about programming these systems in high-level languages such as C.

Course Level Learning Outcomes:

Upon completion of the module the student will be able to:

- Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.
- Explain the architecture of the ATOM processor and its programming aspects (assembly Level)
- Describe the interrupts, hyper threading and software optimization.
- Design real time embedded systems using the concepts of RTOS.

UNIT-I

Introduction of Embedded Systems: Concept of Embedded System Design: Design challenge, Processor technology, IC technology, Embedded Design technology.

UNIT-II

Single and General Purpose Processor : introduction, basic architecture, operation, super-scalar and VLSIIW architecture, application specific instruction set processors (ASIPS), microcontrollers, digital signal processors, selecting a microprocessor.

UNIT-III

Memory and Input / Output Management: Interfacing Analog and digital blocks: Analog-to-Digital Converters (ADCs), Digital to-Analog, Converters (DACs)., Communication basics and basic protocol concepts, Microprocessor interfacing: I/O addressing, Port and Bus based, I/O, Memory mapped I/O, Standard I/O interrupts, Direct memory access , communication principles parallel, serial and wireless.

UNIT-IV

Processes and Operating Systems: Real time operating systems, Kernel architecture: Hardware, Device Embedded operating systems, Task scheduling in embedded systems: task scheduler, first in first out, shortest job first, round robin, priority based scheduling. Types of embedded operating systems.

Suggested Readings:

1. Barrett, S.F. and Pack, D.J., *Embedded Systems: Design and Applications.*, Pearson Education India, 2008.
2. Barry, P. and Crowley, P., *Modern Embedded Computing: Designing Connected, Pervasive, Media-Rich Systems*, Morgan Kaufmann Publication, 2012.
3. Kamal, R., *Embedded Systems: Architecture, Programming and Design.*, 2nd Edition., McGraw Hill Education, 2008.
4. Shibu, K.V., *Introduction to Embedded Systems.*, McGraw Hill Education, 2017.
5. Vahid, F. and Givargis, T., *Embedded System Design: A Unified Hardware / Software Introduction.*, Wiley Publication, 2006.

Web Development using PHP Lab-III
Course Code: SBS CS 01 01 08 C 0021

L T P **Total Credit: 1**
0 0 2

Course Objectives:

The objective of this course is to provide the necessary knowledge to design and develop dynamic, database-driven web applications using PHP version 5. Students will learn how to connect to any ODBC-compliant database, and perform hands on practice with a MySQL database to create database-driven HTML forms and reports etc. Students also learn how to configure PHP and Apache Web Server. Comprehensive lab exercises provide facilitated hands on practice crucial to develop competence web sites.

Course Level Learning Outcomes:

Upon successful completion of the course students will be able to:

- Build a simple, yet functional web application using PHP/MySQL.
- Setup and configure MySQL, PHP, and web server development environment.
- Select, insert, update and delete data using SQL language.
- Use PHP built-in functions and creating custom functions.

Android Application Development Lab-III
Course Code: SBS CS 01 03 24 C 0021

L T P **Total Credit: 1**
0 0 2

Course Objectives:
Android Application Development course is designed so that students are able to write apps for Android devices. The student will learn the basics of Android platform and get to understand the application lifecycle. Covers Android application development phases, terminologies, application design, and coding. Students will be able to write simple GUI applications, use built-in widgets and components, work with the database to store data locally, and much more.

Course Level Learning Outcomes:
Upon successful completion of the course students will be able to:

- Install and configure Android application development tools.
- Design and develop user Interfaces for the Android platform.
- Save state information across important operating system events.
- Apply Java programming concepts to Android application development.

Advance Java Programming Lab-II
Course Code: SBS CS 01 04 29 C 0021

L T P **Total Credit: 1**
0 0 2

Course Objectives:
In this course, student will learn using Graphics, Animations and Multithreading for designing Simulation and Game based applications. Student will get in touch with design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling. Design and develop Web applications. Student will understand about designing Enterprise based applications by encapsulating an application's business logic. Designing applications using pre-built frameworks.

Course Level Learning Outcomes:
Upon successful completion of the course students will be able to:

- Learn to access database through Java programs, using Java Data Base Connectivity (JDBC)
- Create a full set of UI widgets and other components, including windows, menus, buttons, checkboxes, text fields, scrollbars and scrolling lists, using Abstract Windowing Toolkit (AWT) & Swings
- Use Internet Programming using Java Applets
- Map Java classes and object associations to relational database tables with Hibernate mapping files

(General Elective Paper)
Emerging Trends and Technologies in IT
Course code: SBS CS 01 02 19 E 3104

L T P **Total Credits: 4**
3 1 0

Course Objectives:
In this course, students enables to compare and contrast multiple division techniques, mobile communication systems, and existing wireless networks. Provide students with the fundamentals and essentials of Cloud Computing. Student will also get knowledge of protocols used in wireless communications and perform simulations of wireless networking.

Course Level Learning Outcomes:
Upon successful completion of the course students will be able to:

- Describe the possible future of mobile computing technologies and applications.
- Demonstrate basic skills for cellular networks design.
- Identify problems, and explain, analyse, and evaluate various cloud computing solutions.
- Compare different solutions for communications at each network layer

UNIT-I

Mobile Computing and the "Post-PC" Era: Smartphones & Tablets: Why now? MobilePlatforms (e.g. iOS, Android, BB, Windows), Applications Markets.

UNIT-II

Cloud Computing: What does ―X as a Service‖ mean (X=Platform, Infrastructure orSoftware), Service Models, Scalability and Reliability, Development frameworks (e.g. AWS, Azure App Engine) Business Benefits, Cloud Security & Privacy, Regulation, Consumerization of IT.

UNIT-III

Mobile Computing (MC): Introduction to MC, novel applications, limitations, andarchitecture. GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

UNIT-IV

Medium Access Control (Wireless): Motivation for a specialized MAC (Hidden andexposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA. Mobile Network Layer, Mobile Transport LayerAudio and Video Conferencing: Technology & Applications, Application to informationtechnology to various function areas such as education, banking, communication etc.

Suggested Readings:

1. Chowdhury, M., Biswas, A.., *Wireless Communication: Theory and Applications*., Cambridge University Press., 2016.
2. Erl, T., Puttini, R., Mahmood, Z., *Cloud Computing: Concepts, Technology & Architecture*., Pearson Education India., 2014.
3. Jackson, W*., Android Studio New Media Fundamentals: Content Production of Digital Audio/Video, Illustration and 3D Animation*., Apress Publisher., 2016.
4. Talukder, K.A., Ahmed, H., Yavagal, R., *Mobile Computing: Technology, Applications and Service Creation*., 2nd edition., McGraw Hill., 2014.
5. Schiller, J., *Mobile Communications*., 2nd Edition., Pearson., 2014.

हरियाणा केंद्रीय विश्वविद्यालय
महेंद्रगढ़--123031 (हरियाणा), भारत
नैक द्वारा 'ए' ग्रेड प्राप्त विश्वविद्यालय

Central University of Haryana
Mahendergarh-123031(Haryana), India
NAAC ACCREDITED 'A' GRADE UNIVERSITY

Achieving Through Believing

क्रमांक / No.....

दिनांक / Date: 18/02/2021

School of Education

Minutes of Meeting of the Board of Studies

A Meeting of Board of Studies, School of Education held on 18.02.2021 at 11:00 A.M. (through Video Conference). The following members were present during the meeting:

1. **Dr. Parmod Kumar** Dean, School of Education	Chairperson
2. **Prof. R.S. Khan** Former Vice-Chairman, NCTE & Former Dean, Faculty of Education and Head ISC, JMI, New Delhi	Member Expert
3. **Prof. Sarika Sharma** Professor, School of Education	Member
4. **Dr. Dinesh Chahal** Assistant Professor, School of Education	Special Invitee
5. **Dr. Aarti Yadav** Assistant Professor, School of Education	Special Invitee
6. **Dr. Manju** Assistant Professor, School of Education	Special Invitee

The following members could not attend the meeting:

1. Prof. Poonam Batra, Member Expert
2. Dr. Renu Yadav, Assistant Professor, School of Education

At the outset, Dr. Parmod Kumar, Dean of School, School of Education and Chairperson, Board of Studies, School of Education welcomed Prof. R.S. Khan and all the members of the Board and also presented the brief report of School of Education of the academic session 2020-21. Thereafter, the following agenda items (one by one) were taken up and discussed in the meeting for consideration and approval of the Board of Studies of School of Education, Central University of Haryana:

Item No.	Description
	Reporting Items
01	**Confirmation of the Minutes of Meeting of Board of Studies, School of Education held on 17.07.2020.**
	The Board of Studies of School of Education confirmed and approved the Minutes of the Meeting of Board of Studies, School of Education held on 17.07.2020 duly approved by the School Board, School of Education and Academic Council. **(Annexure-I)**
02	**To report, record and confirm the actions taken on the resolutions of the meeting of the Board of Studies, School of Education held on 17.07.2020**
	The action taken on the resolutions of the meeting of the Board of Studies, School of Education held on 17.07.2020 was reported, recorded and confirmed. **(Annexure-I.I)**
03	**Confirmation of the Revised Syllabi of M.Phil. and Ph.D. programme for the session 2020-21 as approved by the Academic Council.**
	The Board of Studies of School of Education confirmed the revised syllabi of M.Phil. and Ph.D. programme for the session 2020-21 as duly approved by Academic Council held on 8.10.2020. **(Annexure-II)**
	Items for Consideration
03	**To consider and approve the Minutes of Departmental Research Committee, School of Education held on 12.02.2021.**
	The Board of Studies of School of Education resolved that the recommendations of Departmental Research Committee, School of Education held on 12.02.2021 be approved. **(Annexure-III)**
04	**To consider the recommendations of the RAC and DRC, School of Education for re-registration of Mr. Dilbag in Ph.D. programme as per the CUH Ordinance 2014.**
	The Board of Studies of School of Education discussed the case of Mr. Dilbag for re-registration in Ph.D. programme and resolved that the recommendations of RAC and DRC of School of Education for re-registration of Mr. Dilbag in Ph.D. programme be approved in the light of CUH Ordinance 2014. **(Annexure-IV)**

05	**To consider and approve the Syllabi of M.Ed. Programme of Semester- II for the Academic Session 2020-2021.**
	The Board of Studies of School of Education discussed the Syllabi and approved the Syllabi of M.Ed. Programme of Semester- II for the Academic Session 2020-2021 with the suggestions that new suggested readings and e-resources should be added in Syllabi. **(Annexure-V)**
06	**To consider and approve the Syllabi of B.Ed. Programme of Semester- II for the Academic Session 2020-2021.**
	The Board of Studies of School of Education discussed and approved the Syllabi of B.Ed. Programme of Semester- II for the Academic Session 2020-2021 with the suggestions that new suggested readings and e-resources should be added in Syllabi. **(Annexure-VI)**
07	**To consider and approve the Panel of Moderators, Paper Setters, and examiners for Theory & Practical examination of 2nd and 4th Semester, M.Ed. programme for the academic session 2020-2021.**
	The Board of Studies of School of Education discussed and approved the Panel of Moderators, Paper Setters, and Examiners for Theory & Practical examination of 2nd and 4th Semester, M.Ed. programme for the academic session 2020-2021. **(Annexure-VII)**
08	**To approve the Panel of Moderators, Paper Setters, and examiners for Theory & Practical examination of 2nd and 4th Semester, B.Ed. programme for the academic session 2020-2021.**
	The Board of Studies of School of Education discussed and approved the Panel of Moderators, Paper Setters, and Examiners for Theory & Practical examination of 2nd and 4th Semester, B.Ed. programme for the academic session 2020-2021. **(Annexure-VIII)**
09	**To consider and approve the Panel of External Experts for DRC, School of Education.**
	The Board of Studies of School of Education discussed and approved the Panel of External Experts for DRC, School of Education. **(Annexure-IX)**
10	**Any other items, with the permission of Chairperson**
	Nil

The meeting ended with a vote of thanks to the chair.

18/2/2021

Dr. Parmod Kumar

Sarika 18/2/21

Prof. R.S. Khan

Prof. Sarika Sharma

18/2/21

Dr. Aarti Yadav

18/2/2021

Dr. Dinesh Chahal

18/2/21

Dr. Manju

Dean school of Education <deansoe@cuh.ac.in>

Minutes of Meeting of BOS, School of Education held on 18.02.2021

Prof. Riaz Khan <riazskhan@gmail.com> Wed, Feb 24, 2021 at 11:36 AM
To: Dean school of Education <deansoe@cuh.ac.in>

Dear Dr. Pramod,

Thanks for forwarding me the minutes of the meeting of BoS, School of Education held on 18-02-2021.

Minutes of the meeting are approved.

(Prof. Riaz Shakir Khan)
[Quoted text hidden]

Prof. R.S. Khan's BOS Hon. Bill, CUH.docx
1224K

क्रमांक / No.....

दिनांक / Date: 09.03.2021

School of Education

Minutes of Meeting

The meeting of the School Board, School of Education held on 09.03.2021 at 11:00 am (through online mode). The following members were present:

1. **Dr. Parmod Kumar**
   Dean, School of Education,
   Central University of Haryana — **Chairman**

2. **Prof. Sohanvir Singh Chaudhary**
   Former Vice-Chairman, NCTE, Govt. of India &
   Ex. Director, School of Education, IGNOU, New Delhi — **Member**

3. **Prof. Shamsher Singh**
   Professor (Retd.), Department of Physical Education,
   Chaudhary Devi Lal University, Sirsa, Haryana — **Member**

4. **Prof. Sangeeta**
   Former Dean, Faculty of Education &
   Head, Department of Education,
   Kurukshetra University, Kurukshetra, Haryana — **Member**

5. **Dr. (Ms.) Jayashree Acharya**
   Professor, Lakshmibai National Institute of Physical Education,
   Gwalior, M.P. — **Member**

6. **Prof. Sarika Sharma**
   Professor, School of Education,
   Former Head, Department of Education,
   Central University of Haryana — **Member**

7. **Prof. Ravinder Pal Ahalawat**
   Head, Department of Physical Education and Sports,
   Central University of Haryana — **Member**

8. **Dr. Jaipraksah Bhukar**
   Associate Professor, Department of Physical Education and Sports,
   Central University of Haryana — **Member**

9/3/21 9/3/21 09/3/21 Sarika 9/3/21 9/3/21 9/3/21 Jayadas 9/3/2021

9. **Dr Renu Yadav** — **Member**
Assistant Professor, School of Education,
Central University of Haryana

10. **Dr. Dinesh Chahal** — **Member**
Assistant Professor, School of Education,
Central University of Haryana

11. **Dr. Sandeep Dhull** — **Member**
Assistant Professor, Department of Physical Education and Sports,
Central University of Haryana

Prof. Jatinder Grover, Member, Department of Education, Panjab University, Chandigarh could not attend the meeting.

At the outset, Dr. Parmod Kumar, Dean, School of Education and Chairman, School Board, School of Education, Central University of Haryana, initiated the meeting with the warm welcome of all the members of the Board and also presented the brief report of the progress made by the School during this pandemic period. The School of Education started two new programmes- M.P.S.E. and Ph.D. in Physical Education and Sports and developed five Resources Centers/Labs- Psychological Lab, Language Lab, Art & Craft, Social Science, and Physical Education Resource Centers during the current academic year. After that the following agenda items (one by one) were taken up and discussed in the meeting for consideration and approval of the School Board:

Item No	Description
1	**Confirmation of the Minutes of School Board, School of Education held on 18.07.2020.**
	School Board, School of Education confirmed and approved the Minutes of Meeting of School Board, School of Education held on 18.07.2020. **(Annexure-I)**
2	**To report, record and confirm the actions taken on the resolutions of the meeting of the School Board, School of Education held on 18.07.2020.**
	Dr. Parmod Kumar, Dean, School of Education presented the Action Taken Report on the resolutions of the Meeting of School Board of Education held of 18.07.2020. All the members of School Board appreciated, endorsed and confirmed the Action Taken Report presented by Dean, School of Education. **(Annexure-II)**

3	**To endorse the Revised Syllabi of M.Phil. and Ph.D. programme in Education for the session 2020-21 as approved by Academic Council held on 8.10.2020.**
	Dr. Parmod Kumar, Dean, School of Education appraised to the members, School Board about the resolution passed by Academic Council to reduce the number of elective courses from 07 to 03 alongwith 03 core courses in Syllabi of M.Phil. and Ph.D. programme in Education for the session 2020-21. The School Board, School of Education endorsed the revised Syllabi of M.Phil. and Ph.D. programmes in Education for the session 2020-21 as approved by Academic Council held on 8.10.2020. **(Annexure-III)**
4	**To endorse the Revised Syllabi of Ph.D. programme in Physical Education and Sports for the session 2020-21 as approved by Academic Council held on 8.10.2020.**
	Dr. Parmod Kumar, Dean, School of Education appraised to the members, School Board about the resolution passed by Academic Council to reduce the number of elective courses from 04 to 03 alongwith 03 core courses. The School Board, School of Education endorsed the revised Syllabi of M.Phil. and Ph.D. programmes in Education for the session 2020-21 as approved by Academic Council held on 8.10.2020. **(Annexure-IV)**
5	**To consider and approve the Minutes of Board of Studies, School of Education held on 18.02.2021.**
	School Board resolved and approved the Minutes of Board of Studies, School of Education held on 18.02.2021. **(Annexure-V)**
5.1	**To consider the recommendations of the Department of Research Committee held on 17.02.2021 and Board of Studies, School of Education held on 18.02.2021 for re-registration of Mr. Dilbag in Ph.D. programme as per the CUH Ordinance 2014.**
	School Board considered and approved the recommendations of the **Department of Research Committee** held on 17.02.2021 and **Board of Studies**, School of Education held on 18.02.2021 for re-registration of Mr. Dilbag in Ph.D. programme as per the CUH Ordinance 2014 w.e.f. 09.03.2021. **(Annexure-VI & V)**
5.2	**To consider the recommendations of the Board of Studies, School of Education held on 18.02.2021 for Syllabi of M.Ed. Programme of Semester- II for the Academic Session 2020-2021.**
	School Board resolved and approved the recommendations of Board of Studies, School of Education held on 18.02.2021, for the Syllabi of M.Ed. Programme of Semester- II for the Academic Session 2020-2021. **(Annexure-VII)**

09/03/21 9/3/21 9/3/21 9/3/21 9/3/2021 9/3/2021

5.3	**To consider the recommendations of the Board of Studies, School of Education held on 18.02.2021 for Syllabi of B.Ed. Programme of Semester- II for the Academic Session 2020-2021.**
	School Board resolved and approved the recommendations of Board of Studies, School of Education held on 18.02.2021, for the Syllabi of B.Ed. Programme of Semester- II for the Academic Session 2020-2021. (Annexure-VIII).
6	**Any other item, with the permission of Chairperson**
	Nil

The Meeting was ended with vote of thanks to the Chair.

Copy of the mail is attached for approval of the external experts) as they attended the meeting Online.

(Prof. Sohanvir Singh Chaudhary) **(Prof. Shamsher Singh)** **(Prof. Sangeeta)**

Sarika 9/3/21

(Prof. Jayashree Acharya) **(Prof. Sarika Sharma)** 09/03/21 **(Prof. Ravinder Pal Ahalawat)**

(Dr. Jaipraksah Bhukar) 9/3/21 **(Dr. Renu Yadav)** 9/3/21 **(Dr. Dinesh Chahal)**

9/3/21 **(Dr. Sandeep Dhull)** 9/3/2021 **(Dr. Parmod Kumar)**

Dean school of Education <deansoe@cuh.ac.in>

Draft Minutes of the Meeting of School Board, School of Education on 9th March,2021

SVS Chaudhary <svschaudhary@ignou.ac.in> Sun, Mar 14, 2021 at 1:55 PM
To: Dean school of Education <deansoe@cuh.ac.in>
Cc: Sangeeta Ahlawat <s.edu65@yahoo.com>, Shamsher Singh Jang Bahadur <ssjbcdlu@gmail.com>, "Prof. Jayashree Acharya Ph.D" <jayashreeacharya@hotmail.com>, sohanvir chaudhary <sohanvirchaudhary@gmail.com>

Thanks for the mail. I approve the minutes of the meeting.
Sohanvir
[Quoted text hidden]
--

Dr. S V S Chaudhary
Professor of Education
(Former Vice Chairman, NCTE & Project Director, DEP-SSA)
School of Education
Indira Gandhi National Open University
New Delhi 110068 India
e-mail: chaudhary38@hotmail.com
svschaudhary@ignou.ac.in

Minutes of Meeting of School Board 09-03-2021 (1).docx
104K

Dean school of Education <deansoe@cuh.ac.in>

Draft Minutes of the Meeting of School Board, School of Education on 9th March,2021

Shamsher Singh Jang Bahadur <ssjbcdlu@gmail.com> Mon, Mar 15, 2021 at 2:29 PM
To: Dean school of Education <deansoe@cuh.ac.in>

I approve the minutes as circulated.

Prof. Shamsher Singh
[Quoted text hidden]

Dean school of Education <deansoe@cuh.ac.in>

Draft Minutes of the Meeting of School Board, School of Education on 9th March,2021

Sangeeta Ahlawat <s.edu65@yahoo.com> Sat, Mar 13, 2021 at 3:41 PM
To: Dean school of Education <deansoe@cuh.ac.in>

Approved .
Prof Sangeeta

Sent from my iPhone

> On 13-Mar-2021, at 2:18 PM, Dean school of Education <deansoe@cuh.ac.in> wrote:
>
> [Quoted text hidden]
> <Minutes of Meeting of School Board 09-03-2021.docx>

Dean school of Education <deansoe@cuh.ac.in>

Draft Minutes of the Meeting of School Board, School of Education on 9th March,2021

Prof. Jayashree Acharya Ph.D <jayashreeacharya@hotmail.com> Sun, Mar 14, 2021 at 11:31 PM
To: Dean school of Education <deansoe@cuh.ac.in>, SVS Chaudhary <svschaudhary@ignou.ac.in>, Sangeeta Ahlawat <s.edu65@yahoo.com>, Shamsher Singh Jang Bahadur <ssjbcdlu@gmail.com>, pkyadav <pkyadav@cuh.ac.in>, "rpahlawat@cuh.ac.in" <rpahlawat@cuh.ac.in>, "Dr. Sarika Sharma" <sarikasharma@cuh.ac.in>, "jpbhukar@cuh.ac.in" <jpbhukar@cuh.ac.in>, "Dr. Renu Yadav" <renuyadav@cuh.ac.in>, "sandeepdhull@cuh.ac.in" <sandeepdhull@cuh.ac.in>, sohanvir chaudhary <sohanvirchaudhary@gmail.com>, "Dr. Aarti Yadav <aartiyadav@cuh.ac.in>,, Dr. Dinesh Chahal" <dineshchahal@cuh.ac.in>

Dear Sir,
Thank you for your mail . I approve the minutes of the meeting. Best wishes and kind regards

Jayashree Acharya, Ph.D
Professor , Department of Sports Psychology
Director IQAC
Lakshmibai National Institute of Physical Education
(Ministry of Youth Affairs and Sport, Govt of India)
Shakti Nagar , Gwalior-474002
Phone :0751-4000906 (O)
Mob:+ 91- 9425309469 / 8319459478

From: Dean school of Education <deansoe@cuh.ac.in>
Sent: Saturday, March 13, 2021 2:18 PM
To: SVS Chaudhary <svschaudhary@ignou.ac.in>; Sangeeta Ahlawat <s.edu65@yahoo.com>; Shamsher Singh Jang Bahadur <ssjbcdlu@gmail.com>; Prof. Jayashree Acharya Ph.D <jayashreeacharya@hotmail.com> ; pkyadav <pkyadav@cuh.ac.in>; rpahlawat@cuh.ac.in <rpahlawat@cuh.ac.in>; Dr. Sarika Sharma <sarikasharma@cuh.ac.in>; jpbhukar@cuh.ac.in <jpbhukar@cuh.ac.in>; Dr. Renu Yadav <renuyadav@cuh.ac.in>; sandeepdhull@cuh.ac.in <sandeepdhull@cuh.ac.in>; sohanvir chaudhary <sohanvirchaudhary@gmail.com>; Dr. Aarti Yadav <aartiyadav@cuh.ac.in>,, Dr. Dinesh Chahal <dineshchahal@cuh.ac.in>
Subject: Draft Minutes of the Meeting of School Board, School of Education on 9th March,2021

[Quoted text hidden]

Annexure VII

Scheme and Syllabus

M.Ed.
(Master of Education)



School of Education

w.e.f. Academic Session 2020-22

Programme Outcomes:

- Demonstrate a critical engagement with educational discourse in theories and practice.
- Identify and engage with various nuances of inter/multidisciplinary perspectives in education.
- Situate education practices in historical, political and socio-cultural contexts, both locally and globally.
- Critically think, reflect, and analyse arguments, claims, evidences and problems in the Indian education context.
- Pursue guided and ethical research study and demonstrate the ability to analyse and synthesize information to address research questions.
- Engage with educational practice at both school and non-school sites
- Demonstrate analytical and professional skills related to teaching-learning, teacher education, curriculum and material development, education policies and programmes across different levels of education.
- Reflect on the educational processes and experiences of self and others while engaging with the psycho-social underpinnings of education.

M.Ed. Semester- I

S. No.	Course Credit	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits (Practical)	Class Teaching / Field Based Activity Hours per week
1	4	SOE 01 01 01 C3104	Psychology of Learning and Development	3	1	0	4
2	4	SOE 01 01 02 C3104	Historical, Political and Economic Foundations of Education	3	1	0	4

3	4	SOE 01 01 03 C3104	Introduction to Educational Research	3	1	0	4
4	2	SOE01 01 04 C0022	ICT in Education	0	0	2	4
5	2	SOE 01 01 05 C0022	Development of Self: Yoga Education	0	0	2	4
Elective Courses							
6	4	SOE 01 01 01 DCEC 3104	Personality Development and Communication Skills	3	1	0	4
7	4	SOE 01 01 02 DCEC 3104	Educational Administration, Management and Leadership	3	1	0	4
8	4	SOE 01 01 03 DCEC 3104	Distance and Open Learning	3	1	0	4
9	4		**Taken from other Department/ MOOC**				
Tota l	24						

M.Ed. Semester- II

S. No.	Course Credit	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits (Practical)	Class Teaching / Field Based Activity Hours per week
10	4	SOE 01 02 06 C3104	Philosophical Foundations of Education	3	1	0	4
11	4	SOE 01 02 07 C3104	Sociological Foundations of Education	3	1	0	4
12	4	SOE 01 02 08 C3104	Advance Research Methodology	3	1	0	4
13	4	SOE 01 02 09 C3104	Curriculum Studies	3	1	0	4
14	2	SOE 01 02 10 C0022	Academic Writing	0	0	2	4
15	2	SOE 01 02 11 C0022	Internship and Field Attachment	0	0	2	4
16	2	SOE 01 02 12 C0022	Dissertation (Part-I)	0	0	2	4
Elective Courses							
17	4	SOE 01 01 04 DCEC 3104	Guidance and counselling	3	1	0	4
18	4	SOE 01 01 05 DCEC 3104	Gender, School and Society	3	1	0	4

19	4	SOE 01 01 06 DCEC 3104	Education of the Disadvantaged Groups	3	1	0	4
20	4	SOE 01 01 07 DCEC 3104	Comparative Education	3	1	0	4
Total	26						

M.Ed. Semester- III

S. No.	Course Credit	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits (Tutorial/ Practicum Practical)	Class Teaching / Field Based Activity Hours per week
21	4	SOE 01 03 12 C3104	Teacher Education	3	1	0	4
22	4	SOE 01 03 13 C3104	Inclusive Education	3	1	0	4
23	4	SOE 01 03 14 C0044	Internship in Specialized Area	0	0	4	8
24	4	SOE 01 03 15 C0044	Dissertation Part-II	0	0	4	8
Elective Courses							
25	2	SOE 01 01 08 DCEC 2002	Institutions, Systems and Structures at Elementary Stage	2	0	0	2
26	2	SOE 01 01 09 DCEC	Institutions, Systems and Structures at Secondary Stage	2	0	0	2

		2002					
27	2	SOE 01 01 10 DCEC 2002	Stage Specific Status, Issues and Concerns at Elementary Stage	2	0	0	2
28	2	SOE 01 01 11 DCEC 2002	Stage Specific Status, Issues and Concerns at Secondary Stage	2	0	0	2
29	4*		**Taken from other Department/ MOOC**				
Total	24						

M. Ed. Semester- IV

S. No.	Course Credit	Course Code	Course Title	Credits (Theory)	Credit (Tutorial/ Practicum)	Credit (Practical)	Class Teaching / Field Based Activity Hours per week
30	4	SOE 01 04 16 C3104	Recent Trends in Teacher Education	3	1	0	4
31	4	SOE 01 04 17 C3104	Educational Studies	3	1	0	4
32	4	SOE 01 04 19 C3104	Educational Technology	3	1	0	4
33	2	SOE 01 04 20	Environmental Education	2	0	0	2

4	**Third**	**SOE 01 03 04 GEC 3014**	Art of Teaching	4
5	**Fourth**	**SOE 01 04 05 GEC 3014**	Introduction to Counselling	4
6	**Fourth**	**SOE 01 04 06 GEC 3014**	Inclusive Education and Practices	4

		C2002					
34	4	SOE 01 04 21 C0044	Dissertation	4	0	4	8
Elective Courses							
35	2	SOE 01 01 12 DCEC 2002	Practice Relating to Curriculum, Pedagogy and Assessment at Elementary Stage	2	0	0	2
36	2	SOE 01 01 13 DCEC 2002	Practice Relating to Curriculum, Pedagogy and Assessment at Secondary Stage	2	0	0	2
37	2	SOE 01 01 14 DCEC 2002	Educational Policy, Economics and Planning at Elementary Level	2	0	0	2
38	2	SOE 01 01 15 DCEC 2002	Educational Policy, Economics and Planning at Secondary Level	2	0	0	2
Total	22						

List of Generic Elective Courses (GEC)

Sr. No.	Semester	Course Code	Course Title	Credits
1	First	SOE 01 01 01 GEC 3014	Life Skills in Education	4
2	Second	SOE 01 02 02 GEC 3014	Introduction to Academic Writing	4
3	Second	SOE 01 02 03 GEC 3014	Educational Leadership and Management	4

PHILOSOPHICAL FOUNDATIONS OF EDUCATION

COURSE CODE: SOE 01 02 06 C3104

Year: I **Credit:4**

Semester: II **Marks: 100 (External: 70+Internal: 30)**

Learning Outcomes:

On the completion of this course, the students will be able to :

- explain the concept and nature and various branches of Philosophy.
- acquaint with the concept and various types of knowledge.
- understand the relationship between Philosophy and Education.
- acquaint with the ideas of thinkers in the realm of Education.
- understand the indispensable role of Philosophy in Education.
- explain the educational implications of some schools of philosophy in Western Thought and Indian Philosophy
- critically analyse the importance of Indian school of philosophy and western schools of philosophy in Indian education.

Course Content / Syllabus

Unit-1: Conceptual Understanding of Educational Philosophy

- Concept and nature of Educational Philosophy, Relationship between Education and Philosophy.
- Branches of Philosophy: Metaphysics, Epistemology and Axiology and their educational implications.
- Knowledge: Concept, nature and types of knowledge.

Unit-2: Indian Schools of Philosophy

Indian Schools of Philosophy and their educational implications: Sankhya, Vedanta, Buddhism, Jainism.

Unit-3: Western Schools of Philosophy

Western Schools of Philosophy and their educational implications: Idealism, Naturalism, Pragmatism, Existentialism.

Unit-4: Contribution of Educational Thinkers

- J. Krishnamurthy
- Rabindranath Tagore
- John Dewey
- Paulo Friere

Transactional Strategies

Lectures, Discussions, Presentations, Problem based learning.

Suggested Readings:

- Aggarwal, J.C. (2013). *Basic ideas in education*. New Delhi: Shipra Publications.
- Bailey, Richardet. al. (2010). *Philosophy of education*. U.S.A.: Sage Publication Ltd.
- Barrow, R. (2010). Schools of Thought in Philosophy of Education. In Bailey, R. Barrow, Carr, D., & McCarthy, C.(ed.), *The SAGE Handbook of Philosophy of Education*. London: Sage Publications.
- Bharathy, V., & Rao, D. B. (2015). *Educational philosophies of Swami Vivekananda and John Dewey*. New Delhi: APH Publications Corporation.
- Carr, D. (2010). The Philosophy of Education and Educational Theory. In Bailey, R. Barrow, Carr, D., & McCarthy, C. (ed.), *The SAGE Handbook of Philosophy of Education*. London: Sage Publications.
- Chand, J. (2010). *Philosophical foundation of education*. New Delhi: Anshah publishing house.
- Coulby, D. & Zambeta, G. (2005). *Globalization & nationalism in education*. New York: Routledge.
- Deshpande, S. (2004). *Contemporary India: a sociological view*. New Delhi: Penguin.
- Gupta, R. (2011). *Philosophical, sociological and economic bases of education*. Ludhiana : Tondon Publications.
- Gupta, R. (2012). *Shiksha ke darshnik, samajshastriya aurarthik adhar*.Ludhiana:Tondon Publications.
- Kaur. (2018). Philosophical and sociological perspectives in education. New Delhi:ABD Publishers.
- Kenkel, W.F. (1980).*Society in action: Introduction to sociology*. New York: Harper and Row.

- Kumar, A. (2015). *Philosophical perspective of education*. New Delhi: APH Publishing Corporation.
- Mathur S.S. (2008). *A Sociological approach to Indian Education*. Agra: Vinod Pustak Mandir.
- Ministry of Education (1985). *Challenges of Education-A policy perspective*. New Delhi: Govt. of India.
- Ministry of Education (1993). *Education for all: The Indian Scene*. New Delhi: Govt. of India.
- Ozmon, H. A. (2017). *Philosophical foundations of education*. New Jersey: Pearson Publication
- Pandey, R.S. (1997). *East west thoughts on education*. Allahabad: Horizon Publishers.
- Phillips, D.C. (2010). What is Philosophy of Education? In Bailey, R. Barrow, Carr, D., & McCarthy, C. (ed.), *The SAGE Handbook of Philosophy of Education*. London: Sage Publications.
- Pring, R. (2010). The philosophy of education and educational practice. In the sage handbook of philosophy of education. Bailey, R. Barrow, Carr, D., & McCarthy, C. (ed.). London: Sage Publications.
- Siegel, H. (2010). Knowledge and truth. In Bailey, R. Barrow, Carr, D., & McCarthy, C. (ed.). *The sage handbook of philosophy of education*. London: Sage Publications.
- Singh, Y. K. (2014). *Education philosophy of Mahatma Gandhi*. New Delhi: APH Publishing Corporation.
- Sodhi T.S. & Suri A. (1998). *Philosophical and sociological foundation of education*. Patiala: Bawa Publications.
- Vallikkat, S. (2015). *Philosophy of education*. New Delhi: APH Publishing Corporation.
- Vashishtha, U. C. (2011). *Educational philosophy*. New Delhi: APH Publishing Corporation.
- Walia, J.A. (2011).*Modern Indian education and its problems*. Gopal Nagar, Jalandhar City: Paul Publishers

Web Resources

- https://www.cukashmir.ac.in/departmentdocs_16/WESTERN%20SCHOOLS%20OF%20PHILOSOPHY%20-%20Dinesh%20Kumar%20K.pdf, https://shodhganga.inflibnet.ac.in/bitstream/10603/68349/7/07_chapter%202.pdf
- http://www.ibe.unesco.org/sites/default/files/krishnamurtie.pdf
- http://www.ijcrar.com/vol-4/T.%20Pushpanathan.pdf
- https://files.eric.ed.gov/fulltext/ED564712.pdf, https://files.eric.ed.gov/fulltext/EJ1158258.pdf,
- http://sabarishedn.blogspot.com/2014/02/educational-philosophy-of-paulo.html

SOCIOLOGICAL FOUNDATIONS OF EDUCATION

COURSE CODE: SOE 01 02 07 C3104

Year: I

Semester: II

Credit 4

Marks. 100 (External: 70+Internal: 30)

Learning Outcomes:

After the completion of this course, the students will be able to:

- understand the indispensable role of Philosophy and Sociology in Education.
- describe the relationship between Education and Sociology.
- explain the various social institutions and their role in education.
- construct ideas relevant for the social change.
- Illustrate with examples the national values as enshrined in the Indian Constitution.

Course Content / Syllabus

Unit-1: Concept of Educational Sociology and Sociology of Education

- Educational Sociology, Sociology of education, Relationship of Sociology and Education.
- Social foundations of education.
- Approaches to Sociology of Education (Structural Functionalism and Conflict Theory).

Unit-2: Social Institutions and types, Social Movements and theories

- Concept and types of social Institutions and their functions in education (family, school and society).
- Concept of Social Movements and Theories (Relative Deprivation, Resource Mobilization, Political Process Theory and New Social Movement Theory).

Unit -3: Socialization and Education, Education and Culture

- Concept and Meaning of Socialization, Agencies of Socialization; Home, School and Community.
- Social Stratification: Concept and educational implications.
- Role of education in cultural context, Education and cultural changes.

Unit-4: Social Changes, Social Mobility and National Values

- Social changes: Concept and educational Implications, constraints to social changes in India.
- Social Mobility and education.
- National Values as enshrined in the Indian Constitution – Socialism, secularism, justice, liberty, democracy, equality, freedom with special reference to education.

Transactional Strategies: Lectures, discussions, observation and report of a social setting

Suggested Readings:

- Abrahan F. & Margan, J. (2002). *Sociological thought.* New Delhi: *MC Millian India Ltd.*
- *Banks (2018). An Introduction to Multicultural Education.* New Delhi*: Pearson.*
- *Gore, M.S. (1984). Education and modernization in India.* Jaipur: *Rawat Publishers.*
- Hanighurst, R.(1995). *Society and education.* Boston: Allyn and *Bacon.*
- Harlambos, M. (1997).*Sociology theme and perceptive.* New Delhi: *OUP.*
- Jayapalan N. (2001). *Sociological theories.* New Delhi: Atlantic Publishers and Distributers.
- Kamat, A.R. (1985). *Education and social change in India.* Bombay: Samaiya Publishing Co.
- Lal, R.B. & Palod, S. (2016*). Philosophical & Sociological perspectives of education.* Meerut: R.Lall Publications
- M.H.R.D. (1990). *Towards an enlightened and human society. New Delhi: Department of Education.*
- Mathur, S.S.(1966). *Sociological Approach to Indian Education. Agra: Vinod Pustak Mandir.*
- Maubnhein K. (1962). *An introduction to sociology of education. London: Routledge.*
- Mossish, Loor (1972). *Sociology of Education: An Introduction. London: George Lalen and Unwin.*
- Pandey, K.P. (1983). *Perspective in Social Foundations of Education. Gaziabad: Amita Prakashan.*
- Rao, Shanker, C.N. (2002*). Sociology, primary principles. New Delhi: S. Chand & Co.*
- Saxena, S. (2001). *Philosophical and sociological foundation of education. Meerut: Surya Publications.*
- Singh, A.(2018). *Emerging trends in education and future vision. New Delhi: Omega Publications*
- Singh, B.N. (2005). *Education: social change and economic development. Jaipur: RBSA Publishers.*
- Snedden, D. (2018*). A digest of educational sociology. Australia: Trestie Publications*

- Sodhi, T.S. & Suri, Aruna (1998). *Philosophical and sociological foundation of education. Patiala: Bawa Publication.*

Web Resources

- *http://www.bevkon.org/dergi/2016/SPRING/2016XI.1.10.A.Sen.pdf*
- *https://www.bmartin.cc/pubs/90psa2/90psa2_Rootes.pdf*
- *https://www.cliffsnotes.com/study-guides/sociology/the-sociological-perspective/three-major-perspectives-in-sociology*
- *https://www.ebscohost.com/uploads/imported/thisTopic-dbTopic 1248.pdfhttps://laulima.hawaii.edu/access/content/user/kfrench/sociology/The%20Three%20Main%20Sociological%20Perspectives.pd*
- *https://study.com/academy/lesson/sociologys-four-theoretical-perspectives-structural-functional-social-conflict feminismsymbolic-interactionism.html*
- *https://en.wikibooks.org/wiki/Introduction_to_Sociology/Sociological_Theory*

ADVANCE RESEARCH METHODOLOGY

COURSE CODE: SOE 01 02 08 C3104

Year-I **Credits: 4**

Semester: II **Marks: 100 (Theory: 70, Internal: 30)**

Learning Outcomes: **After the completion of this course the students will be able to:**

- describe the steps in designing quantitative research.
- illustrate with examples the use of qualitative research designs.
- explain the characteristics of good data collection instrument used in quantitative and qualitative research.
- describe the meaning and assumptions of parametric and non-parametric tests.
- write the concept and assumptions of various parametric and non-parametric tests.
- explain the terms: standard error, confidence limits, levels of significance, null hypothesis, one tailed and two tailed test; two types of error.
- conduct hypothesis testing using suitable statistical tests.
- apply various method of research in their research activities.
- apply various statistical methods for analysis of the collected data and infer results.

Course Content / Syllabus

Unit -1 **Research Designs**

Quantitative Research Methods:

- Descriptive Research
- Experimental Research: Experimental Designs.

Qualitative Research Methods: Ethnography and Case Study

Unit-2 **Tools and Techniques of Data Collection**

- Characteristics of a good data collection instrument

- Quantitative data collection: Characteristics and uses of Questionnaire, Psychological Tests, Rating Scales and Socio-metric Techniques in Research
- Quantitative Data Collection: Characteristics and uses of Observations, Interview, Documents, Audio-Visual Materials

Unit-3 **Inferential Statistics (Parametric Tests)**

- Meaning and assumptions of parametric tests.
- Standard Error
- Confidence Limits
- Levels of Significance
- Null Hypothesis
- One tailed and two tailed test; Two types of Error
- Hypothesis Testing:
    - Z-Test & t-Test: Concept, Assumptions, Computation and Uses
    - ANOVA (One Way and Two Way): Concept, Assumptions, Computation and Uses.

Unit -4 **Inferential Statistics (Non-Parametric Tests)**

Meaning and assumptions of Non Parametric tests

Concept, Computation and Uses of:

- Chi-Square Test of Equality and Independence
- Median Test
- Sign Test
- Mann Whitney U Test

Transactional Strategies	**Discussion on qualitative and quantitative research studies , practice on data with various statistical methods, case studies and assignments**

Suggested Readings:

- Best, J. W. and Kahn, J. V. (1995). *Research in Education.* New Delhi: Prentice Hall.
- Burns, R. B. (1991). *Introduction to Research in Education.* New Delhi: Prentice Hall.
- Adward, Allen Literacy. (1968). *Experimental designs in Psychological Research*. New York: Holt, Rinehart and Winston.
- Creswell, J. W. (2017). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research.* India: Pearson.
- Ferguson, G. A. (1976). *Statistical Analysis in Psychology and Education*. New York: McGraw Hill.
- Garrett, H. E. (1973). *Statistics in Psychology and Education.* Bombay: Vakils, Feiffer and Simon.
- Guilford, J.P. and Benjamin, F.(1973). *Fundamental Statistics in Psychology and Education.* New York: McGraw Hill.
- Johnson, B., & Christensen, L.B.(2020). *Educational research: Quantitative, qualitative, and mixed approaches*. USA: Sage
- Kerlinger, F. N. (1973). *Foundation of Behavioural Research.* New York: Holt, Rinehart and Winston.
- Koul, L.(1988). *Methodology of Research.* New Delhi: Vikas.
- Kurtz, A.K. and Mayo S.T. (1980). *Statistical Methods in Psychology and Education.* New Delhi: Narela.
- Lindquist, E.F. (1970). *Statistical Analysis in Educational Research.* New Delhi, Oxford and IBH publishing House.
- Mangal, S.K. (2002). *Statistics in Psychology and Education.* New Delhi: Prentice Hall of India.
- Mann, P.S. (2015). *Introductory Statistics.* NewYork: Wiley.
- Neuman, W.L. (1997). *An Introduction to Educational Research Methods: Qualitative and Quantitative Approaches*. Boston: Allyn and Bacon.
- Sharma, S.R. (2003). *Problems of Educational Research.* New Delhi: Anmol Publications Pvt. Ltd.
- Siegel, S. (1986). *Non-parametric Statistics*. New York: McGraw Hill.
- Travers, R.M. W. (1978). An Introduction to Educational Research. New York: Macmillan.

- Springer, K. (2010). *Educational research: A contextual approach*. Hoboken, N.J: Wiley.

M.Ed. Semester-II

CURRICULUM STUDIES

COURSE CODE: SOE 01 02 09 C3104

Year I **Semester: II**

Credit : 4. **Marks: 100 (External : 70+Internal: 30)**

Learning Outcomes : After the completion of this course the students will be able to:

- Write the meaning, definition and elements of curriculum.
- Explain types of curriculum.
- Describe the concept, scope and principles of curriculum development
- Elaborate the steps of various models of curriculum development
- Explain the significance of curriculum as a field of study in Teacher Education.
- Get sensitized to curriculum as a process, product and praxis.
- Acquaint students with the different aspects of curriculum evaluation..
- Explain the models of curriculum evaluation.

Course Content

Unit -1: Conceptual Understanding of Curriculum

- Meaning, definition and elements of curriculum
- Types of curriculum-hidden curriculum, integrated curriculum
- Determinants of curriculum (Philosophical, Sociological and Psychological)

Unit -2: Curriculum Development

- Nature, purposes, scope and principles of curriculum development
- Process of curriculum development
- Structure of teacher education curriculum and its vision in curriculum documents of NCERT and NCTE
- Curriculum framework for teacher education in NEP, 2020

Unit -3: Curriculum Transaction

- Flipped classroom
- Collaborative learning
- Team teaching
- Factors influencing Curriculum Transaction

Unit- 4: Curriculum evaluation

- Tyler model
- Kirkpatrick model
- CIPP model
- Formative and Summative evaluation

Transactional Strategies: Assignments and workshop on curriculum development and evaluation

Suggested Readings:

- National Council of Educational Research and Training. (2006). Position paper: National focus group on aims of education, (MrinalMiri, Chairman). National Council of Educational Research and Training, Delhi, India.
- Kumar, K. (1992). What is worth teaching? In What is worth teaching (pp. 1 – 22). Delhi: Orient Longman
- Dhankar, R. (2003). Aims of Education: Policy documents and demands of democracy
- Egan, K. (2003). What is curriculum? Journal of the Canadian Association for Curriculum Studies, 1(1), pp. 66-72.
- Young, M. (2007). What are schools for? Education Sociology, 28 (101), pp. 1287-1302.
- Kumar, Krishna. (1999). Listening to Gandhi. What is worth teaching? pp. 111 - 128. New Delhi: Orient Longman. (or Kumar, K. (1998). BuniyadiShikshakiprasangigkta. Shikshavimarsha)
- Tagore, Rabindranath (1951/2000). What is real education? In Devi Prasad (Ed.) Rabindranath Tagore philosophy of education and painting, pp. 43 – 50. New Delhi: NBT.
- National Council of Educational Research and Training. (2005). National Curriculum Framework, (Yash Pal, Chairman). National Council of Educational Research and Training, Delhi, India. (Foreword, acknowledgement, executive summary and the steering committee description)
- National Council of Educational Research and Training. (2006). Position paper: National focus group on curriculum syllabus and textbook, (RohitDhankar, Chairman). National Council of Educational Research and Training, Delhi, India. (Summary)
- Posner, G. J. (1998). Models of curriculum planning. In L. E. and M. W. Apple (Eds.) The curriculum: Problems, politics and possibilities (2nd ed.) (pp. 79-91). New York: Sunny Press.

- Anderson, L. W and Krathwohl, DR (eds) (2001) A Taxonomy for Learning, Teaching and Assessing: A revision of Bloom's Taxonomy of Educational Objectives (Addison Wesley Longman).
- Apple, M. W. (1993). The Politics of Official Knowledge: Does a National Curriculum Make Sense? Teachers College Record Volume 95, Number 2, Winter, Teachers College, Columbia University
- Kumar, K. (1988). Origins of India's "Textbook Culture". Comparative Education Review, Vol. 32 (4), pp. 452-464.
- Ahvaan trust and Ambedkar University, Delhi. (forthcoming). Teachers in conversation. Proceedings of two focus group discussions with teachers.
- Apple, M.W. and Beane, J. A. (2007). Democratic schools: Lessons in powerful education (2nd ed.). Heinmann.
- Pathak, A. (2002). Mirambika: An alternative school. In Social implications of schooling: Knowledge, pedagogy and consciousness (pp. 166 – 235). Noida: Rainbow Publishers.
- Vineeta, Sood. (2012). Foreword to Indian edition. In J. T. Gatto, Weapons of mass instruction: A school teacher's journey through the dark world of compulsory schooling, pp. vii-xiv. Indore: Banyan Tree.
- Documentaries: Summerhill; HSTP
- Kelly, A.V. (2009). The curriculum theory and practice. Sage.
- Marsh, C. J. (2004). Key concepts for understanding curriculum (3rd ed.). London: RoutledgeFalmer.
- Flinders, D. J. and Thorton, S. J. (Eds.). (2009). The curriculum studies reader (3rd ed.). New York: Routledge.
- MHRD (2012) Vision of Teacher Education in India Quality and Regulatory Perspective (Report of the High-Powered Commission on Teacher Education constituted by Hon'ble Supreme Court of India), Department of School Education & Literacy, MHRD, Government of India, New Delhi
- McKernan, James (2007): Curriculum and Imagination: Process, Theory, Pedagogy and Action Research. Routledge. U.K.
- National CurriculumFramework (2005): New Delhi: NCERT.
- Ornstein, A.C & Hunkins, F.P, (2018). *Curriculum: Foundations, Principles and Issues* (7th Ed.). New York: Pearson
- Ornstein, P. & Ornstein. A.C. (2011). *Contemporary Issues in Curriculum* (5th Ed,). New York: Pearson

ACADEMIC WRITING

COURSE CODE:SOE01 02 09 C3104

Year : I

Semester: II

Credit: 2

Marks : 50

Learning Outcomes: After the completion of this course the students will be able to:

- Explain the steps in essay writing and report writing.
- Describe the essential requirements of academic writing and distinguish a good academic writing from others.
- Identify and analyse academic sources and refer to those sources of learning.
- Cite and acknowledge various sources of learning.
- Edit one's own and peer's writing work
- Reflect on their communicative behaviour.
- Build capacities for self-criticism and facilitate self- growth.
- Enhance their listening & writing skills.

Course Content

- Introduction to the Writing Process
- Writing in one's own words: Summarizing and Paraphrasing
- Write a professional report of any workshop and seminar
- Critically analyze two research papers on the topic of your interest and write a report on it.
- Book Review: Any Text Book/Novel/Book

Practicum

- Workshop on listening, conversing, speaking, presenting, explaining and expositing ideas in groups and before an audience.
- Write a paragraph on any topic of interest, then acknowledge the source & edit one's own writing. Prepare a report on the entire programme.
- Attend a seminar/workshop or conference and write a report on the entire programme.
- Workshop on academic writing skill and report writing.

References:

- Academic English: Writing Specialization (2019). Retrieved from https:// www.coursera.org/specializations/academic-english.
- Bailey. S. (2015). *Academic writing: A Handbook for International Students*. London and New York: Rutledge.
- Eric Hayot (2014). T*he Elements of Academic Style: Writing for the Humanities*. US: Columbia University Press.
- Labaree, R.V. (2009). Organizing your social sciences research paper: Academic writing style. Retrieved from libguides.usc.edu/writing guide/academic writing
- Murray, N. (2012). *Writing essays in english language and linguistics*. UK: Cambridge University Press.
- Olivia, V. (2019). An introduction to academic writing: Characteristics and common mistakes to avoid. Retrieved from https:// www.thoughtco.com /what-is -academic-writing-1689052

INTERNSHIP AND FIELD ENGAGEMENT

COURSE CODE:SOE 01 02 11 C0022

Year: I
Semester II

Credit: 2
Marks: 50

Learning Outcomes : Internship program is aimed at providing practice of the concepts and skills learned in the theoretical papers in the field of education such as schools, teacher education institutes apart from where the scholar is studying.

Plan of Activities:

Sr. No.	Phase	Name of Activity	Duration
1	Part -One	Pre Internship training (Each student is required to deliver at least one lecture to B.Ed. students of School of Education)	01 Week
2	Part - Two	Observation of Internship Activities of B.Ed. students	01 Week
3	Part-Three	Attachment in Teacher Training Institution.	02 Week
Total Duration of Internship			**04 Week**

Part-A:

This phase is preparatory in nature aimed at providing students with necessary guidance and skills enriching their field based engagement. In this phase each M.Ed. student is required to take a minimum of One Pedagogy paper class in the B.Ed. course of the Department.

Part-B:

Each student is required to observe the internship activities of B.Ed. students attached to a high school / higher secondary school for school based internship programme. The students are required to observe at-least five lessons of B.Ed. students and should maintain a separate observation record. The students are also expected to familiarize himself/herself with the school practices including school administration, organization of curricular and co-curricular activities.

Part-C:

Each M.Ed. student is required to take a minimum of 06 classes in B.Ed. college/DIET either in core papers or in optional papers or both taken together under the close mentorship of teacher educators of the institution selected for internship related activities. The students are also expected to familiarize himself/herself with the college practices including administration, organization of curricular and co-curricular activities. The students are also expected to collectively organize at least one activity.

The suggestive list are as follows:

- Teaching learning material making competition
- Drawing / poster making competition on themes related to education
- Organize an innovative teaching learning material making workshop.
- Debate/ Essay writing/ Slogan competition.
- Nukkad Natak
- Cleanliness Drive
- Workshop on Micro-teaching Skills

DISSERTATION-I

COURSE CODE:SOE 01 02 12 C0022

Year I

Credit 2

Semester II

Marks 50

Learning Outcomes : After the completion of the dissertation work , students will be able to:

- Understand the process of conducting research.
- Identify the various databases for conducting literature related to their research.
- Know various statistical techniques used for analysing the data.
- Apply the steps of writing review of related literature
- Critically analyse the related literature
- Identify the research gap.

Course Content

- Research problem: Concept, identification and specification of the research problem
- Review of related literature: Concept, importance and identification of the research gaps
- Introduction to various referencing styles
- Research proposal: Concept and preparation of research proposal

(Note: In this part of Dissertation each student is required to undertake the aforesaid activities under the guidance of their respective) supervisors

Departmental Elective Courses

GUIDANCE & COUNSELLING

COURSE CODE:SOE 01 01 04DCEC 3104

Year I

Semester II

Credit 4

Marks 100 (Theory: 70, Internal: 30)

Learning Outcomes : On the completion of this course the students will be able to:

- explain the meaning and concept of guidance and counselling in India.
- describe the models of guidance.
- write a note on importance of guidance and counselling.
- Prepare activities reflecting the skills of counselling.
- understand various techniques adopted for guidance and counselling.
- compare and contrast among theories of counselling.
- differentiate between various approaches of counselling.
- identify the factors affecting mental health.
- elaborate the need and importance of mental health

Course Content / Syllabus

Unit -1 : Introduction to Guidance

- Guidance: Concept, Principles and Functions
- Types of Guidance: Educational, Vocational, Social, Personal, health and Social Guidance.
- Contemporary Models of Guidance; Sholen's Model

Unit -2 : Introduction to Counselling

- Concept, Principles, Techniques & Procedure of Counseling
- Counselor: Characteristics, Functions & Ethics
- Skills of Counseling: Building Trust, Listening, Observation & Empathy

Unit -3 : Approaches and theories of counselling

- Approaches of Counseling: Directive, Non-Directive, Eclectic Counseling, Cognitive-behavioural approach, Albert Ellis-REBT, Humanistic (Rogers)

- Theories of Counseling: Freud's Psychoanalytic, Behaviouristic

Unit 4: Mental Health and Hygiene

- Concept of Well Being
- Concept of Mental Health
- Factor Affecting Mental Health
- Promoting Positive Mental Health at Work Place

Transactional Strategies : Lectures, discussions, use of psychological tests, observation of students, conducting career guidance in the schools, counsel students by identifying their mental health problems such as lack of concentration, anxiety, anger etc.

Suggested Readings:

- Aggarwal, J.C. (2005). *Career information in career guidance theory & practice*. Delhi: Doaba House.
- Aggarwal, R. (2010).*Elementary guidance and counselling*. New Delhi: Shipra Publication.
- Bala, Rajni. (2007).*Guidance and counselling: Modern Review*. New Delhi: Afa Publication.
- Burnard, P. (2005). *Counselling Skills Training*. New Delhi: Viva Book Private Limited.
- Chandra, R. (2009). *Career information and guidance and counselling*. Delhi: Isha Books.
- Chandanpat (2018). *Guidance and counselling*. ND: Educational Publisher & Distributor.
- Chauhan, S.S. (2007). *Principle and techniques of guidance*. New Delhi: Vikas Publishing House.
- Dev, K. (2005). *Educational guidance*. New Delhi: Pragun Publication.
- Gibson, R. L. & Mitchell, M. (2008). *Introduction counselling and guidance*. New Delhi: PHI Learning Pvt. Ltd.
- Gibson, Robert L. & Mitchell, Marianne, H. (2016). *Introduction to counselling and guidance*. New Delhi: Pearson Prentice Hall in India.
- Gladding, R. (2018). Introduction to counselling. ND: Pearson.
- Gupta, M. (2005). *Effective guidance & counselling*. Jaipur: Mangaldeep publications.
- Kochhar, S. K. (2006). *Educational and vocational guidance in secondary education*. Delhi: Sterling Publications.
- Kochhar, S.K. (2009). *Guidance & counselling in colleges & universities*. New Delhi: Sterling Publishers Pvt Ltd.
- Koshy, J. (2007). *Guidance and counselling*. New Delhi: Dominant Pub. & Distributors.
- Kottler, J. A. & Shepard, D. S. (2008). *Counselling theories & practices*. Cenage Learning: 1st Edition.
- Madhukumar, I. (2007). *Guidance and counselling*. New Delhi: Authors Press.
- Mathur, S. S. (2008). *Fundamentals of guidance & counselling, (2nd ed.)*. Agra: Aggarwal Publication.
- Mishra, R.C. (2004). *Guidance & counselling*. New Delhi: APH Publishing Corporation.
- Naik, D. (2007). *Fundamentals of guidance and counselling*. New Delhi: Adhyayan publishers.
- Pandey, V.C. (2006). *Educational guidance & counselling*. Delhi: Isha Books.
- Rao, S N. (2006). *Counselling and guidance*. Delhi: McGraw hill Publication.
- Rao, S. N. & Hari, H. S. (2004).*Guidance and counselling*. New Delhi: Discovery Pub. House.

- Safaya, B.N. (2002). *Guidance & counselling*. Chandigarh: Abhishek Publications.
- Saxena, A. (2006). *Organization of Guidance Service*. Delhi: Rajat Publications.
- Saxena, A. (2007). *Introduction to educational & vocational guidance*. Delhi: Rajat Publications.
- Sexena, A. (2007). *Modern techniques of counselling*. New Delhi: Rajat Publications.
- Sharma, R. A.(2011).*Fundamentals of guidance and counselling*. Meerut: R. Lal Book Depot.
- Sharma, S.P. (2008). *Career guidance & counselling*. New Delhi: Kanishka Publishers & Distributors.
- Sharma, T.C. (2002). *Modern methods of guidance & counselling*. New Delhi: Sarup & Sons.
- Sharma, Y.K. (2005). *Principles of educational & vocational guidance*. New Delhi: Kanishka Publishers.
- Shrivastava, K.K. (2003). *Principles of guidance & counselling*. New Delhi: Kanishka Publishers.
- Singh, R. (2002). *Educational & Vocational Guidance*. New Delhi: Commonwealth Publishers.
- Varky, B. G. & Mukhopadhyay, M. (2006). *Guidance and Counselling*. New Delhi: Sterling Publications.
- Vashist, S.R. (2004). *Evaluation of Guidance*. New Delhi: Anmol Publications Pvt. Ltd.
- Yadav, R.H. (2012). *Guidance & Counselling*. New Delhi: APH Publishing Corporation.

Gender, School and Society

COURSE CODE:SOE 01 01 05 DCEC 3104

Year I

Semester II

Credit 4

Marks 100 (Theory: 70, Internal: 30)

Learning Outcomes : After completion of course students will be able to:

- explain the key concepts-gender, gender bias, gender stereotype, empowerment, describe the policies, plans and schemes of the government for addressing all forms of disparities and inequalities existing in the society
- learn about gender issues in school, curriculum, textual materials across disciplines, pedagogical processes and its intersection with class, caste, religion and region; and
- discuss the need to address gender based violence in all social spaces and evolve strategies for addressing it.
- elaborate on the practices of gender and sexuality in contemporary societies;
- identify and critically analyse the gender- and sexuality-related issues within complex, changing social and cultural contexts
- Examine the gendered nature of school curriculum, textbooks, school processes, classrooms, teacher attitudes and peer conversation.

Unit 1: Gender Issues: Key Concepts

- Gender and Sex
- Gender Roles
- Socio-economic and cultural aspects of gender
- Gender Identities and socialization

Unit 2: Gender and Media

- Portrayal of Women in Mass Media (Cinema, TV, Print media),
- Role of Women in media,

- Development of Communication skills
- Alternative media- Folk art, Street play and Theatre

Unit 3: Creating Gender Inclusive Classroom

- Gendered texts: Curriculum, Textbooks
- Teacher attitudes and classroom processes
- Producing the Gendered Self, Nurturing Masculinities and Femininities
- Teacher as an agent of change

Transactional Strategies : Lecture, Videos, Group work, field observation

Suggested Readings

- Desai, Neera and Thakkar, Usha. (2001). Women in Indian Society. National Book Trust, New Delhi
- Geetha, V. (2002). Gender. Calcutta: Stree. pp: 1-10, 38-50 and 89-109.
- Menon, Nivedita (2012). Family, in idem Seeing Like a Feminist. New Delhi: Zubaan, pp: 1-50.
- Vincent, Carol (2010).The Sociology of Mothering. In Michael W. Apple. Stephen J. Ball (Eds.) The Routledge International Handbook of the Sociology of Education, New York: Routledge, pp: 109-120.
- Martin, Jane Roland (1986). 'Redefining the Educated Person: Rethinking the Significance of Gender', Educational Researcher, Vol. 15, No. 6, Special Issue: The New Scholarship on Women in Education, June-July, pp: 6-10.
- Kumar, Krishna (2010). 'Culture, State and Girls: An Educational Perspective', Economic & Political Weekly, Vol. 45. No. 17, pp: 75-84.
- Manjrekar, Nandini (2003). 'Contemporary Challenges to Women's Education: Towards an Elusive Goal?'. Economic and Political Weekly. Vol. 38, No. 43, Oct. 25-3, pp. 4577-4582.
- Kumar, Krishna and Gupta, Latika (2008). 'What Is Missing in Girls' Empowerment?', Economic & Political Weekly. Vol. 43, No. 26/27, pp: 19-24.
- Balagopalan, Sarada (2010). 'Rationalizing Seclusion: A Preliminary Analysis of a Residential Schooling Scheme for Poor Girls in India', Feminist Theory, Vol. 11, No. 3, pp: 295-308.

- Kalia, Narendra Nath (1986). 'Women and Sexism: Language of Indian School Textbooks', Economic and Political Weekly, Vol. 21, No. 18, pp.: 794-797.
- Bhog, Dipta et al (2009). Textbook Regimes: A Feminist Critique of Nation and Identity. New Delhi: Nirantar. Selected Excerpts.
- Leach, Fiona. (2003). Practising Gender Analysis in Education, Oxfam
- NCERT 2006, National Curriculum Framework 2005: Position Paper, National Focus Group on Gender Issues in Education, New Delhi
- Chanana, Karuna(1988) Socialization, Education and Women. Nehru Memorial Museumand Library: New Delhi.
- Conway, Jill K., et al .(1987). 'Introduction: The Concept of Gender', Daedalus, Vol. 116, No. 4, Learning about Women: Gender, Politics, and Power (Fall): XXI-XXX
- Engineer, Asghar Ali (1994). 'Status of Muslim Women', Economic and Political WeeklyVol. 29, No. 6 (Feb.): 297-300
- Erikson, Erik H. 1964. 'Inner and Outer Space: Reflection on Womanhood', DaedalusVol.93, No.2, The Woman in America (Spring): 582-606
- Ganesh, K. 1994. 'Crossing the Threshold of Numbers: The Hierarchy of Gender in the Family in India', Indian Journal of Social Science, 7(3 & 4): 355-62
- Ganesh, K. (1999). 'Patrilineal Structure and Agency of Women: Issues in Gendered Socialization' in T. S.Saraswathi (ed.), Culture, Socialization and Human DevelopmentDelhi: Sage Publication India Pvt. Ltd.
- Government of India. (1975) Towards Equality: Report of the Committee on the Status of Women in India(Delhi: Department of Social Welfare, Government of India)
- Government of India .(1994).The Girl Child and the Family: An Action Research Study. Department of Women and Child Development Delhi: HRD Ministry,
- Kumar, Krishna.(2010). 'Culture, State and Girls: An Educational Perspective Economic and Political Weekly Vol. XLV, No. 17 , April 24
- Ridgeway, Cecilia L. and Correll, Shelley J.(2004). 'Unpacking the Gender System: A Theoretical Perspective on Gender Beliefs and Social Relations', Gender and Society, Vol. 18, No. 4.

Education of the Disadvantaged Groups

COURSE CODE:SOE 01 01 06 DCEC 3104

Year I

Semester II

Credit 4

Marks 100 (Theory: 70, Internal: 30)

Learning Outcomes : After completion of course students will be able to:

- reflect on the policy perspectives related to education of socially disadvantaged section in India,
- identify the features of disadvantaged sections of India.
- explain the constitutional provisions for socially disadvantages sections of India.
- examine and state the status of disadvantaged children in India.
- describe the educational provisions of socially disadvantaged children.
- analyze the status of education of the socially disadvantaged children in the country
- illustrate the educational opportunities required to meet the diverse needs of children- socio-cultural and linguistic.
- discuus the skill to address social group inequality in school and, society,
- explain the schemes and programmes of education of socially disadvantaged group,
- identify research priorities and conduct researches in the area of education of socially disadvantaged groups.

Course Content / Syllabus

Unit-1 : Conceptual Understating of Education of the Disadvantaged Groups

- Disadvantaged Sections of India: Scheduled Castes, Scheduled Tribes, Educationally backward minorities, girls, children from rural and slum children.
- Constitutional Provisions for social group equity and education of socially disadvantaged sections of India
- National Policy on Education (1986), POA (1992), and National Curriculum Framework, 2005.
- International initiatives: Dakar Framework of Action (2000) and Millennium Development Goals (2000).

Unit-2 : Status of School Education of Disadvantaged Section in India

- Status of enrolment at elementary and secondary stage with reference to social group equity, different access in habituations, class, caste, tribe and other disadvantages groups.
- Achievement of disadvantages children.
- Education of gifted and underachievers of disadvantaged group
- Remedial measures for disadvantaged section of society

Unit-3 : Problems in education of disadvantaged section and addressing inequality

- Problems in education of socially disadvantaged children.
- Multicultural education, multi-grade teaching in rural context.
- Organization and management of school to address socio-cultural diversity, bias in textbooks, hidden curriculum (teacher attitude, expectations).
- Teaching learning process and support materials, addressing language issues, curriculum and curricular activities for meeting diverse needs of children- socio-cultural and linguistic.

Unit-4 : Research priorities in the area of education of disadvantaged section

- Evaluation of centrally sponsored schemes of education of SCs, STs, girls and Minorities.
- Status study of education of SCs, STs, girls, and Minorities and other marginalized groups.
- Study of teaching learning practices and social inclusion.
- Case studies on innovative institutional practices-NVS, KGVBs, Madrassas etc.

Transactional Strategies Discussions, debates, research trends analysis, case studies

Suggested Readings:

- Bank, B.J. (2007).*Gender and education: An encyclopedia*. Westport, London: Praeger.
- Bhatt, B.D. & Sharma, S.R. (1992). *Women's education and social development*. Delhi: Kanishka.
- Fredman, S. (2018). *Human rights and equality in education: comparative perspectives on right to education of minorities and disadvantaged groups*. Germany: Lambart publications.
- Government of India (1986). *National policy on education*. New Delhi. Department of Education.
- Government of India (1992). *Programme of action*, New Delhi: MHRD, Department of Education.
- Mehrotra, S. (2006). Child malnutrition and gender discrimination in south Asia. *Economics and political weekly*.
- NCERT (2005): *National curriculum framework*. New Delhi: NCERT.
- NCERT (2006). *National focus group report on education of SCs and STs*. New Delhi: NCERT.
- Ramchandran, V. (1998). *Girls and women education: policies and implementation mechanism*. Case study: India, Bangkok, UNESCO.
- Scot Danforth & Terry J.S. (2005). *Engaging Troubling Students-A Constructivist Approach*.

- Sharma, M.C. & Sharma, A.K. (2003). *Discrimination based on sex, caste, religion and disability: Addressing through educational interventions; A handbook for sensitizing teacher and teacher educators*. New Delhi: NCTE & NHRC.
- ShehVimal P (1982). The *educational problems of scheduled caste and scheduled tribe school and college students in India*
- Subramanyam, R. (2003): Gender equality in education: Definitions and measurements. *International Journal of Educational Development.*
- Thamasseri, I. (2018). *Elementary education of socially disadvantaged groups*. Germany: Lambert Publications

Comparative Education

COURSE CODE:SOE 01 01 06 DCEC 3104

Year I

Semester II

Credit 4

Marks 100 (Theory: 70, Internal: 30)

Learning Outcomes : After the completion of this course the students will be able to:

- explain the with concept, need, history and development of Comparative Education.
- Discuss the problems of education in world perspective.
- Compare and contrast the elementary and secondary education of U.K., U.S.A. and India.
- Present comparative view of salient features of higher education in UK, USA and India
- Describe the aims, content, methods of instructions and evaluation strategies related to teacher education and vocationalization courses in Finland and India.

Course Content / Syllabus

Unit -1 : Conceptual Understanding of Comparative Education & Historical Development

- Concept, scope and aims of Comparative Education.
- Principles behind analysing educational system of different countries
- Historical development of comparative Education
- Approaches to Comparative Education: Historical, Philosophical, Sociological and Problem Approach
- Factors influencing Education system in any country

Unit-2 : Elementary Education and secondary Education (U.K., U.S.A. and India)

- Salient Features of Pre-Primary Education in UK, USA and India
- Salient Features of Elementary Education in UK, USA and India
  - Aims, content, Methods of Instructions and Evaluation strategies
  - Concept of Universalization of Elementary Education in India and its implementation, SSA and DPEP

- Salient Features of Secondary Education in UK, USA and India
  - Aims, Content, Methods of Instructions and Evaluation strategies
  - Rastriya Madyamik Sikhsha Abhiyan
- Educational Administration in UK, USA and India

Unit-3 : Higher Education and Distance Education and Continuing Education

- Salient Features of Higher Education in UK, USA and India
  - Aims, content, Methods of Instructions and Evaluation strategies
  - RUSA
- Salient Features of Distance and continuing Education in UK, Australia and India
  - Aims, Content, Methods of Instructions, Modes of Communication and Evaluation strategies
  - Its Need and Various Concepts

Unit 4 : Teacher Education and Vocationalization of Education

- Salient Features of Teacher Education in Finland and India
  - Aims, content, Methods of Instructions and Evaluation strategies
- Salient Features of Vocationalization of Education in UK, USA and India
  - Meaning and Needs of Vocationalization of Education
  - Aims, Content, Methods of Instructions and Evaluation strategies
- Research trends in Comparative Education

Transactional Strategies Discussions, debates, research trends analysis,

Suggested Readings:

- Cramer, J.F. & Browne, C.S. (1965). *Contemporary education: A comprehensive study of national system.* New York: Brace and world, Inc.
- Humbersone, T.H. (2018). A short history of education in great britain and ireland. England: Forgotten books.
- Karen M., Kathy B. & Hayhoe R. (2017). *Comparative and International Education, (2nd Eds.).* Canada: Canadian Scholars' Press
- Naseema, C. & Jibin, V.K. (2012). *Comparative education*. Shipra Publication.
- Sharma, Y. K. (2004). *Comparative education-Comparative study of educational system*. Guwahati: Eastern Book House.
- Sodi, T.S. (2018). *Textbook of Comparative Education (6thEd.),* New Delhi: Vikas Publication.
- UNESCO (1971). *Developing of Education in Asia*.Paris: Unesco, Mineda's.
- Young, D. (1995).*Introduction of American public education*. New York: McGraw-Hills Inc.
- Tulanatmak Shikshan – Dr. Seeteram Jaiswal, Dr. Ramdas Barkale, Dr, Nalini Pichad

Annexure-VIII

Scheme and Syllabus

B.Ed.
(Bachelor of Education)

School of Education
w.e.f. Academic Session 2020-22

Programme Outcomes:

- To enable student-teachers to engage with studies on Indian society and education.
- To acquire conceptual understanding of Philosophy sociological analysis and hands-on experience of engaging with diverse communities, children and schools.
- To develop conceptual understanding about issues of diversity, inequality and marginalization in Indian society
- To critically analyse the significant policy debates in Indian Education.
- To recognise the importance of the social and emotional development, self and identity, and cognition and learning of children to develop better learning experiences.
- To develop critical understanding of the school curriculum; pedagogy as the integration of knowledge about the learner, the discipline and the social context of learning, and research relating to different aspects of learning.
- To enable student-teachers to recognise the nature of knowledge in various subject areas (Science-Biological/ Physical/Mathematics/Social Science/ Languages–Hindi /English /Urdu /other region-specific languages), and pursue efforts to keep themselves abreast with advancements in their areas of specialisation
- To apply perspectives and theoretical frameworks studied in a teacher education classroom with field-based experiences.
- To enhance professional capacities of a student-teacher such as communication skills, use of arts in education, maintaining healthy body, mind and soul, self-development and ICT skills.
- To enhance the competencies of teachers they need for working as professionals i.e., working as reflective practitioners, researchers and generators of knowledge in the field of education and pedagogy.

Scheme/Course Structure of Bachelor of Education (B.Ed.) w.e.f. the Academic Session 2020-2022

B.Ed. Semester-I

S. No.	Course Credit	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits (Practical)	Class Teaching / Field Based Activity Hours per week
Core Courses							
1.	4	SOE 02 01 01 C3104	Childhood and Growing Up	3	1	0	4
2.	4	SOE 02 01 02 C3104	Contemporary India and Education	3	1	0	4
3.	4	SOE 02 01 03 C3104	Learning and Teaching	3	1	0	4
4.	2	SOE 02 01 04 C2002	Understanding Discipline and Subjects	2	0	0	4
5.	2	SOE 02 01 05 C0022	Reading and Reflection on Text	0	0	2	4
6.	2	SOE 02 01 06 C0022	Understanding the Self	0	0	2	4
Elective Courses							
7.	4	SOE 02 01 01 DCEC3104	School Administration and Management	3	1	0	4
8.	4	SOE 02 01	Art in Education (Visual	2	0	2	6

		02 DCEC2024	& Performing Arts)				
9.	4	SOE 02 01 03 DCEC3104	Health & Physical Education	3	1	0	4
10.	4		**To be taken from other Department/MOOC**	4	0	0	4
	Total	**26**					

Generic Electric Courses (GECs) - Semester I

S. No.	Course Credit	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits (Practical)	Class Teaching / Field Based Activity Hours per week
1.	4	SOE 02 01 01 GEC 3104	Value Based Education	3	1	0	4
2.	4	SOE 02 01 02 GEC 2024	Art in Education	2	0	2	6

B.Ed. Semester-II

S. No.	Course Credit	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits (Practical)	Class Teaching / Field Based Activity Hours per week
Core Courses							
11.	4	SOE 02 02 07 C3104	Foundation of Education	3	1	0	4
12.	4	SOE 02 02 08 C3104	Creating an Inclusive School	3	1	0	4
13.	4	SOE 02 02 09 C3104	Value and Peace Education	3	1	0	4
14.	2	SOE 02 02 10 C2002	Language across the Curriculum	2	0	0	2
15.	2	SOE 02 02 11 C0022	Critical Understanding of ICT	0	0	2	4
16.	4	SOE 02 02 12 C0044	School Internship (Part-I)	0	0	4	8
Discipline Courses Elective Courses (Any Two)							
17.	4	SOE 02 02 04 DCEC3104	Pedagogy of Hindi	3	1	0	4
18.	4	SOE 02 02 05 DCEC3104	Pedagogy of English	3	1	0	4

	4	SOE 02 02 06 DCEC3104	Pedagogy of Social Sciences	3	1	0	4
20.	4	SOE 02 02 07 DCEC3104	Pedagogy of Mathematics	3	1	0	4
21.	4	SOE 02 02 08 DCEC3104	Pedagogy of Life Science	3	1	0	4
22.	4	SOE 02 02 09 DCEC3104	Pedagogy of Physical Science	3	1	0	4
23.	4	SOE 02 02 10 DCEC3104	Pedagogy of Economics	3	1	0	4
24.	4	SOE 02 02 11 DCEC3104	Pedagogy of Commerce	3	1	0	4
	Total	28					

Generic Electric Courses (GECs) - Semester II

S. No.	Course Credit	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits (Practical)	Class Teaching / Field Based Activity Hours per week
3.	4	SOE 02 02 03 GEC 2024	Essentials of Guidance and Counselling	2	0	2	06
4.	4	SOE 02 02 04 GEC 2024	Performing and Visual Arts	2	0	2	06

B.Ed. Semester-III

Sl. No.	Total Credits	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum/ Practical)	Class Teaching Hours per week
25.	16	SOE 02 03 13 C 001616	**School Internship (Part-II)**	0	16	32
26.	04		**To be taken from other Department/MOOC**	4	0	04

B.Ed. Semester-IV

S. No.	Course Credit	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits (Practical)	Class Teaching / Field Based Activity Hours per week
Core Courses							
27.	4	SOE 02 04 14 C3104	Gender, School and Society	3	1	0	4
28.	4	SOE 02 04 15 C3104	Assessment for Learning	3	1	0	4
29.	4	SOE 02 04 16 C3104	Curriculum Transaction	3	1	0	4
30.	2	SOE 02 04 17 C0022	Yoga Education	0	0	2	4
31.	2	SOE 02 04 18 C2002	Environmental Education	2	0	0	2
32.	2	SOE 02 04 19 C0022	Art, Craft and Aesthetics	0	0	2	4
Discipline Centre Elective Courses (Any Two)							
33.	4	SOE020412 DCEC3104	Guidance and Counselling	3	1	0	4
34.	4	SOE020413 DCEC3104	Comparative Education	3	1	0	4
35.	4	SOE020414 DCEC3104	Life Skills Education	3	1	0	4
36.	4	SOE020415 DCEC3104	Web Technologies in Education	3	1	0	4

	4	SOE020416 DCEC3104	Human Rights in Education	3	1	0	4
38.	4	SOE020417 DCEC3104	Education for Mental Health	3	1	0	4

Generic Electric Courses (GECs) - Semester IV

S. No.	Course Credit	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits (Practical)	Class Teaching / Field Based Activity Hours per week
5.	4	SOE 02 04 05 GEC 3104	Educational Management and Leadership	3	1	0	4
6.	4	SOE 02 04 06 GEC 3104	Peace Education	3	1	0	4

SEMESTER-II

Year	I	FOUNDATION OF EDUCATION	Credits	4
Semester	II		Course code	SOE 02 02 07 C3104

Learning Outcomes

After the completion of the course, students will be able to:

- Understand Education as a discipline.
- Get acquainted with the contribution of school of philosophy in education.
- Establish the relationship between Education and Sociology and compare the role of different social institutions in education.
- Internalise the importance and role of education for national and international integration.
- Evaluate the role of education in contemporary trends.
- Value the importance of education for socially disadvantaged children.

Course Content

Unit -1 **Meaning and Functions of Education**

- Indian and Western Concept of Education
- Scope and Functions of Education
- Aims of Education:
  - Individual and Social
  - Cultural and Vocational
  - Democratic
- Dimensions of Education
  - The Learner– Nature of Learners, Learner-Centered Education
  - The Teacher-Qualities and Responsibilities
  - The Curriculum-Meaning, Need and Importance Curricular and Co-curricular activities

Unit -2 **Philosophical Foundations of Education**

	• Meaning and Scope of Educational Philosophy • Functions of Educational Philosophy • Relationship between Philosophy and Education • Schools of Philosophy and their impact on Education with specific reference to Aims, Curriculum and Methods of Teaching: ➢ Idealism ➢ Naturalism ➢ Pragmatism
Unit -3	**Sociological Foundations of Education**
	• Meaning and Nature of Educational Sociology • Relationship between Sociology and Education • Social Institutions of Education- Family, School and Society • Concept of Social Mobility – Role of Education in Social Mobility
Unit -4	Contemporary **Trends in Education**
	• Education and Democracy • Education for National Integration and International Understanding • Impact of Modernization and Globalization on Education • Education for Socially and Economically Disadvantaged sections of the society
Transaction Strategies	E-learning, Lecture cum Discussion Method, Tutorials, Brainstorming Session Use of audio-visual materials, Use of PPT, assignments on different key areas given in syllabus, debate on role of education in democracy, modernization, globalization and social mobility & panel discussion, brainstorming session and in-depth analysis of various other key aspects.
Practicum : • Group discussion on role of different social institutions in education.	

- Debate on role of education in democracy, modernization, globalization and social mobility.
- Assignments on different key areas given in syllabus.
- Panel discussion on importance of education for national integration and international understanding.
- Report on impacts of modernisation and globalisation on education.
- Any other activity suggested by the teacher.

Suggested Readings:

- Aggarwal, J.C. (2014). *Philosophical and sociological perspective on education*. Delhi: Shipra Publications.
- Aggarwal, J.C. (2018). *Education in emerging India*. New Delhi: Doaba House.
- Chakraborty, A. K. (2003). *Principles and practices of education*. Meerut: Lal Book Depot.
- Chandra, S. S., Sharma, R., & Rejendra, K (2002). *Philosophy of education*. New Delhi: Atlantic Publishers.
- Chaube, A., & Chaube, S.P. (2020). *Philosophical and sociological foundations of education*. Agra: Shri Vinod Pustak Mandir.
- Dewey, J. (1916/1977). *Democracy and education: An introduction to the philosophy of education*. New York: Macmillan.
- Dewey, J., (2017). *Democracy and education*. Delhi: Aakar Books Classics.
- Goswami, A.C. (2001). *Philosophical and sociological bases of education in emerging India*. Guwahati: Jyoti Prakashan.
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- Sharma, R.K., & Chandra, S.S. (2006). *Sociology of education*. New Delhi: Atlantic.
- Singh, K.S. (2011). *Educational philosophies & thinkers* (1st ed.). Agra: H.P. Bhargava Book House.

• Singh, K.S. (2011). *Principles and development of education in India* (1st ed.). Agra: Rakhi Prakashan.

Year	**I**	**CREATING AN INCLUSIVE SCHOOL**	**Credits**	4
Semester	**II**		**Course code**	SOE 02 02 08 C3104
Learning Outcomes	After the completion of the course, students will be able to: • Understand the exceptional children and their exceptionality. • Identify and address the diverse needs of exceptional children. • Get sensitized towards inclusion. • compare the national & international policies & programmes with respect to the children with special needs • Discuss the role of different specialists in the area of inclusive education. • Apply the techniques of teaching the children with special needs. • Device the various inclusive practices to promote inclusion in the classroom.			
Course Content				
Unit -1	**Exceptionality & Exceptional Children** • Exceptionality: Meaning, definition and types ➢ Mentally Exceptional Children ➢ Physically Exceptional Children ➢ Emotionally Exceptional Children			
Unit -2	**Conceptual understanding of Inclusive Education** • Inclusive Education: Concept, meaning and principles • Models of Inclusion (i) Charity Model			

	(ii) Human Rights Model • Paradigm shift from segregation to inclusion: Special, Integrated and Inclusive Education
Unit -3	**Policies and Programmes for Inclusive Education**
	• International Policies & Programmes ➢ Salamanca Statement (1994) ➢ Policies guidelines on Inclusive Education, UNESCO- 2009 • National Policies & Programmes ➢ RCI Act, 1992 ➢ PWD Act, 1995 ➢ The Right of Persons with Disabilities Act,2016 ➢ National Policy on Disability (2006)
Unit -4	**Preparing Schools for Inclusion**
	• School readiness for addressing the diverse needs of children with special needs : ➢ Infrastructural ➢ Technological ➢ Pedagogical ➢ Attitudinal needs • Strengthening support services - collaboration of different specialists : ➢ Special Education Teacher ➢ Speech Therapist ➢ Physiotherapist ➢ Counsellor
Transaction	Lecture-cum-Discussion, Group discussion on various policies and programmes, Power point presentation, Film shows, Sharing of

Strategies	experiences of people regarding issues of disabilities, Preparation of projects on various issues related to special education and exclusion.

Practicum :

- Collection of data regarding children with special needs from school record.
- Visit to Inclusive Schools and to observe classroom transaction and prepare a report of the same.
- Case study of one mainstreamed (Inclusive) student with respect to :
  1. Role of a parent
  2. Role of a teacher, special school teacher
  3. Role of counselor
- Any other activity suggested by the teacher

Suggested Readings:

- Alur, M., & Timmons, V. (2009). *Inclusive education across cultures: Crossing boundaries, sharing idea*. New Delhi: Sage Publications India Pvt. Ltd.
- Fimian, M.J., Fafard, M., & Howell, K.W. (1984). *A teacher's guide to human resources in special education: Para professionals, volunteers, and peer tutors*. Boston: Allyn and Bacon Inc.
- Hallahan, D.P., & Kauffman, J.K. (1988). *Exceptional children: Introduction to special Education*. N.J.: Englewood Cliffs.
- Jangira, N.K. (1986). *Special education scenario in Britain and India*. Gurgaon: The Academic Press.
- Kapoor, S. (2015). *Index of inclusive school quality*. Delhi: Brotherhood Publisher.
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- Hallahan, D.P., Kauffman, J.M., & Pullen, P.C. (2018). *Exceptional learners: An introduction to special education*. (14th edition) New Jersey: Pearson Education.
- Kothari, R.G., & Mistry, H.S. (2011). *Problems of students and teachers of the special schools – A study of Gujarat state*. Germany: VDM Publication.

- Messily, K. (2012). *Confronting marginalisation in education: A framework for promoting inclusion*. London: Rutledge Publication.
- Mithu, A., & Michael, B. (2005). *Inclusive education: From rhetoric to reality*. New Delhi: Viva Books Pvt. Ltd.
- NCERT (2006). *National focus group on education of children with special needs*. New Delhi: NCERT.
- Oza, D., & Pandit, R. (2011). *Management of behavioural problems of children with mental retardation*. Germany: VDM Publication.
- Premavathy, V., & Geetha, T. (2006). *Integrated and inclusive education DSE (VI) Manual*. New Delhi: Krishana Publication.
- Reed, M. (1984). *Educating hearing impaired children*. Milton Keynes: Open University Press.
- Sharma, P.L. (1988). *A teacher's handbook on integrated education of the disabled*. New Delhi: NCERT.
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- Frederickson, N., & Cline, T. (2009). *Special educational needs, inclusion and diversity* (2nd edition). New York: McGraw Hill Education Open University Press.

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- Consortium for Research on Educational Access, Transitions and Equity. Retrieved from http://www.createrpc.org/pdf_documents/PTA15.pdf
- IBE-UNESCO (2016). Training Tools for Curriculum Development - Reaching Out To All Learners: a resource pack for supporting Inclusive Education, Ibe.training@unesco.org , http.//www.ibe.unesco
- The SALAMANCA statement and framework for action on special needs education. Available onlinewww.unesco.org/education/pdfSALAMA_EPDF
- IBE-UNESCO (2016). Training Tools for Curriculum Development - Reaching Out To All Learners: a resource pack for supporting Inclusive Education, Ibe.training@unesco.org , http.//www.ibe.unesco
- Video on A World for Inclusion (2007) by UNESCO, directed by David Atrakchi, 20 minutes,http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=213
- Children with Disabilities (2012), by UNESCO, 23 minutes,http://www.unesco.org/archives/multimedia/index.php?s=films_details&pg=33&id=2758
- Educational Resources for Teaching Special-Needs Students https://www.teachervision.com/teaching-strategies/special-needs
- Preparing Teachers for Inclusive Education in Botswana: The Role of Professional Development https://www.researchgate.net/publication/282774571_Preparing_Teachers_for_Inclusive_Education_in_Botswana_The_Role_of_Profess

ional Development • Pedagogy for Inclusive Education http://www.rehabcouncil.nic.in/writereaddata/Block2accie.pdf

Year	**I**	**VALUE AND PEACE EDUCATION**	**Credits**	**4**
Semester	**II**		**Course code**	SOE 02 02 09 C3104
Learning Outcomes	After the completion of the course, students will be able to: • Understand the concept of values and peace. • Appreciate the values inherent in the preamble of the Constitution. • Acquaint with the practices of peace education. • Employ various methods, techniques and approaches of value and peace development. • Evaluate the importance of living together.			
Course Content				
Unit -1	**Meaning, definitions and organizations of values** • Value: Concept, Meaning, Nature and characteristics • Sources and selection of values - human needs and culture • Preamble to the Indian Constitution and values inherent in it • Models of value education: Rationale building model, the consideration model, valuing process and clarification model			
Unit -2	**Value-based Education and Pedagogy of Value Education** • Concept of value based education • Need for and importance of value based education in the present scenario			

	• Recommendations of Sri Prakash Committee (1959) on value education • Values Prevalent in contemporary society • Approaches and Techniques of teaching human values ➢ Direct approach: Silent sitting, Yoga and Meditation, Value Based Story-Telling ➢ Group activities (Dramatization, Literary Activities, Games and Sports, Service Activities) ➢ Counselling, organizing value based co-curricular activities • Role of the Teacher for developing Values
Unit -3	**Understanding Peace and Historical development**
	• Concept and meaning of Peace: Indian view • Understanding Peace in the individual, Social, National and International context • Gandhian Philosophy of Peace education • Creation of the United Nations, UNESCO, UNICEF and their endeavors to promote Peace Education
Unit -4	**Pedagogy of Peace Education**
	• Approaches and Techniques of teaching human values:- ➢ Self-Learning, Yoga and Meditation, Games and Sports, Dramatics and Literacy Activities, co-curricular activities • Different Approaches of Peace ➢ Power politics ➢ World order ➢ Conflict resolution ➢ Nonviolence ➢ Transformation
Transaction Strategies	Lecture cum discussion, Tutorials, Brainstorming Session, Use of PPTs, Assignments on different key areas of Value and Peace related issues.

Practicum :

- Develop / compile stories with values from different sources and cultures, organize value based co-curricular activities in the classroom and outside the classroom, develop value based lesson plans, integrating values in school subjects.
- In addition, school and community based activities may be organized.
- Any other activity suggested by the teacher.

Suggested Readings:

- Arulsamy, S. (2016). *Peace and value education*. New Delhi: Neelkamal Publication.
- Barash, P. David (2000). *Approaches to Peace*. New York: Oxford University Press.
- Behra, S.K., Dūarah, Mouchumi and Mohakud, Lalit Lalitav (2018). *Value Education in the 21st Century*. New Delhi: New Delhi Publishers.
- Charles, K., & Selvi, A. (2016). *Peace and value education*, New Delhi; Neelkamal Publication.
- Bernard, Jessie (1957). *The Sociological study of conflict. International Sociological Association, the Nature of Conflict*, UNESCO Paris.
- Galtung, J. (1984). *The Struggle for Peace*. Ahmedabad: Gujarat Vidyapeeth.
- Gandhi, M.K. (1944). *Non-Violence in Peace and War*. Ahmedabad: Navajeevan Publishing House.
- Govt. of India (1983). *Report on Education in Human Values in Teacher Training Programmes*. New Delhi: Ministry of Human Resource Development.
- Harris Ian. M. (1998). *Peace Education*. McFarland& Company, London: Inc. Publisher.
- Howlett, Charles F. (2008). *John Dewey and Peace Education, Encyclopedia of Peace Education*. Teacher College, Columbia University.
- Kapani, Madhu (2000). *Education in Human Values – concept and practical implications*. New Delhi: Sterling Publishers.
- NCERT National Curriculum Framework (2005). *National focus Group on Education for Peace*. NCERT, New Delhi (2006).
- National Curriculum Framework (2005). *National Focus group on Education for Peace*, NCERT, New Delhi.

- NCTE (1998). *Curriculum Framework for Quality Teacher Education*. NCTE, New Delhi.
- Pandey, S. (2004). *Education for Peace, Self-Instructional Package for Teacher Education*. NCERT, New Delhi.
- Sri Sathya Sai Bal Vikas Education Trust (1985). *Curriculum and Methodology for integrating Human Values Education*. Prashanthi Nilayam (International Education).
- Sri Sathya Sai International Center for Human Values (2009). *Education in Human Values: Course Book for Training of Master Trainers*. New Delhi.
- The Curriculum framework for Quality Teacher Education (1998) NCTE, New Delhi.
- UNESCO (2001). *Learning the way of Peace, "A Teacher Guide to Education for Peace"*. UNESCO, New Delhi.

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- Education for values in schools- a framework, NCERT: http://www.ncert.nic.in/pdf_files/Framework_educationCOMPLETEBOOK.pdf
- Values Education A Handbook for Teachers (2012), CBSE: http://cbseacademic.in/web_material/ValueEdu/Value%20Education%20Kits.pdf
- Position Paper National Focus Group on Education for Peace. NCERT http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/education_for_peace.pdf

Year	**I**	**LANGUAGE ACROSS THE CURRICULUM**	**Credits**	2
Semester	**II**		**Course code**	SOE 02 02 10 C2002
Learning Outcomes	After the completion of the course, students will be able to: • Understand the nature, function and role of different kinds of languages in curriculum transaction. • Get acquainted with obstacles in language usage while using the language and ways to overcome them. • Analyse the importance and use of first and second language, multilingualism and impact of culture. • Explain about the communication process and verbal and nonverbal communication skills.			
Course Content				
Unit -1	**Nature and Functions of Language** • Language – Concept and functions • Role of Language in Transaction of Curriculum • Piaget's Theory of Language Learning • Barriers in Using a Language & Strategies to Overcome them			
Unit -2	**Strategies for Communication & Multilingual Classrooms**			

	• Communication – Concept & Process • Types of Communication flow in schools • 'Multilingualism & Language Diversity in class'- as a resource and challenges • Language as a determinant of Access & symbol of aspiration in Indian Context
Transaction Strategies	Lecture cum discussion, Tutorials, Brainstorming Session, Use of PPT, Film Shows (selected films), use of audio and video materials, Assignments on different key areas of gender related issues given in syllabus through multimedia approach and Group Discussion. Role plays to demonstrate optional learning, use of e-learning platforms, MOOCs, etc.

Practicum :

- Panel discussion on ways of communication.
- Report on different barriers of communication.
- Any other activity suggested by the teacher.

Suggested Readings:

- Sharma, R.K., Dubey, S.K., Dayal, I. (2019). *Language Across the Curriculum and Reflecting on Texts.* Agra,Radha Prakashan Mandir Pvt. Ltd.
- Akmajian, A. et al. (2018). *Linguistics: Introduction to Language and Communication.* (6thed.). Cambridge: MIT Press.
- Panda, K.P.(2017). *Language Across the Curriculum.* New Delhi, A.P.H. Publishing Corporation.
- Fasold, R. & Connor-Linton, J. (2017). *An Introduction to Language and Linguistics.* (6thed.). Cambridge: Cambridge University Press.
- Floyd, K. (2017). *Interpersonal Communication.* New York: McGraw Hill Companies Inc.
- Rao, P.A. (2016). *Language Across the Curriculum.* New Delhi, Kanishka Publishers.
- Chand, B. (2016). *Language Across Curriculum.* (1st). Neel kamal Publishing Pvt. Ltd.
- Areekkuzhiyil, S. (2016). *Language Across the Curriculum.* (1st). Neel kamal Publishing Pvt. Ltd.
- Pandey, R. (2016). *Language Across the Curriculum.* Meerut, R. Lall Book Depot.
- Fromkin, V., Rodman, R. &Hyms, N. (2016). *Introduction to Language.* (9thed.). Canada: Pearson

- J.C. et al (2013). *Human Communication*. (4th ed.). New York: McGraw Hill Companies Inc.

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- First and Second Language Acquisition – A Brief Comparison. Retrieved from https://www.uni-due.de/ELE/FLA_SLA_brief_comparison.pdf
- Similarities and Differences between First and Second Language Acquisition Retrieved from http://multilingualism.pbworks.com/w/page/21913433/Similarities%20and%20Differences%20between%20First%20and%20Second%20Language%20Acquisition
- Activities for Developing Speaking Skill Retrieved from http://faculty.weber.edu/ppitts/ed4320/Handouts/speakingskills.htm http://www.educ.ualberta.ca/staff/olenka.Bilash/best%20of%20bilash/speaking.html
- Activities for Developing Listening Skill Retrieved from http://www.educ.ualberta.ca/staff/olenka.bilash/best%20of%20bilash/listening.html https://blog.udemy.com/listening-skills-exercises/
- Learning curves: Language Education (2009), by AzimPremji Foundation http://azimpremjifoundation.org/pdf/LCIssue13.pdf
- Courses on Communication Skills http://nptel.ac.in/courses/109104030/
- Notes on Communication: Meaning, Nature and Importance https://www.businessmanagementideas.com/notes/management-notes/communication-management-notes/notes-on-communication-meaningnature-and-importance/5183

Year	I	CRITICAL UNDERSTANDING OF ICT	Credits	2
Semester	II		Course code	SOE 02 02 11 C0022
Learning Outcomes	After the completion of the course, students will be able to: • Understand the basics of computer system, its parts and types. • Acquaint themselves with the meaning and types of software. • Work on MS- Word, MS- Excel and MS- Power Point. • Grasp the conceptual understanding of information & communication technology. • Familiarize themselves with the working style of internet and online learning platforms.			
Course Content				
Unit -1	**Fundamentals of Computer** • Computer and its components • Hardware: Meaning and types (Input and Output Devices) • Software: Meaning and types • MS- Word: Introduction and handling of its various operations			

	• MS- Excel: Introduction and handling of its various operations • MS- Power Point: Introduction and handling of its various operations
Unit -2	**Conceptual Understanding of Information and Communication Technology and Internet**
	• Information and communication technology: Meaning, Concept and Challenges of Integration of ICT in School • Aims and Objectives of National Policy on Information and Communication Technology (ICT) in School Education in India and National Mission on Education through ICT (NMEICT) • Internet: Ways of using the internet in teaching learning process 1. Google Drive 2. Google Classroom 3. Google Forms 4. SWAYAM 5. Swayam Prabha 6. You Tube
Transaction Strategies	• Hands on experience in ICT Lab • Demonstration on various applications of MS- Office • Discussion on various ICT related issues • Online demonstration of related topics
Practicum : Choose any three from the following and make a soft file of it for final submission • Making of a resume in MS- Word. • Making of a Lesson Plan in MS- Word. • Making of presentation in MS- Power Point. • Making of progress report-card in MS- Excel. • Graphical representation of data.	

- Any other project/assignment given by the concerned teacher.

NOTE: External practical will be conducted by external examiner at the end of the semester

Suggested Readings:

- Ara,A, Sujhatha, M. & Ramakrishna(2018). *ICT mediation in teaching learning*. New Delhi: Neel kamal Publications.
- Bansal & Kaur. (2016). *Critical understanding of ICT*. Ludhiana: Tandon Publication.
- Cheema, S.S., Kumar, G. & Preet, K.(2015). *ICT skill development*. Patiala: Twenty first Century Publication.
- Benkler, Y. (2016). *The wealth of networks: How social production transforms markets and freedom*. Yale: University Press.
- Brian K. W. & Stacey, S. (2005). *Using information technology*, 6th Edition Tata McGraw Hill, Curtin.
- Douglas, C. (2007). *The internet book: Everything you need to know about computer networking and how the internet works*, New York: Prentice Hall Publications.
- DSERT, Karnataka (2012). *Position paper on ICT mediation in education*. DSERT.
- MHRD, GOI (2004 revised 2010). *National ICTC schools scheme, development of education and literacy*. MHRD, New Delhi
- MHRD (2012). *National policy on information and communication technology (ICT) in school education*. MHRD, Government of India.
- Castells, M. (2011). The rise of the network society: The information age: Economy, society, and culture (Vol. I, II and III). John Wiley and Sons.
- NCERT (2013). *National repository of open educational resources*, CIET, New Delhi (nroer.gov.in)
- Sinha & Sinha (2005). *Computer fundamentals*. New Delhi: BPB Publications.

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- E-book: Getting Started with Libre Office 3.4 available at http://wiki.documentfoundation.org
- Swayam - Hiralal Khatri - Google Books https://books.google.com/books/about/Swayam.html?id=NVQpMgAACAAJ
- 6 Effective Ways To Use Google Drive in eLearning https://elearningindustry.com/6-effective-ways-use-google-drive-in-elearning
- 34 DTH channels | India - Swayam Prabha https://www.swayamprabha.gov.in/index.php/about
- Google Forms - A tutorial - SlideSharehttps://www.slideshare.net/andrewpp/google-forms-an

- Google Classroom: A Free Learning Management System For eLearning https://elearningindustry.com/google-classroom-a-free-learning-management-system-for-elearning
- Components of a Computer https://www.d.umn.edu/~gshute/arch/computer-components.xhtml
- How to install Microsoft Office https://www.youtube.com/watch?v=I0lDau83Cbc
- MS-Excel https://www.youtube.com/watch?v=-ujVQzTtxSg
- Free Software, Free Society: Selected Essays of Richard M. Stallman, digital book available on www.notabug.com/2002/rms-essays.pdf
- Free Software Foundation, www.fsf.org
- Information and Communication Technology Policy in School Education 2010. www.mhrd.gov.in/sites/upload_files/mhrd/files/ReviesICT_School.pdf
- http://en.wikibooks.org/wiki/Computers_for_Beginners . An exhaustive source for beginners
- National Policy on Information and Communication Technology (ICT) In School Education, http://mhrd.gov.in/sites/upload_files/mhrd/files/upload_document/revised_policy%20document%20ofICT.pdf

Elective Courses (DCEC)

Year	I	PEDAGOGY OF HINDI	Credits	4
Semester	II		Course code	SOE 02 02 04 DCEC3104

सिखने के परिणाम

इस कोर्स को पूरा करने के बाद, छात्र शिक्षक कर सकेंगे:

- भाषा की अलग-अलग भूमिकाओं को जानना
- स्कूल की भाषा, बच्चों की भाषा और समझ के बीच संबंध जानना
- पाठ्यचर्चा, पाठ्यक्रम का विश्लेषण कर कक्षा विशेष और बच्चों की समझ के अनुसार ढालना।
- हिन्दी भाषा के विविध रूपों की अभिव्यक्तियों को जानना
- भाषा के विभिन्न कौषलों का विकास करना
- भाषा के मूल्यांकन की प्रक्रिया को जानना।

पाठ्यक्रम की विषयवस्तु

इकाई -1 हिन्दी भाषा अधिगम की प्रक्रिया

- हिन्दी भाषा की भूमिका, प्रकृति एवं महत्व।
- हिन्दी भाषा अधिगम के सामान्य सिद्धान्त।
- हिन्दी शिक्षण के उद्देश्य : ज्ञानात्मक उद्देश्य, कौशलात्मक उद्देश्य, सौन्दर्य बोधात्मक उद्देश्य, रचनात्मक उद्देश्य।

	• मातृभाषा शिक्षण का अर्थ, स्वरूप, महत्व, सामान्य सिद्धान्त, लक्ष्य एवम् उद्देश्य।
इकाई -2	**हिन्दी भाषा शिक्षण की विभिन्न विधाएँ** • हिन्दी शिक्षण में सूचना तकनीकी की उपयोगिता एवं गुण • हिन्दी भाषा शिक्षण में क्रियात्मक अनुसंधान : अर्थ, महत्व एवं प्रक्रिया, हिन्दी में क्रियात्मक शोध योजना का प्रारूप। • पद्य, गद्य एवं व्याकरण शिक्षण का अर्थ उद्देश्य, महत्व, विधियाँ एवं सोपान। • वाचन प्रक्रिया एवं प्रकार।
इकाई -3	**हिन्दी भाषा शिक्षण के भाषाई कौशलों का विकास** • श्रवण कौशल : अर्थ, प्रकार, शैक्षिक क्रियाकलाप। • मौखिक अभिव्यक्ति कौशल के उद्देश्य, मौखिक अभिव्यक्ति विकास की क्रियाएं, मौखिक अभिव्यक्ति सम्बन्धी त्रुटियों का निवारण। • पठन कौशल की प्रक्रिया, प्रकार, पठन अभिरूचि का विकास, पठन सम्बन्धी त्रुटियों का निवारण। • लिखित अभिव्यक्ति कौशल का विकास, लेखन का महत्व, प्रक्रिया, लिखित रचना के प्रकार एवं उनका शिक्षण।
इकाई -4	**हिन्दी भाषा शिक्षण के लिए अनुदेशन योजना** • ब्लूम द्वारा निर्धारित अनुदेशनात्मक उद्देश्य। • हिन्दी शिक्षण कौशलों का विकास : प्रस्तावना कौशल, व्याख्या कौशल, उदाहरण कौशल,उद्दीपन परिवर्तन कौशल और प्रश्न कौशल। • हिन्दी पाठ योजना (गद्य, पद्य एवं व्याकरण) का अर्थ, महत्व, एवं रूपरेखा। • हिन्दी में मूल्यांकन : अर्थ, महत्व, विभिन्न विधियाँ एवं साधन।
कार्य सम्पादन रणनीतियाँ	इकाई-1 -व्याख्यान, समूह चर्चा, पावरप्वाइंट प्रस्तुतियाँ, एम ओ ओ सी और ई-लर्निंग का उपयोग इकाई-2 व्याख्यान, समूह चर्चा, स्कूल के अध्ययन के अध्यापन के भाषा के खेल, ऑडियों और वीडियों सामग्री आदि का उपयोग। इकाई-3 व्याख्यान विधि-समूह चर्चा, प्रदर्शन विधि का प्रयोग एवं पावरप्वाईंट प्रस्तुति, ई-लर्निंग आदि का उपयोग। इकाई-4 व्याख्यान विधि- समूह चर्चा, प्रदर्शन विधि का प्रयोग एवं पावरप्वाईंट प्रस्तुति, ई-लर्निंग, एम ओ ओ सी का उपयोग।

व्यवहारिक कार्य :

- छात्रों में संचार की समस्या/आशंका का पता लगाने के लिए बाहरी स्कूलों का दौरा।
- श्रवण, मौखिक, पठन और लेखन कौशल विकसित करने के लिए खेल और व्यायाम करना।
- श्रवण, मौखिक, पठन और लेखन कौशल विकसित करने पर गतिविधियाँ- मौखिक प्रस्तुतियाँ, वहस, भाषण, चर्चा एवं ब्रेनस्टार्मिंग, अनुच्छेद एवं निबंध लेखन।

इसके अतिरिक्त विद्यालय एवं समुदाय आधारित गतिविधियाँ भी आयोजित की जायेगी जिसके अन्तर्गत छात्रो को अधिगम एवं शिक्षक प्रशिक्षण संस्थाओ मे भ्रमण कराया जायेगा। शिक्षण प्रशिक्षण एवं स्कूल आधारित क्रियात्मक अनुसंधान भी कराये जायेगे।

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- पाठक, आर. पी. (2013). *हिंदी भाषा शिक्षण,* द्वितीय एडिशन, कनिष्क पब्लिशर, डिस्ट्रीब्यूटर, नई दिल्ली
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- *समझ का माध्यम*, राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्, नई दिल्ली।
- *आंकलन स्त्रोत पुस्तिका*, राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्, नई दिल्ली।
- *अभिव्यक्ति और माध्यम*, राष्ट्रीय अनुसंधान और प्रशिक्षण परिषद्, नई दिल्ली।
- *सृजन-1*, राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्, नई दिल्ली।
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वेब रिसोर्स :

- https://hi.wikipedia.org/wiki/शिक्षणविधियाँ
- https://www.hindisahity.com/hindi-teaching-methods
- https://samanyagyanedu.in/हिंदीशिक्षणविधियाँ
- www.manuu.ac.in/DDE.../BED%20215%20DST%20Hindi.pdf
- https://www.scribd.com/.../हिंदीभाषा

- https://www.amazon.in/हिन्दी_भाषा_इसकी_शिक्षण.../dp/8120350030

Year	**I**	**PEDAGOGY OF ENGLISH**	**Credits**	4
Semester	**II**		**Course code**	SOE 02 02 05 DCEC3104
Learning Outcomes	After the completion of the course, students will be able to: • Understand the concept, nature and functions of language. • Comprehend the importance of English in a multilingual society. • Learn about ways of developing basic language skills. • Critically explain and adopt various teaching methods and approaches as per their suitability to the content to be taught. • Design and develop effective lesson-plans for various genres such as poetry, prose, grammar and composition. • Develop and incorporate teaching skills for effective teaching and learning. • Design various activities for language acquisition in classroom. • Familiarize themselves with the ways of assessment in teaching learning process.			
Course Content				

Unit -1	**An Overview of specificities of the English Language and Basic Language Skills**
	1. English language: Nature, functions and importance in special reference to India 2. English Linguistics and Language Teaching- Sound Patterns and Word Formation 3. Teaching of basic Language Skills and components ❖ Listening ❖ Speaking ❖ Reading ❖ Writing ❖ Grammar ❖ Vocabulary
Unit -2	**Approaches, Methods and Techniques of Teaching English**
	Approaches ❖ Structural Approach ❖ Lexical Approach ❖ Communicative Approach ❖ Constructivist Approach **Method** ❖ Grammar Translation Method ❖ Direct Method ❖ Audio-lingual method **Techniques** ❖ ICT integration ❖ Discussions and Debates ❖ Role Play

	❖ Language Games
Unit -3	**Basic Teaching Skills and Micro Lesson Planning**
	• Basic Teaching Skills: Meaning, components and micro lesson • Skill of Introduction • Skill of Explanation • Skill of Probing question • Skill of Illustration with examples • Skill of Stimulus Variation • Skill of Class-Room Management • Skill of Using Writing Board • Skill of Reinforcement
Unit -4	**Teaching of English Genres and Lesson Planning and Assessment**
	• Lesson Planning: Yearly, Unit and Daily Lesson, need and importance • Approaches to Lesson planning: Herbartian and Constructivist • Revised Bloom's Taxonomy of writing instructional objectives in behavioral terms • Teaching of Prose: Aims and steps • Teaching of Poetry: Aims and steps • Teaching of Composition: Aims and steps • Teaching of Grammar: Aims and steps **Assessment** • Assessment of Listening

	• Assessment of Speaking • Assessment of Reading • Assessment of Writing • 360° Holistic Assessment: NEP vision
Transaction Strategies	Lecture, Discussion, Debates, Games, Exercises, Use of audio-visual materials, Exposition, Reading demonstration, Games, Exercise, short and long lecture, e-learning etc.

Practicum :

- Planning and presentation of lesson plan on any topic demonstrating all the major teaching skills.
- Record of any event organized in schools to develop reading, writing, speaking and listening skills through extempore, declamation and discussion.
- PPT Presentation on give topic of syllabus.

Suggested Readings:

- Agnihotri, R.K., Khanna, A.L. (1994) (eds.), Second language acquisition: Socio-cultural and linguistic aspects of English in India (RAL1). New Delhi: Sage Publications
- Brown, H.D. (2010). *Language assessment: Principles and classroom practices.* Pearson Education.
- Chapman, D. (2011). *Teaching English as a second language: a guide for teaching children (TESL or TEFL).* Trafford Publishing.
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Year	I	PEDAGOGY OF SOCIAL SCIENCES	Credits	4
Semester	II		Course code	SOE 02 02 06 DCEC3104
Learning Outcomes	After the completion of the course, students will be able to: • Understand Social Science as a discipline. • Evaluate the importance of teaching of Social Science at the secondary school level. • Apply the methods and approaches of teaching Social Sciences. • Design lesson plans based on different approaches. • Equip with the skills to update the text books of Social Science.			

	• Equip the student trainees with the skills of diagnostic and remedial teaching.
Course Content	
Unit -1	**Social Science as a subject**
	• Social Science as a school subject • Nature and Scope of Social Science and Place of Social Science in school curriculum • Aims & Objectives of Teaching Social Science at secondary school level • Bloom Taxonomy
Unit -2	**Approach, Methods and planning of Teaching Social Science**
	• Approach: Herbertian., RCEM and Constructivist • Method: Narration Cum Discussion, Role-Play, Project Method, Problem Solving, Storytelling and Source Method • Lesson Plan : Objective, need and importance • Teaching Aids: Audio, Visual and Audio-visual (meaning, use, merit and limitation)
Unit -3	**Teaching Skills, Teacher, Resource Center and Text Book of Teaching Social Science**
	• Teaching skills : Introductory, Reinforcement, Writing Board, Stimulus Variation, Probing Questioning And Illustration with example • Characteristics and qualities of Social Science teacher • Need, importance and arrangement of Social Science Resource Centre • Social Science Text book: Characteristics and Analysis
Unit -4	**Evaluation in Social Science**
	• Evaluation: Meaning and types • Evaluation Tools: Check list, observation and interview • Test and its types

	• Diagnostic and Remedial Teaching: Concept, need and importance
Transaction Strategies	Lecture-cum-discussion along with interactive group discussion, field trips, group discussions, brainstorming and simulation in the form of mock session, Bal Panchayat etc.

Practicum : Arrange any two activity : each out of the following two groups:

1) **Educational visit:**
   - ❖ Historical places
   - ❖ Ecological places
   - ❖ Political places

2) **Organization of Programme**
   - ❖ Social Awareness
   - ❖ Election Awareness
   - ❖ Exhibition
   - ❖ Preparation of Annual Plan, Unit Plan and Lesson Plan
   - ❖ Scrapbook

Suggested Readings:

- Bhattacharya, S. & Darji, D.R. (1966). *Teaching of Social Studies in Indian Schools*, Acharya Book Depot, Baroda.
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- Sharma, B.L., & Shukla, A.K. (2018). *Teaching of social science.*Meerut: R. Lal Publication.
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Year	**I**	**PEDAGOGY OF MATHEMATICS**	**Credits**	4
Semester	**II**		**Course code**	SOE 02 02 07 DCEC3104
Learning Outcomes	After the completion of the course, students will be able to: • Understand Mathematics as a school subject • Explore aims and objectives of teaching Mathematics at Secondary School level. • Select appropriate methods and strategies of teaching Mathematics.			

	• Use approaches of designing lesson plans. • Develop teaching skills for teaching Mathematics. • Construct appropriate tools for evaluating Mathematics learning. • Apply a variety of assessment techniques and practices by formal or informal ways.
Course Content	
Unit -1	**Mathematics as a school subject**
	• Mathematics as a school subject • Correlation of Mathematics with other school subjects • Aims and Objectives of teaching Mathematics at secondary school level • Bloom's Taxonomy of writing Instructional Objectives in behavioural terms
Unit -2	**Approaches and Skills of teaching Mathematics**
	• Approaches of Formulation of instructional objectives in Behavioural Term: ❖ RCEM ❖ Constructivist ❖ Herbart • Basic Teaching skills of Mathematics: ❖ Introducing the Lesson ❖ Probing Question ❖ Explanation ❖ Illustration with Examples ❖ Stimulus Variation ❖ Board Writing

Unit -3	**Methods and Resources for Teaching Mathematics**
	• Methods of Teaching Mathematics: ❖ Inductive- Deductive Method ❖ Analytic –Synthetic Method ❖ Laboratory Method ❖ Activity Based Method ❖ Project Method ❖ Problem Solving Method • Resources of teaching Mathematics: ❖ Text Book ❖ Mathematics Labs ❖ Mathematics Club ❖ Mathematics Library ❖ ICT equipped classroom ❖ Mathematics Learning Software ❖ Audio- Visual Aids
Unit -4	**Planning & Evaluation**
	• Planning: Yearly, Unit and Daily Lesson • Meaning, Need and Importance of Lesson Plan • Approaches of Lesson planning: Herbertian and Constructivist • Evaluation: Formative and Summative • Tools and Techniques of Evaluation • Construction of an Achievement Test with Blue Print

Transaction Strategies	Lecture cum Discussion should follow around readings. Students should be given hands on experiences and appropriate illustrations be made around methods and strategies. Visit to mathematics library and laboratory and hands on experience to students, e-platforms, library assignment. Critical analysis of the school textbook and syllabus will be made.

Practicum :

- Content Analysis of Position paper of National Focus Group on Teaching of Mathematics
- Prepare a report about the contribution of Indian Mathematicians Mathematics.
- Prepare a report on the History of Mathematics (Number System & Measurement etc.)
- Critically Review of Mathematics Text book and make a report
- Observation of children doing everyday Mathematics, community numeracy practices and make a report.
- Development and trying out of Teaching-learning strategy for teaching of particular Mathematical concepts.
- Construction of Mathematical Working and Non-Working 2D and 3D Models
- Development and use of Mathematics laboratory.
- Organizing a 'Math mela' in a school or a locality and write a report
- Lesson Plan on one topic from secondary school mathematics
- Construction of an achievement test with blue print
- PPT Presentation on give topic of syllabus

Suggested Readings:

- Anice, J. (2016). *Methods of teaching mathematics*. New Delhi: Neelkamal Publications.
- Ang. K.C.(2019).*Mathematical modelling for teachers*. London:Springer.
- Boston, M.L., Kendela, A.G. & dixon, K.J. (2019). *Making sense for teaching of mathematics*.Bloomington:Solution Tree Press.
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- Leonard, J. (2019). *Culturally specific pedagogy in the mathematics classroom: Strategies for teachers and students*.New York: Routledge.
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- Siddiqui, M.H .(2009). *Teaching of mathematics*. New Delhi: APH Publishing House.
- Upadhyay, R. (2014).*Teaching of mathematics*. Meerut: R.Lall Publication.

Web resources

- https://www.youtube.com/watch?v=2AqXZJD92Ig
- https://www.youtube.com/watch?v=oEMOEjQocgY

- https://www.youtube.com/watch?v=hbDkSaSnbVM
- https://www.youtube.com/watch?v=1O19-MTwTh1
- https://www.youtube.com/watch?v=Mrldc-Hs-is
- https://www.youtube.com/watch?v=lhwAMhZQ6kU
- http://mathigon.org/resources/value-of-mathematics.pd

Year	**I**	**PEDAGOGY OF LIFE SCIENCE**	**Credits**	4
Semester	**II**		**Course code**	SOE 02 02 08 DCEC3104

Learning Outcomes	After the completion of the course, students will be able to: • Explain the need and importance of life sciences at school level. • Differentiate between aims and objectives of teaching Life Science. • Write instructional objectives in behavioural terms. • Use various teaching methods and skills used in teaching of life science. • Construct Micro-lesson plan based on various skills. • Construct lesson plan based on different approaches. • Choose appropriate teaching aids according to the need of the topic. • Acquaint the importance of evaluation and assessment in pedagogy of life science
Course Content	
Unit -1	**Conceptual Understanding of Pedagogy of Life Science and Planning of Instruction** • Need and Importance of Teaching of Life Science. • Interdisciplinary Linkage of Life Science. • General Aims Objectives of Teaching of Life Sciences at secondary school level. • Bloom's Taxonomy
Unit -2	**Practicing of Teaching Skills, Methods and Lesson Planning** • Lesson Plan: Meaning, Concept, importance. • Construction of Lesson Plan based on different approaches. • Basic Teaching skill; Introducing the Lesson, Reinforcement Skill, Questioning, Explaining, Illustration with Example, Board Writing Skill, Stimulus Variation Skill • Methods of Teaching; Lecture Method, Demonstration Method, Laboratory Method, Project Method, Heuristic Method
Unit -3	**Learning Resources in Life Science**

	• Learning Resources in Life science; Print Resources, Audio, Visual, ICT Resources, Community Resources • Biology experiment kit field visit and Excursion, Planning, its organization and observation • Biology Laboratory; Design and components of Life Science laboratory • Qualities of life science teacher.
Unit -4	**Assessment and Evaluation in Life science**
	• Pedagogical analysis; meaning, concept and Steps involved. • Assessment in Life Science learning; Assignment, Project, Portfolio, reports • Non-testing methods of assessment for life science Learning: Observation of learners in action, rating of participation in various tasks and activities • Blue Print, Test • Test Items and its types.
Transaction Strategies	Lecture cum discussion, Lecture cum demonstration, Use of PPT, Assignments on various topics, Presentation and discussion, Debate and presentations by Pupil Teachers will be encouraged.

Practicum :

- Presentation of lesson plan using various basic teaching skills
- Visit in nearby 5 school and prepare a report on Science Laboratory
- Critical analysis of a test paper of Biological Science.
- Critical review of a text book of science.
- Critical analyze the Practical Aspect /syllabi of science/ life science and prepare a report over that.

Suggested Readings:

- Abraham, I., & Reiss, M. (2016). *Enhancing learning with effective practical science* (Ist ed.). London: Bloomsbury Publishing House.
- Agarwal, K. P., & Bain M. P. (2019). *Powerful teaching: unleash the science of learning*. New Jersey: Wiley publishing House.

- Ahmad, J. (2014). *Teaching of biological science*. Delhi: PHI Learning Private Limited
- Amit (2002). *Teaching of physical sciences*. New Delhi: Anmol Publications.
- Gupta, S.K. (1985). *Teaching of physical science in secondary schools*. New Delhi: Sterling Publications (Pvt.) Limited.
- Keith, S. T. (2018). *Master class in science teaching* (1st Ed.). London: Bloomsbury Publishing House.
- Kootchar, S.K. (2003). *Methods and techniques of teaching*. Sterling Publishers Pvt Limited.
- Kohli, V.K. (1998): *How to teach science*. Ambala: Vivek Publishers.
- Kulshrestha, S.P. & Singh, G. (2013). *Teaching of physical science.* Meerut: R. Lall Book Depot.
- Kulshrestha, S. K. (2007). *Teaching of science*. New Delhi: Lotus Press.
- Kumar,R. & Kumar. (2000). *Teaching of science*. Mangal Deep Publication.
- Kumar, P & Ramaiah, K. & Sreedharacharyulu, K. (2016). *Pedagogy of physical science.* New Delhi: Neelkamal Publication.
- Laxmi, G. B.& Rao, Bhaskara (2004). *Methods of teaching life Science,* New Delhi: Neelkamal Publication.
- Mangal, S.K. (1997). *Teaching of life science*. New Delhi:Discovery Publishing House.
- Nagaraju, M.T. V& Vanaja, M. (2015). *Methods of teaching of physical science.* New Delhi: Neel Kamal Publications.
- Pahuja, S. & Ravikant. (2016). *Pedagogy of school subject biological science.* New Delhi: Neel Kamal Publication.
- Pedagogy of Biological Science. (2015). Retrieved from http://www.senthilcollegeedu.com/Pedagogy%20of%20Biological%20Science.pdf
- Position Paper on Teaching of Science. (2006). Retrieved from http://epathshala.nic.in/wp-content/doc/NCF/Pdf/science.pdf
- Pandey. (2003). *Major issues in science teaching*. New Delhi: Sumit Publications.
- Prasad Janardan. (1999). *Practical aspects in teaching of science*. New Delhi: R. Lall Publication
- R. vijaylatha, & Sunitha, D. (2016). *Pedagogy of Biological Science.* New Delhi: Kanishka Publication.
- Teaching of Science (n.d.). Retrieved from http://www.ncert.nic.in/departments/nie/dse/activities/advisory_board/PDF/teaching_sc.pdf

Web resources

- http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/science.pdf Retrieved November 16, 2018
- http://www.ncert.nic.in/rightside/links/pdf/h_focus_group/Vigyan%20Shikshan.pdf Retrieved November 16, 2018

- http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/aims_of_education.pdf Retrieved November 16, 2018
- http://www.ncert.nic.in/departments/nie/desm/publication/pdf/basic_in_education.pdf Retrieved November 16, 2018
- http://www.ncert.nic.in/departments/nie/desm/publication/pdf/phy_sci_partI.pdf Retrieved November 16, 2018
- http://www.ncert.nic.in/departments/nie/desm/publication/pdf/phy_sci_PartII.pdf Retrieved November 16, 2018

Year	I	PEDAGOGY OF PHYSICAL SCIENCE	Credits	4
Semester	II		Course code	SOE 02 02 09 DCEC3104
Learning Outcomes	After the completion of the course, students will be able to: • Familiarize with concept and nature of Physical Science. • Acquaint with the importance of teaching of Physical Science at secondary school level. • Develop scientific thinking in themselves, students and communities. • Prepare lesson plans based on different approaches. • Familiarize with the learning resources and instructional aids. • Describe the importance of educational technology for teaching of Physical Science. • Learn the methods and pedagogical analysis of teaching of Physical Science.			
Course Content				
Unit -1	**Conceptual Understanding and Objectives of Teaching Physical Science** • Concept, Nature, Scope and Value of Physical Science as a Subject of the School Curriculum • Correlation of Science with subjects (Mathematics, Social Studies, Geography, Health & Physical Education). • Aims and Objectives: Meaning and Difference between the terms, Aims of teaching Physical Sciences at Middle and Secondary level with special reference to NCF 2005 • Bloom's Taxonomy of Educational Objectives (Cognitive, Affective and Psychomotor): Traditional and Revised • Approaches of writing objectives in behavioural terms: Robert Mager, Miller and RCEM approach			
Unit -2	**Basic Teaching Skills, Methods and strategies of Teaching Physical Sciences** • Basic teaching skill: Meaning and Components of Skills (Skill of Introducing the Lesson, Skill of Reinforcement, Skill of Probing Questioning, Skill of Illustration with Example, Skill of Explanation, Skill of Stimulus Variation, Skill of Board Writing, Skill of Classroom Management)			

	• Methods of Teaching Physical Science: Lecture-Cum Demonstration, Project Method, Laboratory Method, Heuristic Method, Brainstorming • Strategies of Teaching Physical Science: Team Teaching, Panel Discussion, Field Trips, Science Club, Science Fairs and Exhibition
Unit -3	**Pedagogical Analysis, Lesson Planning & Evaluation**
	• Pedagogical analysis: Utility, Principles, Steps in Pedagogical Analysis • Pedagogical analysis of any one of the topic from Science text book from class 6th to 10th referred by NCERT • Lesson Plan: Essential features, Advantages, Requirement, Approaches to Lesson Plan: Herbertian Approach, Constructivist Approach • Evaluation: CCE, meaning and needs, Types, Qualities of a good test, Blue Print • Action Research: Meaning, Steps and importance
Unit -4	**Instructional material and Teacher of Physical Science**
	• Instructional Aids: Meaning, Need, Types (Charts, Models, Display Boards, and Black Board, Computer, Science Kit and their merits & demerits.) • Improvisation: Meaning, need and importance • Laboratory: Planning, equipping and organization • Text book: Meaning, Qualities of a good Science Textbook, Critical Analysis of a Secondary School Physical Science Textbook, Procedure of Textbook selection • Physical Science Teacher: Qualities and Duties
Transaction Strategies	Lecture cum discussion, Lecture cum demonstration, Use of PPT, Assignments on various topics, Presentation and discussion, Debate and presentations by Pupil Teachers will be encouraged.
Practicum : Lesson plan presentation on any topic of Physical Science book from Class VIth -X th by using all (mentioned in syllabus) basic teaching	

skills.

Suggestive Readings:

- Albert, Paul (2017). *Pedagogy of Physical science*. New Delhi: Blue Rose Publishers.
- Kochhar, S.K. (2003). *Methods and techniques of teaching*. New Delhi: Publishers Pvt. Ltd.
- Kohli, V.K. (1998). *How to teach science*. Ambala: Vivek Publishers.
- Kulshrestha, S.P., Singh, Gaya (2013). *Teaching of physical science*. Meerut: Raj Printers.
- Kumar, Pramod , Ramaiah, K. , Sreedharacharyulu,K. (2016). *Pedagogy of Physical Science*. Meerut: R.Lall.
- Mangal, S.K., Mangal, Shubhra (2018). *Pedagogy of Physical Sciences*. Meerut: International Publishing House.
- Nagaraju, M.T.V., Vanaja, M. (2015). *Methods of teaching of physical science*. New Delhi: NeelKamal Publications.
- NCF (2005). *National curriculum framework*. New Delhi: NCERT.
- NCERT. (2006). *Position paper on teaching of science*. New Delhi: NCERT.
- Pal, Sangeeta (2016).*Pedagogy of Physical Science*. Agra: Rakhi Prakashan.
- Pandey. (2003). *Major issues in science teaching*. New Delhi: Sumit Publications.
- Praveen, Manoj G.,Haseen, Koya. M. P.(2016). *Teaching Science Resource,Methods and Practices - (Physical Science & Natural Science*. New Delhi: Neelkamal Publishers.
- Radha Mohan. (2016). *Teaching of physical science*. New Delhi: Neelkamal Publishers.
- Rahi, Avtar Singh (2018). *Pedagogy of Physical Sciences and Teachers*. Colorado (U.S.A.): Create space Independent Publishing Platform.
- Rajasekar, S. (2016). *Methods of Teaching Physical Science*. New Delhi: Neelkamal Publishers.
- Rao, N. Venkat, Ramulu,Ch. A. (2016). *Pedagogy of Physical Sciences*. New Delhi: Neelkamal Publishers.
- Sharma, R.C. (2006). *Modern science teaching*. New Delhi: Dhanpat Rai Publishing Comp.
- Sharma, R.P. (2010). *Teaching of physical science*. Meerut: R.Lall.
- Sood, J.K. (1992). *New directions in science teaching*. Chandigarh: Kohli Publishers.
- Tolman, Marvin N. (2006). *Hands on Physical Science Activities*. United States: Jossey Bass (Wiley).

Web Resources:

- http://sprabhakngce.blogspot.com/
- http://www.ncert.nic.in/textbook/textbook.htm
- http://www.ncert.nic.in/ncert/textbook
- http://www.ncert.nic.in/rightside/links/pdf/framework/ncf_hindi_2005/ncf2005.pdf
- http://www.ncert.nic.in/rightside/links/pdf/framework/english/nf2005.pdf

Year	I	PEDAGOGY OF ECONOMICS	Credits	4
Semester	II		Course code	SOE 02 02 10 DCEC3104
Learning Outcomes	After the completion of the course, students will be able to: • Explain Meaning, & Scope of Economics. • Know the aims and objectives of teaching Economics at secondary school level. • Understand various approaches of writing instructional objectives in behavioural terms. • Use various approaches of lesson planning in designing their lesson plans. • Understand appropriate methods, aids and techniques of teaching Economics at secondary school level. • Develop skills to update the text books of Economics. • Equip the student trainees with the skills of diagnostic and remedial teaching.			
Course Content				
Unit -1	**Conceptual understanding, aims and objectives of Economics** • Concept, Need and Importance of Economics • Nature and Scope of Economics and Place of Economics in school curriculum • Aims & Objectives Teaching of Economics • Bloom Taxonomy			
Unit -2	**Methods, Planning and Instructional aids of Teaching Economics** • Narration cum discussion, role-play, Project method, Problem solving, storytelling, Source method (meaning, uses and limitations)			

	• Unit Plan: objective, needs and importance • Lesson plan : objective, needs and importance • Teaching Aids: Audio, Visual and Audio-visual (meaning, use, merit and limitation)
Unit -3	**Basic teaching skills, Teacher, Resource Center and Text book of teaching Economics**
	• Teaching skills : introductory, reinforcement, writing board, stimulus variation, probing questioning and Illustration with example • Characteristics and qualities of Economics teacher • Need, importance and arrangement of Economics Resource centre • Text book: Characteristics of good text book, analysis of text book in Economics
Unit -4	**Evaluation in Teaching Economics**
	• Meaning of evaluation and examination • Tools of evaluation in Economics (Check list, observation, interview) • Types of test (Meaning, Construction, Merit, Limitation) • Concept, Need and importance of diagnostic and remedial work in Economics
Transaction Strategies	Lecture-cum-discussion along with interactive group discussion, field trips, group discussions, brain-storming and simulation in the form of mock session, case study of banks and insurance etc.
Practicum : • Preparation of Annual plan, Unit plan and Lesson plan • Identifying and Evaluating ICT resources suitable for teaching Economics • Develop a Multi-Media lesson using appropriate ICT resources and transacting the same before peers in simulated teaching exercise. • Action Research Project Report	

- Visits can be organized to
  - ✓ RBI and other Banks
  - ✓ Any Industry or Factory
  - ✓ Finance ministry

*** In addition, school and community based activities may be organized with provisions for visits to innovative centres of pedagogy and learning, innovative schools, educational resource centres, etc. Action research based on teaching learning and school and community could be conducted.**

Suggested Readings:

- Arora, P.N. And Shorie, J.P. (1986). *Open book examination question in economics*, New Delhi: NCERT.
- Assistant Masters Association (1974). *The Teaching of Secondary School Examinations*, London Cambridge University Press.
- Bawa M. S. (ed.) (1998). *Source Book on Strategies of Teaching Social Sciences*, IASE, Deptt. of Education, Delhi University.
- Bawa, M. S. (ed.) (1995). *Tendering of Economics: Contemporary Methods and Strategies for Secondary and Senior Secondary levels*, IASE, Deptt. of Education, Delhi University.
- Bawa, M. S. (ed.) (1996). *Evaluation in Economics*, IASE, Deptt. of Education, Delhi University.
- Blanchard, O., *Macroeconomics*, 4th Edition, Prentice Hall.
- Chakravorty, S. (1987). *Teaching of Economics in India*, Bombay, Himalaya Publishing.
- Dornbusch, R., Fischer, S & Startz, R., (2015). *Macroeconomics*, 11th edition, McGraw Hill.
- Mishra & Puri, (1995). *Economic development and planning*. Himalaya publishing house.
- Lekhi R.K., (2014). *Economics of Development and Planning*. kalyani Publishers
- Hicks, J.R. (1960). *The social framework- an introduction to economics*, London: Oxford University Press.
- Hodkinson, Steve, Whitehead & David J. (ed) (1986). *Economics Education: Research and Development Issues*, London, New York: Longman.
- Hazlitt, H. (2010). *Economics in one lesson: the shortest and surest way to understand basic economics. Currency.*
- Mishra & Puri (2015). *Indian economy*. Himalaya Publishing house.

- Dutt & Sundaram, (2016). *Indian economy*, S.Chand Publisher.
- Ahuja, H.L.(2016). *Micro economics*. S.Chand Publishers.
- Salvatore, D.. and Reed, (2013). *International economics* 11th edition, Wiley.
- Soderston, B.O. (1991). *International economics*, Macmillan.
- Siddiqi, M.H. (1998). *Teaching of economics*, New Delhi: Ashish Publishing House.
- Srivastava, H.S. (1976). *Unit Tests in Economics*, New Delhi, NCERT.
- Verma, S. (2018). *Bhartiya arthvyastha*, New Delhi: unique publisher.

Web resources

- www.cseindia.org (for documentary films and DVD)
- www.india-seminar.com
- Janchetana.blogspot.com (Hindi and English)
- http://www.ibe.unesco.org/publications/educationalpracticesseries
- 1947PartitionArchive.org
- http://www.indiabudget.nic.in/survey.asp
- dsal.uchicago.edu
- http://bombay.indology.info/mahabharata/statement.html
- http://archive.is/http://www.sdstate.edu/projectsouthasia
- Position Paper National Focus Group on Teaching of Social Sciences, NCERT

http://www.ncert.nic.in/new_ncert/ncert/rightside/links/pdf/focus_group/social_sciencel.pdf

- Package in social science for professional development of in-service teachers, NCERT

http://www.ncert.nic.in/departments/nie/dess/publication/prin_material/ITPD%20Final%20june%2014.pdf

Year	I	PEDAGOGY OF COMMERCE	Credits	4
Semester	II		Course code	SOE 02 02 11 DCEC3104
Learning Outcomes	After the completion of the course, students will be able to: • Explain Meaning, & Scope of commerce. • Know the aims and objectives of teaching commerce at secondary school level. • Understand various approaches of writing instructional objectives in behavioural terms. • Use various approaches of lesson planning in designing their lesson plans. • Understand appropriate methods, aids and techniques of teaching commerce at secondary school level. • Develop skills to update the text books of Social Science. • Equip the student trainees with the skills of diagnostic and remedial teaching.			
Course Content				
Unit -1	**Conceptual understanding, aims and objectives of Commerce** • Concept, Need and Importance of Commerce • Nature and Scope of Commerce and Place of Commerce in school curriculum • Aims & Objectives Teaching of Commerce • Bloom Taxonomy			

Unit -2	**Methods, Planning and Instructional aids of Teaching Commerce**
	• Narration cum discussion, role-play, Project method, Problem solving, storytelling, Source method (meaning, uses and limitations) • Unit Plan: objective, needs and importance • Lesson plan : objective, needs and importance • Teaching Aids: Audio, Visual and Audio-visual (meaning, use, merit and limitation)
Unit -3	**Basic teaching skills, Teacher, Resource center and Text book of teaching Commerce**
	• Teaching skills : introductory, reinforcement, writing board, stimulus variation, probing questioning and Illustration with example • Characteristics and qualities of Commerce teacher • Need, importance and arrangement of Commerce Resource centre • Text book: Characteristics of good text book, analysis of text book in Commerce
Unit -4	**Evaluation in Teaching Commerce**
	• Meaning of evaluation and examination • Tools of evaluation in Commerce (Check list, observation, interview) • Types of test (Meaning, Construction, Merit, Limitation) • Concept, Need and importance of diagnostic and remedial work in Commerce
Transaction Strategies	**Unit I:** Lecture followed by discussion supplemented by searches on MOOC's and augmented by power- point presentation analytical and synthetic discussions. **Unit II:** Lectures, discussions, use of MOOCs, e-platforms, library assignment, **Unit III:** Lectures, discussions, library assignments, PowerPoint presentations on various approaches to lesson planning.

	discussion on model lesson plan of commerce formulated by RIE's. **Unit IV:** Lecture followed by discussion supplemented by searches on MOOC's and augmented by power- point presentation analytical and synthetic discussions.

Practicum :

- Design and Deliver a 15 Minutes presentation on any topic by using Lecture method.
- Prepare a report on India's Trade pattern.
- Prepare PowerPoint presentation on any topic covered in pedagogy of commerce syllabus.
- Sessional work/unit test/practicum/ project based activities and Terminal Assessments
- Construction of Achievement test in commerce

Suggested Readings:

- Agrawal, J.C. (2018). *Teaching of commerce: A practical Approach.* New Delhi: Vikas publishing House
- Babu, M. (2009).*Teaching of commerce and accountancy*. Centrum Press.
- Bansal, R.R.(1994). *New trends in teaching of commerce; Models of teaching and conceptual learning.* Anmol Publishing House.
- Busham, Y.K. (1991).*Fundamentals of business organization &Management.*New Delhi: Sultan Chand & Sons
- Chandra, S.S. (2017). *Pedagogy of school subject commerce*. Meerut: R. Lall Publications
- Doshi, S. (2009). *Modern methods of teaching commerce*. Paradise Publishers.
- Jawawi, R. (2010). Reflective practices in teaching economics and commerce. VDM Verlag Publications.
- Khan, M.S. (1982). *Commerce education.* New Delhi: Sterling Publications.
- Kumar, M. (2004).*Modern teaching of commerce.* Anmol Publishing House.
- Lloyd V. D.(1972). *Teaching business subjects (3rd Ed.).* New Jersey: Prentice Hall Publications
- Singh, R.P. & Mansoori, I. (2017). *Pedagogy of school subject commerce*. Meerut: R. Lall Publications
- Singh, Y.K. (2018). *Teaching of commerce*. New Delhi: APH Publishing House.
- Tonne, H.A. (1975). *Methods of teaching business subjects*. New York: McGraw Company Ltd.

- Venkateswarlu, K. (1993). *Methods of teaching commerce*. New Delhi: Discovery Publishing House.

Generic Electric Courses (GECs)

Year	I	ESSENTIALS OF GUIDANCE AND COUNSELING	Credits	4 (2 Theory + 2 Practicum)
Semester	II		Course code	SOE 02 02 03 GEC 2024
Learning Outcomes	After the completion of the course, students will be able to: • Develop conceptual understanding of term Guidance and Counselling. • Differentiate among various types of guidance and counselling. • List the main objectives of guidance and counselling programmes in education • Encourage learners to maintain the highest standards in offering services to individuals, groups and organizations • Critically analyze the role of a teacher as a guide in school • Identify various qualities of a teacher necessary for a counselling role • Develop competencies and skills in individuals to live life smoothly.			
Course Content				
Unit -1	Conceptual Understanding of Guidance			

	• Meaning and Definition of Guidance • Functions of Guidance • Fundamental Principles of Guidance • Need for Guidance Services in India • Types of Guidance: Educational, vocational and Personal • Role of a class teacher in Guidance programme
Unit -2	**Counselling**
	• Concept of Counselling • Difference between Guidance and Counselling • Types of Counselling: a) Direct Counselling b) Indirect Counselling c) Eclectic Counselling • Teacher as a Counsellor
Transaction Strategies	Lecture cum discussion, use of audio visual learning material, discussion brainstorming reflection, conduct counselling sessions, assignments on various topics, and presentation of case study of students in need of counselling, group participation and group discussions conduct of psychological Tests, project work and field.
Practicum : Select any three out of the following 1. Administration and interpretation of any two. a) Intelligence Test b) Interest Inventory c) Aptitude Test	

d) Personality Test

2. Prepare a case study of two students one general and one problem students
3. Planning/Preparing Guidance Programme for School.
4. Plan a Motivational Schedule for enhancing learning
5. Create a School Development Plan for initiating a guidance and counselling programme in schools

Suggested Readings:

- Ajowi, J. O., & Simatwa, E. M. W. (2010). *The role of guidance and counseling in promoting student discipline in secondary schools in Kenya*:
- A case study of Kisumu district. *Educational research and reviews,* 5(5), 263–272. Retrieved from: http://www.academicjournals.org/ERR
- Barki, B. G., & Mukhopadhyay, B. (2008). *Guidance and counselling: A manual* (10th reprint). New Delhi: Sterling.
- Chadurvethi, R. (2006). *Guidance and counseling techniques*, Chennai: S B A Book.
- Chandanpat (2018). *Guidance and counselling*. ND: Educational Publisher & Distributor.
- Chauhan, S.S. (2007). *Principle and techniques of guidance*. New Delhi: Vikas Publishing House.
- Dev, K. (2005). *Educational guidance*. New Delhi: Pragun Publication.
- Gibson, Robert L. & Mitchell, Marianne. H. (2016). *Introduction to counselling and guidance*. New Delhi: Pearson Prentice Hall in India.
- Gladding, R. (2018). Introduction to counselling. ND: Pearson.
- Hurlock, E. B. (2008). *Developmental psychology* (5th ed.). London: McGraw-Hill.
- Mehdi, B. (1967). *Educational & vocational guidance in india,* New Delhi : NCERT.
- Migel,J.(2001). *Counseling in careers guidance*, U S.: Open University Press.
- Nayak, A. K. (2007). *Guidance and counselling*. New Delhi: APH Publishing.
- Okum, B. F., & Kantrwitz, R. E. (2008). *Effective helping: Interviewing and counseling techniques* (7th ed.). Belmont: Thomson.
- Paterson, C.H.(1962). *Counseling and guidance in schools*, New York: Harper & Bros.

- Perry, W. (2008). *Basic counselling techniques: A beginning therapist's toolkit* (2nd ed.). Bloomington: Author House.
- Pesricha, P.(1976). *Guidance & counseling in indian education*, New Delhi : NCERT.
- Roeber, E. & Smith, G. D.(1955). *Organisation and administration of guidance programmes*, New York:Mc Graw Hill Book Co.
- Shaffer, D. R., & Kipp, K. (2010). *Developmental psychology: Childhood and adolescence* (8th ed.). Belmont: Wadsworth.
- Traxler, A.E..(1961). *Techniques of guidance*,New York: Harper & Bros.
- Yuksel-Sahin, F. (2009). The evaluation of counselling and guidance services based on teacher views and their prediction based on some variables. *International journal of instruction*, 2(1)

Year	I	PERFORMING AND VISUAL ARTS	Credits	4 (2 Theory + 2 Practicum)
Semester	II		Course code	SOE 02 02 04 GEC 2024
Learning Outcomes	After the completion of the course, students will be able to: • Understand the concept of Performing and Visual Arts its importance in daily life • Develop competencies and skills for teaching of Art. • Get acquainted with various local, national art forms. • Acquire skills for integrating different art forms across Country for better learning. • Enhance artistic and aesthetic sensibilities among students. • Critically analyse forms of art, performing and visual and its significant role in human life. • Explore various dance forms and their integration in daily life.			

	• Learn to identify areas that are best suited for drama exploration. • Recognize the role of drama as education in elementary school and will learn about different dance styles driven in India.
Course Content	
Unit -1	**Introduction to Performing and Visual Arts (Theory)**
	• Concept of Performing and Visual Arts • Importance of colour • Music, Dance, Theatre • Classical Indian arts
Unit -2	**Acting Direction and Applied Arts (Theory)**
	• Acting according to Natyashastra • Concept of Direction and Design • Understanding concept of advertising • Indian Folk Art
Unit -3	**Performing and Design Technology (Practicum)**
	• Acting (Rasa & Bhava) • Dance and use of body movements • Stage Craft & Design Technology • Basic Drawing • Calligraphy • Waste utilization
Unit -4	**Play Production Process (Practicum)**

	• Performance based on Mime, storytelling & role play • Acting Performance with Voice and speech and body movement • Practical of Direction and Stage Craft • Advertising ideas • Poster Making
Transaction Strategies	Hand on experience of working in different mediums and materials, preparation and presentation of teaching learning materials, workshop, exhibition, slide/film show, project work, group work planning of a stage-setting, visit, role play, celebrations of Indian festivals and fairs brain-storming, interaction with artists, lectures and demonstration.

Practicum :

1. Acting (Integration of Performing Arts in Education)
2. Direction
3. Stage Craft & Design Technology
4. Painting
5. Still Life
6. Calligraphy (Hindi& English)
7. Waste utilization
8. Advertising (Logo & Poster design)
9. Poster Making (Social Activist)

Suggested Readings:

- Chandok Amargeet (2016), *Art and Education*, Delhi: Bookman.
- Chaturvedi Snehlata (2016), *Art Education*, Delhi: Bookman.
- Chauhan Rita (2016), *Drama, Art and Education*, Agra:Agrawal Publications, Sanjay Place.
- Chetan Bharti (2016), *Drama and Art in Education*, Kalyani Publishers.
- Gill Rajesh (2017), *A Textbook of Art Education*, New Delhi: Paragon International Publishers.

- Gill Rajesh (2018), *Art Education*, New Delhi: Paragon International Publishers.
- Jain Ritu (2016), *Art Education*, Delhi: Bookman.
- Kakkar Rekha, Makkhar Ragini (2018), *Drama, Art and Aesthetics in Education*, Agra: Rakhi Prakashan.
- Kumar Rajender (2016), *Drama and art in education*,Rajsthan: Jain Prakashan Mandir.
- NCERT (2006), *Position paper national focus group on Arts. Music, Dance and theatre*. New Delhi: NCERT.
- Raw K. Ravikant and P. Ananad Kumar (2017), *Drama and Art in Education*, Neelkamal.
- Roy Reeta (2017), *Perfect Art Education*, Arya: Publisher Company.
- Saxena Avnish and Sirth Sushil (2016), *Drama, Art and Aesthetics in Education*, Agra:Rakhi Prakashan Raman Tower, Sanjay place.
- Sharma R. P., Sharma R. K. (2016), *Drama and Art in Education*, Agra: Radha prakashan mandir.
- Singh Chitralekha (2016), *Drama and Art in Education*, Agra: Publisher Shri Vinod Pustak Mandir.
- Singh Yadav Narendra (2010), *Advertising Technical and Theory*, Rajsthan: Rajsthan Hindi Granth Akadami, Jaipur.
- Singh Yadav Narendra (2012), *Graphic Design*, Rajsthan: Rajsthan Hindi Granth Akadami, Jaipur.
- Tivari Arjun (2010), *Modern Advertising Art and Behaviour*, Uttar Pradesh:Vishwavidyalaya Prakashan, Varanasi.
- Vatsyayan, kapila (1977), *Classical India Dance in literature and the Arts*, New Delhi: Sangeet natak Akademi.

CENTRAL UNIVERSITY OF HARYANA
Department of Vocational Studies and Skill Development

Date: October 13, 2020

Minutes of the Meeting of the Board of Studies

A meeting of the Board of Studies, Department of Vocational Studies and Skill Development, was held on October 13, 2020, at 12:00 noon, through online mode.

The following members were present:

1. Dr. Pawan Kumar Maurya, Coordinator, Department of Vocational Studies and Skill Development, Central University of Haryana. (Chairperson)
2. Dr. Sandhya Chintala, Executive Director, IT-ITeS Sector Skills Council NASSCOM (SSC NASSCOM) & VP NASSCOM (Member)
3. Professor R. Baskar, Chairperson, Department of Environmental Sciences and Engineering, Guru Jambheshwar University of Science & Technology, Hisar. (Member)
4. Dr. Suyash Mishra, Assistant Professor, B.Voc.-Retail and Logistics Management, Department of Vocational Studies and Skill Development, Central University of Haryana. (Member)
5. Dr. Anoop Yadav, Assistant Professor, School of Engineering and Technology, Central University of Haryana. (Special invitee)
6. Dr. Vikas Saini, Assistant Professor, B.Voc.-Biomedical Sciences, Department of Vocational Studies and Skill Development, Central University of Haryana. (Special invitee)

At the outset, Dr. Pawan Kumar Maurya welcomed the members of the Board of Studies.

In the meeting, the Board discussed and resolved as follows:

1. The Board prepared and recommended the panel of examiners for Odd Semesters (First, Third, and Fifth semesters) Term End Examination Nov /Dec 2020 for each course of general education component of B.Voc.-Retail and Logistics Management, Industrial Waste Management and Biomedical Sciences (Copy Enclosed).

2. The Board discussed and approved the changes in the general education component of syllabi of B.Voc. Biomedical Sciences for the 2020-21 batch onwards as proposed by Dr.

Vikas Saini Assistant Professor, B.Voc.-Biomedical Sciences, Department of Vocational Studies and Skill Development (Copy Enclosed).

The meeting ended with a vote of thanks to the Chair.

Dr. Pawan Kumar Maurya

Dr. Sandhya Chintala — approved in the virtual meet.

Professor R. Baskar — Approved online. document attached

Dr. Suyash Mishra

Dr. Anoop Yadav

Dr. Vikas Saini

Department of Vocational Studies and Skill Development <ddukk@cuh.ac.in>

Meeting of Board of Studies on 13.10.2020 at 12:00 Noon- Reg.

3 messages

Department of Vocational Studies and Skill Development <ddukk@cuh.ac.in> Thu, Oct 8, 2020 at 11:02 AM
To: sandhya@nasscom.in, rbaskargjuhisar@yahoo.com, suyashmishra@cuh.ac.in, yadavanoop@cuh.ac.in, Vikas Saini <vikassaini@cuh.ac.in>

Dear Sir/Madam,
You are requested to please attend the meeting of Board of Studies (BOS) of Department of Vocational Studies and Skill Development, Central University of Haryana on 13.10.2020 at 12 noon through online mode. The link will be shared soon.
Agenda: To discuss the panel of examiners for for Odd Semesters Term End Examination Nov /Dec 2020

Thanking you,

Best regards,
Pawan

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Dr. Pawan Kumar Maurya
Coordinator
Department of Vocational Studies and Skill Development
Central University of Haryana Jant-Pali, Mahendergarh Haryana 123029
Website: www.cuh.ac.in E-mail: hodvssd@cuh.ac.in
Tel (office): +91 (0)-1285-260140

Department of Vocational Studies and Skill Development <ddukk@cuh.ac.in> Mon, Oct 12, 2020 at 3:58 PM
To: sandhya@nasscom.in, rbaskargjuhisar@yahoo.com, suyashmishra@cuh.ac.in, yadavanoop@cuh.ac.in, Vikas Saini <vikassaini@cuh.ac.in>

Dear Sir/Ma'am,

Greeting from the Central University of Haryana!

The Department of Vocational Studies and Skill Development at CUH suggests the experts/members as paper setters for the Term End Examination, Nov/Dec 2020 for odd semesters of all three programmes (B.Voc. Industrial Waste management; B.Voc. Retail and Logistics Management and B.Voc. Biomedical Sciences). In addition, External examiners for the practical exam have been proposed for approval (Attached). I am also enclosing B.Voc. ordinance for your kind information.

It is requested to kindly go through the following names and kindly convey your approval for the same through email as soon as possible.

Online meeting link: meet.google.com/ofq-ozqo-csb

You are requested to please join the meeting on 13-10-2020 at 12 noon.

Thanking you,

Best Regards,

Pawan

[Quoted text hidden]

2 attachments

Department of VSSD-List of examiners for odd semester examination-2020.docx
26K

30-Ordinance-XXX (B.Voc)-41st EC.pdf
2433K

Department of Vocational Studies and Skill Development <ddukk@cuh.ac.in> Mon, Oct 12, 2020 at 4:18 PM
To: sandhya@nasscom.in, rbaskargjuhisar@yahoo.com, suyashmishra@cuh.ac.in, yadavanoop@cuh.ac.in, Vikas Sai[illegible] <vikassaini@cuh.ac.in>

Dear Sir/Madam,
We forgot to add agenda 2.

Please find attached herewith the curriculum of **B.Voc Biomedical Sciences** for the BoS approval. The following changes have been done.

1) Curriculum of Skill education component has been added corresponding to earlier adopted qualifications pack from NSQF level-4 to NSQF level-7.
2) In the Skill education component, the curriculum for Life Skills (Jeevan KAUSHAL) prescribed by UGC has been adopted and distributed among all three years.
3) Communication Skills from the General education component (GEC) have been shifted to the Skill education component (SEC).
4) Minor revision has been done in the GEC and course names have been revised specially for the subjects of chemistry and biochemistry.

For comparison, a copy of the old curriculum has been attached for reference.

It is requested to review the suggestions to take this agenda in tomorrow's BoS meeting.

Thanking you,

Best Regards,
Pawan

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2 attachments

BMS Final 2020-2021.docx
516K

BMS-2018.docx
480K

Department of Vocational Studies and Skill Development <ddukk@cuh.ac.in>

Re: Minutes of the meeting-Board of Studies, Department of Vocational Studies and Skill Development- Baskar-15 Oct 2020

1 message

Baskar <rbaskargjuhisar@yahoo.com> Thu, Oct 15, 2020 at 11:02 AM
Reply-To: Baskar <rbaskargjuhisar@yahoo.com>
To: Department of Vocational Studies and Skill Development <ddukk@cuh.ac.in>, "pkmaurya@cuh.ac.in" <pkmaurya@cuh.ac.in>, Anoop Yadav <yadavanoop@rediffmail.com>

Dear Dr Maurya,

I agree with the minutes and approve.

Regards,

Professor R. Baskar, FGS (*Ind*), FGGS
Department of Environmental Science and Engineering
Guru Jambheshwar University of Science and Technology
Hisar 125 001 Haryana India
Mobile: 00-91-94164 39339 (WhatsApp)
Geological Society of India, Council Member
IUGS-IGEO Geoscience Education Field Officer
IGEO Deputy Counsellor (*India*)
http://www.gjust.ac.in/department/biodata/2020/Web%20CV%201%20January%202020.pdf CV
http://www.igeoscied.org/wp-content/uploads/2016/01/RamanathanBaskar-final.pdf (My Earth Science Educator Story)
http://www.natureasia.com/en/nindia/article/10.1038/nindia.2017.1 (Research)
Email: rbaskargjuhisar@yahoo.com
I check my mails only once a day. If urgent call me.

On Wednesday, 14 October, 2020, 10:53:39 am IST, Department of Vocational Studies and Skill Development <ddukk@cuh.ac.in> wrote:

Dear Sir/madam,
Greetings!

As per meeting of the Board of Studies, Department of Vocational Studies and Skill Development, held on October 13, 2020, at 12:00 noon, through online mode, Please find attached herewith following documents for your kind approval please:

1. Minutes of the meeting

2. List of Examiners for Odd Semesters (First, Third, and Fifth semesters) Term End Examination Nov /Dec 2020

3. Changes in the general education component of the syllabus of B.Voc. Biomedical Sciences for the 2020-21 batch

Please find attached herewith sitting fee/honorarium form. Please fill your details and sign at two places in the back at "Signature of the Claimant".

Thanks for your valuable suggestions and inputs.

Thanking you,
best regards,
Pawan

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Dr. Pawan Kumar Maurya
Coordinator
Department of Vocational Studies and Skill Development
Central University of Haryana Jant-Pali, Mahendergarh Haryana 123029
Website: www.cuh.ac.in E-mail: hodvssd@cuh.ac.in
Tel (office): +91 (0)-1285-260140

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4 attachments

Examiners_for_dec_2020 (update).docx
27K

BMS Final 2020-2021 (1).docx
490K

Minutes of the BOS Meeting_Oct 2020_VSSD.docx
18K

Sitting Fee-Honorarium form.pdf
775K

Syllabus

B. Voc.

(BIOMEDICAL SCIENCES)

Department of Vocational Studies and Skill Development

Central University of Haryana
Mahendergarh, Haryana

STRUCTURE OF B.VOC. (BIOMEDICAL SCIENCES) PROGRAMME:

Module Code	Name of Course	Credits (T+P)	Marks
YEAR – 1, SEMESTER – I			
GENERAL EDUCATION COMPONENT			
BMS-101	Human Physiology	**4** (4+0)	100
BMS-102	Basic Organic Chemistry	**4** (4+0)	100
BMS-103	English Communication	**2** (2+0)	50
BMS-104	Practical	**2** (0+2)	50
	TOTAL	**12**	300
SKILL COMPONENT			
Specific job roles defined by SSCs as per guidelines of NSQF		**18**	
YEAR – 1, SEMESTER – II			
GENERAL EDUCATION COMPONENT			
BMS-201	Pharmaceutical Physical Chemistry	4 (4+0)	100
BMS-202	Environmental Science	4 (4+0)	100
BMS-203	Biomolecules	2 (2+0)	50
BMS-204	Practical	2 (0+2)	50
		12	300
SKILL COMPONENT			
Specific job roles defined by SSCs as per guidelines of NSQF		**18**	----------
YEAR – 2, SEMESTER – III			
GENERAL EDUCATION COMPONENT			
BMS-301	Metabolism of Biomolecules	**4** (4+0)	100
BMS-302	Microbiology	**4** (4+0)	100
BMS-303	Reactions in Organic Chemistry	**2** (2+0)	50
BMS-304	Practical	**2** (0+2)	50
	TOTAL	**12**	300
SKILL COMPONENT			
Specific job roles defined by SSCs as per guidelines of NSQF		**18**	----------
YEAR – 2, SEMESTER – IV			
GENERAL EDUCATION COMPONENT			

BMS-401	Cell Biology	**4** (4+0)	100
BMS-402	Pharmacology	**4** (4+0)	100
BMS-403	Enzymology	**2** (2+0)	50
BMS-404	Practical	**2** (0+2)	50
	TOTAL	**12**	300
SKILL COMPONENT			
Specific job roles defined by SSCs as per guidelines of NSQF		----------	----------
	TOTAL	**18**	
YEAR – 3, SEMESTER – V			
GENERAL EDUCATION COMPONENT			
BMS-501	Medical Genetics	**4** (4+0)	100
BMS-502	Molecular Biology	**3** (3+0)	75
BMS-503	Medical Biotechnology	**3** (3+0)	75
BMS-504	Practical	**2** (0+2)	50
	TOTAL	**12**	300
SKILL COMPONENT			
Specific job roles defined by SSCs as per guidelines of NSQF		**18**	----------
YEAR – 3, SEMESTER – VI			
GENERAL EDUCATION COMPONENT			
BMS-601	Immunology	**4** (4+0)	100
BMS-602	Applied organic chemistry	**4** (4+0)	100
BMS-603	Medicinal Chemistry	**2** (2+0)	50
BMS-604	Practical	**2** (0+2)	50
	TOTAL	**12**	300
SKILL COMPONENT			
Specific job roles defined by SSCs as per guidelines of NSQF		**18**	----------

BMS-101: Human Physiology **Credits: 4**

Unit 1: The tissue level of organization **(5h)**

Types of tissues, Embryonic origin of tissues, Tissue membranes, Classification of epithelial tissue, Connective tissue, Muscle tissue and nervous tissue.

Disorders: Tissue injury and Aging, Cancer

UNIT 2: Blood **(10h)**

Overview of blood, Characteristics of blood, Blood plasma, Shape and structure of erythrocytes and haemoglobin, Life cycle of erythrocytes. Disorders of erythrocytes, Structure and function of Leukocytes and platelets, Disorder of platelets. Hemostasis. Disorders of clotting.

Unit 3: Bone tissue and skeletal system **(8h)**

Functions of Skeletal System, Bone classification, Bone structure, Bone cells and tissues, Bone formation and development.

Disorders: Bone fractures

Exercise, Nutrition, Hormones and bone tissues, Calcium homeostasis

Unit 4: Gastrointestinal and Hepatic system **(7h)**

Overview of digestive system, Digestive system processes and regulation in the mouth, pharynx, oesophagus, Stomach, small and large intestine.

Accessory organs in digestion: Liver, pancreas and gall bladder.

Chemical digestion and absorption.

UNIT 5: The nervous system and nervous tissue **(9h)**

Basic structure and function of the nervous system, The central and peripheral nervous system, Functional division of nervous system, Nervous tissue, parts of neurons, types of neurons, Functions of nervous tissue, Action potential, Communication between neurons, Synapse, Neurotransmitters

Unit 6: Renal Physiology **(6h)**

Physiology of urine formation, Endocrine regulation of urine function

UNIT 7: The Endocrine system **(10h)**

Neural and endocrine signalling, Hormones, Types of hormones, Pathways of hormone action, Regulation of hormone secretion.

Function and regulation of the hormones secreted by following glands: Pituitary and hypothalamus, Thyroid, Parathyroid, Adrenal, Endocrine Pancreas, Gonadal and placental hormones.

Organs with secondary endocrine functions.

Unit 8: Fluid electrolytes and acid-base balance **(5h)**

Body fluids and fluid compartments, Composition of body fluids, Fluid movement between compartments, Water balance, electrolyte balance, Acid-base balance, buffer systems in the body, disorders of acid-base balance in the body.

BMS-102 Basic Organic Chemistry **Credits: 4**

Unit 1: Organic intermediates: (10h)

Reactive Intermediates -Carbocations: Generation, structure, stability and reactivity; Carbanions: Generation, structure, stability and reactivity; Free Radicals: Generation, structure, stability and reactivity; Concept of Electrophile and Nucleophile, inductive effect, mesomeric effect

Unit 2: Chemistry of Organic Compounds (Part-1): (20h)

Preparation, Properties and Reactions of Organic Compounds: Hydrocarbons (Alkanes, cycloalkanes, alkenes, alkynes and dienes,); Haloalkanes and Haloarenes; Alcohols, Phenols

Unit 3: Chemistry of Organic Compounds (Part-2): (20h)

Preparation, Properties and Reactions of Organic Compounds: aromatic and aliphatic Aldehydes, Ketones; Carboxylic acids and Esters; aliphatic and aromatic amines

Unit 4: Chemistry of aromatic compounds and Polynuclear Hydrocarbons: (10h)

Aromatic Compounds: Preparation, properties, structure and reactions of benzene, Huckel's rule of aromaticity, aromaticity of heterocyclic compounds, cations, anions and annulenes; **Structure and medicinal uses of polynuclear hydrocarbons:** Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane

BMS-103 **COMMUNICATION SKILLS (Theory)** **Credits: 2**

UNIT – I **06 Hours**

Communication Skills: Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context.

Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers

Perspectives in Communication: Introduction, Visual Perception, Language, Other Factors affecting our perspective – Past Experiences, Prejudices, Feelings, Environment.

UNIT – II **06 Hours**

Elements of Communication: Introduction, Face to Face Communication – Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication.

Communication Styles: Introduction, The Communication Styles Matrix with example For each – Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

UNIT – III **07 Hours**

Basic Listening Skills: Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations

Effective Written Communication: Introduction, When and When Not to Use Written Communication – Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication

Writing effectively: Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message,

UNIT – IV **11 Hours**

Interview Skills: Purpose of an interview, Do's and Dont's of an interview

Giving Presentations: Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

Group Discussion: Introduction, Communication skills in group discussion, Do's and Dont's of group discussion

Correspondence: Personal, official and Business, Report writing, Drafting an email, Writing of C.V.

BMS-104: Practical **Credits: 2**

1. Estimation of haemoglobin
2. Determination of bleeding time and clotting time of blood.
3. Determination of total erythrocyte count.
4. Determination of total leukocyte count.
5. To perform differential leukocyte count of blood.
6. Blood Pressure recordings in humans.
7. Determination of blood group
8. Preparation of volumetric solutions and estimation of acidic or basic contents
9. Functional group test: Amines, carboxylic acids, aldehydes, and ketones
10. Functional group test: Aromatic and halogenated hydrocarbons and phenols.
11. Preparation of Soap.

BMS-201: Pharmaceutical Physical Chemistry **Credits: 4**

Unit 1: Kinetics of Drug Stability:

Rate and Rate Equation Order and molecularity, first- Order and pseudo first order reactions, Second-order reactions, Zero-order reactions, Half-life, Shelf life and the Factors affecting the Rate of Reactions

Unit 2: Catalysis:

Catalysis: Classification and Applications: Catalysis and Types of Catalysis, Theory and applications of Homogenous and Heterogenous catalysis; **Mechanisms of Catalysis:** Acid- Base Catalysis, Enzyme Catalysis, Biocatalysis Phase, Transfer Catalysis, Transition Metal Catalysis and Oregano catalysis

Unit 3: Disperse System:

Colloidal: Size, Shape and types of colloidal systems, Optical Properties, Kinetic Properties, Electrical Properties, Stability of colloidal systems, Sensitization and protective colloidal Action, Solubilisation, Pharmaceutical Applications of colloids; **Gels and Emulsions:** Gels and its types, Emulsions, Types of emulsions, Preparation of Emulsion; **Suspensions:** Classification and Properties, Formulations and Application

Unit 4: Complexation:

Complexes: Classification, Preparation, Properties and Applications: Classification of complexes, Methods of preparation and analysis of complexes, applications of complexes; **Chelates and Metalloproteins:** Chelate, Metalloporphyrin

BMS-202: Environmental Science **Credits: 4**

Unit 1: Introduction to Environmental Science

Multidisciplinary nature of Environmental Studies. Definition, scope and importance, need for public awareness

Unit: 2: Natural Resources

Renewable and non-renewable resources: Land resources: Land as a resource, land degradation, soil erosion and desertification. Forest resources: Use and over-exploitation, deforestation, case studies. Water resources: Use and over-utilization of surface and ground water

Unit 3: Ecosystems

Concept of an ecosystem. Structure and function of an ecosystem. Energy flow in the ecosystem. Food chains, food webs and ecological pyramids.

Unit 4: Bio-diversity and its Conservation

Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Hot-spots of biodiversity. Threats to biodiversity, Endangered and endemic species of India. Conservation of biodiversity.

Unit 5: Environmental Pollution

Definition, Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Nuclear hazards.

Unit 6: Environment policies & laws

Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

Unit 7: Human Population and Environment

Human population growth, Impacts on environment, human health and welfare. Environment Movements: Chipko, silent valley, Bishnois of Rajasthan.

Unit 8: Field Work

Visit to a local polluted site: Urban/Rural/Industrial/Agricultural.

BMS-203: Biomolecules **Credits: 2**

Unit 1: Carbohydrate **(8h)**

Definition, classification, structure and functions of Carbohydrates

Monosaccharides- Glucose, Fructose, Galactose, Mannose, Stereoisomeres, epimers, Ring structure and anomers, mutarotation.

Disaccharides- Maltose, lactose, Sucrose, Trehalose,

Polysaccharides- Concept of homopolysaccharide and heteropolysaccharide, chemical nature of starch, glycogen, cellulose, bacterial cell wall polysaccharides and agar. Biological importance of Proteoglycans, Glycoproteins, and Glycolipids

Unit 2: Lipids **(6h)**

Definition and classification of lipids. Classification of fatty acids, physio-chemical properties of fatty acids, Structure and function of cholesterol, phosphoglycerides, sphingolipids, glycosphingolipids and Eicosanoids.

Unit 3: Protein **(9h)**

Definition and classification of amino acids based on chemical nature and nutritional (essential and nonessential) requirement, Zwitterions, pKa, pI, titration of amino acids, peptide bonds.

Structure of protein-Primary, secondary, tertiary and Quaternary structure

Protein stability, Bonds and interaction stabilizing the protein structure, protein folding, Denaturation and Renaturation.

Unit 4: Nucleic acids **(7h)**

Importance of nucleic acids in living system, general composition of nucleic acids, the purine and pyrimidine bases. Structure of nucleosides and nucleotide, deoxynucleotides, cyclic nucleotides.

Watson and crick model of DNA, Different types of DNA and RNA, Denaturation and renaturation of DNA

Suggested Textbooks

1. Nelson, D.L. and Cox, M.M.(2009). Lehninger's Principles of Biochemistry, W.H. Freeman and Company, New York.

2. Price, N.C. and Stevens, L.(1996). Fundamentals of Enzymology, Oxford University Press Inc. N.Y.

BMS-204 Practical **Credits: 2**

1. Determination of the effect of temperature on the rate of reaction.
2. Determination of the effect of Concentration on the rate of reaction.
3. Determination of the effect of catalyst on the rate of reaction.
4. Estimation of Mg or Ca ions by EDTA titration
5. Synthesis of a coordination compound metal acetyl acetonate
6. Qualitative tests for Carbohydrates
7. Qualitative tests for Proteins
8. Acrolein test for glycerol
9. Determination of saponification value of fats and oil.
10. Determination of Iodine number of a fat sample.

BMS-301: Metabolism of Biomolecules **Credits: 4**

Unit 1: Carbohydrate Metabolism **(15h)**

Glycolysis, Entry of galactose, Mannose and fructose into glycolytic pathway.

Anaerobic fate of pyruvate: ethanol and lactic acid fermentation,

Gluconeogenesis, Hexose Monophosphate Pathway, Coordinate Regulation of glycolysis and gluconeogenesis, futile cycle

Glycogen metabolism: Synthesis and breakdown of glycogen and its coordinate regulation.

Aerobic fate of pyruvate, Pyruvate dehydrogenase complex enzyme and TCA cycle, Amphibolic nature, Anaplerotic reactions, Regulation of TCA cycle, Glyoxylate cycle

Electron transport chain and Oxidative phosphorylation: Component and sequence of electron, Proton motive force, Chemiosmotic theory of ATP synthesis, Role of uncouplers and thermogenesis.

Disorders associated with defects in carbohydrate metabolism: Lactose intolerance, fructose intolerance, Glycogen storage disorders.

Unit 2: Lipid Metabolism **(15h)**

Transport of fatty acids to mitochondria, β-Oxidation of even chain saturated fatty acid. β-Oxidation of odd chain saturated fatty acid, Omega and Alpha oxidation of fatty acids

Bioenergetics for complete oxidation of fatty acid to acetyl CoA and CO_2, Coordinate regulation of fatty acid synthesis and breakdown, Ketone bodies synthesis and degradation (Ketosis). Relationship of ketone bodies production with Diabetes mellitus and starvation

Disorders associated with defects in Lipid metabolism:

Tay sach's disease, Gaucher disease

Unit 3: Amino acids metabolism **(15h)**

General reaction of amino acid degradation – Transamination, deamination and decarboxylation. ketogenic and glucogenic amino acids, Urea cycle and its significance, Link between Urea cycle and Citric acid cycle. Regulation of Urea cycle, Catabolic pathway of phenylalanine and tyrosine.

Disorders associated with defects in protein and amino acid metabolism:

Disorder associated with deficiency of Urea cycle enzymes and their treatment, Maple syrup urine

Unit 4: Metabolism of Nucleic acid (DNA) **(15h)**

Brief outline of *denovo* synthesis of purine and pyrimidine nucleotides, Regulation of synthesis of purine and pyrimidine nucleotides by feedback mechanism, Allosteric regulation of asparate transcarbamoylase by CTP and ATP, Salvage pathway for DNA synthesis, Chemotherapeutic agents targeting nucleotide biosynthetic pathways.

Disorders associated with defects in nucleotide metabolism- Gout, Lesch-Nyhan Syndrome, ADA.

Suggested Textbooks

1. Nelson, D.L. and Cox, M.M. (2005); Lehninger Principles of Biochemistry, fourth edition, W.H.Freeman and company, N.Y. USA
2. Voet, D. and Voet, J.G.(2004). Biochemistry, John Wiley and Sons. INC

BMS- 302: Microbiology **Credits: 4**

Unit 1: History and Scope of Microbiology **(7h)**

Members of the Microbial World: Prokaryotes, Eukaryotes, Biological entities

Discovery of Microorganisms: Development of Microscopes and Culture-Based Methods

Conflict over Spontaneous Generation: Contributions of Francesco Redi, John Needham, Lazzaro Spallanzani, Theodore Schwann, Theodor von Dusch, Louis Pasteur, John Tyndall

Microorganisms and Disease: Contributions of Louis Pasteur, Joseph Lister, Robert Koch

Unit 2: Prokaryotic Cell Structure and Function **(8h)**

An Overview of Prokaryotic Cell Structure: Shape, Arrangement, and Size

Bacterial Cell Wall and Plasma Membrane: Overview of Bacterial Cell Wall Structure, Peptidoglycan Structure, Gram-Positive Cell Walls, Gram-Negative Cell Walls, Fluid Mosaic Model of Plasma Membrane Structure

Cytoplasmic Matrix & Nucleoid: Inclusion Bodies, Ribosomes, Plasmids, Nucleoid

Components External to the Cell Wall: Capsules, Pilli, and Flagella

Unit 3: Introduction and General Characteristics of Viruses **(4h)**

Structure of Viruses: Virion Size, General Structural Properties, Helical Capsids, Icosahedral Capsids, Viruses with Capsids of Complex Symmetry, Viral Envelopes and Enzymes, Viral Genomes

Bacteriophages: General Characteristics, Lytic Cycle, And Lysogenic Cycles

Unit 4: Pathogenicity of Microorganisms **(8h)**

Host-Parasite Relationships: Parasite, Host, Pathogen, and Virulence

Pathogenesis of Viral Diseases: Maintaining a Reservoir, Contact Entry and Primary Replication, Release from Host Cells, Viral Spread and Cell Tropism, Virus-Host Interactions, Virus Shedding

Pathogenesis of Bacterial Diseases: Maintaining a Reservoir, Transport to the Host, Attachment and Colonization, Invasion of Host Tissues, Growth and Multiplication, Leaving the Host.

Bacterial toxins: Exotoxins, Endotoxins

Unit 5: Human Diseases Caused by Bacteria **(8h)**

Bacterial Pneumonia, Tuberculosis, Staphylococcal food poisoning, Gonorrhea (etiology, clinical symptoms, virulence factors involved, detection and prevention)

Unit 6: Human Diseases Caused by Viruses and Protozoans **(10h)**

Life cycle and clinical symptoms of;

Respiratory Syndromes: Coronaviruses and Human Respiratory Syncytial virus

Acquired Immuno Deficiency Syndrome (AIDS): HIV Virus

Influenza (Flu): Influenza virus A, Influenza virus B

Arboviruses: Dengue and chikungunya

Protozoal Infections: Malaria, Leishmania, Amoebiasis

Unit 7: Chemotherapy and Antiviral Drugs **(5h)**

Development of Chemotherapy: Contributions of Paul Ehrlich, Alexander Fleming, Howard Florey, Ernst Chain, Norman Heatley, Selman Waksman

General Characteristics of Antimicrobial Drugs: Selective Toxicity, Therapeutic Index, Range of Effectiveness

Determining the Level of Antimicrobial Activity: Dilution Susceptibility Tests, Disk Diffusion Tests, Etest

Antiviral Drugs: General characteristics and mode of action of common antiviral drugs

Unit 8: Antibacterial Drugs and Drug Resistance **(10h)**

Antibacterial Drugs: Inhibitors of Cell Wall Synthesis, Protein Synthesis Inhibitors, Metabolic Antagonists, Nucleic Acid Synthesis Inhibitors, Factors Influencing Antimicrobial Drug Effectiveness

Drug Resistance: Mechanisms of Drug Resistance, Origin and Transmission of Drug Resistance, Overcoming Drug Resistance

BOOKS RECOMMENDED

Prescott's Microbiology, 10th Edition, Willey, Sherwood, Woolverton

BMS-303: **Reactions in Organic Chemistry** **Credits: 2**

Unit 1: Organic reactions and their mechanisms (Part-1):

Overview of different types of Organic Reaction, **Addition Reactions:** Electrophilic Addition, Nucleophilic Addition, Free Radical Addition, Concerted Addition; **Substitution Reactions:** Nucleophilic Substitution Reactions, Electrophilic substitution Reaction, Free Radical Substitution Reaction; **Elimination Reactions:** Introduction, E1 Mechanism, E2 Mechanism, E1CB Mechanism, Alpha Elimination reactions

Unit 2: Organic reactions and their mechanisms (Part-2):

Free Radical Reactions: Generation, Structure and Stability of Free Radicals, Reactions and Applications of Free radical reactions, persistent radicals; **Pericyclic Reactions:** Pericyclic reactions and its types, Cyclo Addition Reaction, Electrocyclic Reaction, Sigmatropic Rearrangement Reactions; **Photochemical Reactions:** Photophysical Processes, Jablonskii Diagram, Photochemical reactions

Unit 3: Chemistry of heterocyclic compound:

Nomenclature, Classification, Synthesis, Properties, Reactions and Medicinal Uses of Heterocyclic Compounds: Furan, Thiophene, Pyrrole, Pyridine, Quinoline, Indole; **Structure of heterocyclic Compounds:** Pyrazole, Imidazole, Oxazole, Thiazole, Purine, Pyrimidine, acridine, Azepines; **Heterocyclic Compounds in Drugs:** Identification of Heterocyclic core in Drug molecules

Unit 4: Organic Name Reactions:

Synthetic Applications of Organic Name reactions: Aldol reaction, Cannizzaro reaction, Diels-Alder reaction, Grignard reaction, Michael addition, Mannich reaction, Reformatsky Reaction, Wittig Reaction, Baeyer-Villiger Oxidation, Claisen Schmidt reaction, Dieckmann condensation, Knoevenagel condensation, Mitsunobu reaction, Suzuki coupling, Stille coupling, Sonogashira coupling, Beckman rearrangement

BMS-304: PRACTICAL **Credits: 2**

1. Gram's staining
2. Antibiotic Susceptibility Testing by Agar Disk Diffusion Method
3. Study of Antibiotic Resistance in Bacteria
4. Study of Normal Microflora of the Throat and Skin
5. Identification of staphylococcus pathogens
6. Identification of *Mycobacterium tuberculosis*
7. Drawing structures, reactions, mechanism and properties using chem-draw software.
8. Dibenzal acetone from benzaldehyde by Claisen Schmidt reaction
9. Preparation of umbelliferone by Pechhman reaction
10. Estimation of blood sugar
11. Testing of Liver Function Test (Bilirubin, SGOT, SGPT, Alkaline Phosphatase, Albumin, Globulin, Total Protein)
12. Estimation of urea
13. Estimation of cholesterol

BMS-401: Cell Biology **Credits: 4**

Unit 1: Introduction to cell Biology **(5h)**

Structure, Size and Classification.

Unit 2: Nucleus, Protein Sorting and Transport **(10h)**

Nuclear Envelope - Structure of Nuclear Pore Complex, Nuclear Lamina, Transport across Nuclear Envelope, Chromatin: Molecular Organization, Nucleolus.

Endoplasmic reticulum, Golgi Apparatus, Mechanism of Vesicular Transport, Lysosomes.

Unit 3. Mitochondria and Peroxisomes **(7h)**

Structural Organization, Function, Marker Enzymes, Mitochondrial Biogenesis, Protein Import in Mitochondria, Semiautonomous Nature of Mitochondrial DNA, Peroxisomes' Assembly

Unit 4. Plasma Membrane, Extracellular Matrix and Cell Interactions **(8h)**

Structure; Transport of Small Molecules, Endocytosis, Extracellular Matrix and Cell Matrix Interactions; Cell-Cell Interactions.

Unit 5: Cell Signaling **(8h)**

Signaling Molecules and their Receptors; Functions of Cell Surface Receptors; Intracellular Signal Transduction Pathway (GPCR, RTKs); Signaling Networks.

Unit 6. Cytoskeleton and Cell Movement **(7h)**

Structure and Organization of Actin Filaments; Actin, Myosin and Cell Movement; Intermediate Filaments; Microtubules.

Unit 7. Cell Cycle **(8h)**

Eukaryotic Cell Cycle, Regulation of Cell Cycle Progression, Events of Mitotic Phase, Meiosis and Fertilization.

Unit 8. Cell Death and Cell Renewal **(7h)**

Programmed Cell Death (Extrinsic and Intrinsic Pathways, Necrosis and Autophagy, Stem Cells and Maintenance of Adult Tissues, Embryonic Stem Cells.

BMS-402: Pharmacology **Credits: 4**

Unit 1: Introduction to pharmacology **(5h)**

Basic concepts in pharmacology, Drug nomenclature, Drug Compendia, Concept of Essential medicines, Routes of drug administration.

Unit 2: Pharmacokinetics **(10h)**

Transport across Biological membranes: Passive diffusion, filtration and specialized transport.

Principle of absorption, bioavailability, bioequivalence, distribution, Plasma protein binding, metabolism, excretion, kinetics of elimination

Unit 3: Pharmacodynamics **(7h)**

Principles of drug action, Dose-response relationship, Drug potency and efficacy, Therapeutic index.

Unit 4: Pharmacotherapy and clinical pharmacology **(8h)**

Drug dosage, factors modifying drug action, pharmacogenomics, rational uses of medicines, Expiry date of pharmaceuticals.

Clinical studies: Clinical trails, Cohort studies and case control studies.

Unit 5: Autonomic Nervous System and drugs **(8h)**

Mechanism in autonomic nervous system and cholinergic transmission.

Cholinoreceptors: Muscranic receptors and Nicotinic receptors, Muscarinic and nicotinic actions.

Cholinergic drugs: Cholinergic agonists (Pilocarpine), Anticholinesterases (physostigmine), Anticholinergic drugs (Atropine)

Unit 6: Adrenergic System and drugs **(7h)**

Adrenergic transmission, Adrenergic drugs (Noradrenaline, Adrenaline, Salbutamol) Antiadrenergic drugs (Atenolol)

Unit 7: Antimicrobial and anticancer drugs **(8h)**

General consideration, Antibacterial (tetracyclines, penicillins), antiviral (acyclovir, Zidovudine), Classification of anticancer drugs (Methotrexate, Imatinib).

Unit 8: NSAIDs and diuretic drugs **(7h)**

Pharmacological actions and pharmacokinetics of Aspirin. Thiazide diuretics

Reference Book:

1. Pharmacology by K.D. Tripathi, 6th Edition

BMS-403: Enzymology **Credits: 2**

Unit 1: Enzymes **(15h)**

Introduction to enzymes, Apoenzyme, Holoenzyme, Role of coenzymes and prosthetic groups and vitamins as coenzymes precursors, Metal-activated and Metallo-enzymes.

Classification and nomenclature of enzymes with example, Activation energy and Transition state theory, Binding energy, Proximity and Orientation effect, Strain and distortion theory.

Unit of enzyme activity – definition of IU, Katal, enzyme activity, Specific activity

Effect of pH, temperature, substrate concentration and metal ions on the activity of enzyme. Specificity of enzymes (concept of active site)

Theories of enzyme catalysis – Lock and key model, Induced fit theory.

Unit 2: Enzyme kinetics and regulation **(15h)**

Relationship between initial velocity and substrate concentration,

Enzyme kinetics: Michaelis – Menten equation, Briggs and Haldane theory (rapid equilibrium and steady state theory), Lineweaver – Burk (L-B) plot, Determination of Vmax & Km from L-B plot and their significance, Significance of Kcat and specificity constant.

Reversible enzyme inhibition– Competitive, Non-competitive and Uncompetitive.

Suicide inhibitor, Transition state analogues, Catalytic antibodies, Isozymes and Ribozymes.

Allosteric enzyme, Allosteric regulation with ATPase as an example, Covalent modification- glycogen phosphorylase, Zymogen activation by proteolytic cleavage with example of chymotrypsin and trypsin.

Suggested Textbooks

1. Nelson, D.L. and Cox, M.M.(2009). Lehninger`s Principles of Biochemistry, W.H. Freeman and Company, New York.

2. Price, N.C. and Stevens, L.(1996). Fundamentals of Enzymology, Oxford University Press Inc. N.Y.

BMS-404: PRACTICAL **Credits: 2**

(Whereever wet lab experiments are not possible, the principles & concepts can be demonstrated through any other materials or medium including videos/ virtual labs etc.)

1. Preparation of metaphase chromosome
2. Study of Barr Body in human cheek epithelial cells
3. Demonstration of osmosis in egg
4. To study the stages of Mitosis and Meiosis from permanent slides
5. To prepare stained temporary mounts of onion peels
6. Study of cell division in onion root tip
7. Titration curve of Glycine.
8. Determination of alkaline phosphatase activity from germinating seeds.
9. To determine temperature optima for alkaline phosphatase
10. To examine effect of pH on activity of alkaline phosphatase
11. To study the effect of substrate concentration on activity of alkaline phosphatase and determination of Km and Vmax of the reaction.
12. Preparation of casein from milk and determination of its isoelectric point.

BMS-501: Medical Genetics **Credits: 4**

Unit I Introduction to Medical Genetics (5h)

Importance of medical genetics, History of Genetics, Types of genetic diseases, Clinical impact of genetic disease

Unit II Autosomal dominant and recessive disorders (8h)

Basic concept of formal genetics: Mendel's contributions, concept of phenotype, Basic pedigree structure

Auosomal dominant inheritance: Characteristics of autosomal dominant inheritance, reoccurrence risks

Autosomal recessive inheritance: Characteristics of autosomal recessive inheritance, reoccurrence risks.

Factors affecting expression of disease causing genes: New mutation, germline mosacism, reduced penetrance, age dependent penetrance, variable expression, locus heterogeneity, pleiotropy

Unit III Sex-linked and Non-traditional modes of inheritance (6h)

Sex linked inheritance: X-linked recessive inheritance, X-linked dominant inheritance, Y-linked inheritance, Sex linked and sex influenced traits, mitochondrial inheritance.

Genomic imprinting: Prader-Willi and Angle man syndrome, Fragile X syndrome

Unit IV Genetic Variation (10h)

Mutation: Type of mutation, molecular consequences of mutation, clinical consequence of mutation (Hemoglobin disorders: Sickle cell disease & Thalassemia), Causes of mutation, DNA repair, Mutation rates.

Detection and measurement of genetic variation: genetic variation in ABO blood group and Rh system. Detecting variation by protein electrophoresis, brief mention of techniques for detecting variation at the DNA level.

Genetic variation in populations: Basic concept of probability, Gene and genotypic frequencies, The Hardy-Weinberg principle, Causes of genetic variation

Unit V Clinical cytogenetics (7h)

Cytogenetic technology and nomenclature: Chromosome banding, Fluorescence in situ hybridization

Abnormalities of chromosome number: Polyploidy, Autosomal Aneuploidy (Trisomy 21, 18, 13); Sex chromosome aneuploidy (Turner syndrome, Klinefelter syndrome)

Abnormalities of Chromosome structure: Translocations, deletions, duplication, inversions.

Unit VI Disease-Gene identification (9h)

Gene mapping: Linkage analysis, LOD Scores, Linkage analysis and Human gene map.

Physical Mapping and cloning: Chromosome morphology, Dosage mapping using deletions and duplications, Functional versus non-functional DNA, Computer analysis of DNA sequence, Test for gene expression.

Gene mapping by association: Genome wide association studies, Examples of well-known mendelian disease causing genes.

Unit VII Biochemical Genetics (6h)

Prevalence of metabolic disease, inheritance of metabolic defects.

Defects of metabolic processes: Defects of Carbohydrate metabolism (Glucose), Unclear Defects of amino acid metabolism (Phenylalanine), Defects of Lipid metabolism (Cholesterol)

Unit VIII Cancer genetics, Genetic Testing and Precision medicine (9h)

Causes of Cancer, Cancer genes, Inherited cancer gene versus somatically altered genes, Tumor suppressor genes, Oncogenes, Identification of inherited cancer causing genes

Prenatal diagnosis of genetic disorders and congenital defects: Amniocentesis, Chorionic Villus Sampling

Impact of genomics: Pharmacogenetics, Individualized drug therapy, Diagnosing and monitoring common disease

BOOKS RECOMMENDED

1) Medical Genetics, 5th Edition, Jorde, Carey, Bamshad

BMS-502 Molecular Biology **Credits: 3**

Unit 1: Introduction to molecular biology (10h)

Composition and structure of DNA, gene and genome; Introns and exons

Key experiments establishing the Central Dogma

Chromatin structure: Euchromatin, Heterochromatin, Constitutive and Facultative heterochromatin.

Regulation of Chromatin Structure and Nucleosome Assembly

Organization of Chromosomes

Unit 2. DNA Replication (10h)

General principles: Bidirectional replication, Semiconservative, Semi-discontinuous,

RNA priming,

Various models of DNA replication: Rolling circle, D-loop (mitochondrial), Θ (theta) mode of replication, replication of linear ds-DNA, replicating the 5'end of linear chromosome.

Enzyme involved in DNA replication – DNA polymerases, DNA ligase, Primase, Telomerase and other accessory proteins.

Replication errors, DNA damage, DNA repair.

Unit 3. Mechanism of Transcription (7 hours)

RNA Polymerase, Transcription unit,

Mechanism of Transcription in Prokaryotes and Eukaryotes

Unit 4. Transcription Regulation in Prokaryotes (3 hours)

Principles of transcriptional regulation, regulation at initiation with examples from lac and trp

Operons.

Regulatory RNAs: Riboswitches, RNA interference, miRNA, siRNA, Regulatory RNA and X-inactivation

Unit 5. RNA Modifications (10 Hours)

Removal of Introns, Spliceosome machinery, splicing pathways, alternative splicing, exon shuffling, RNA editing, and mRNA transport.

Unit 6. Translation (Prokaryotes and Eukaryotes) (5 hours)

Steps in protein synthesis: Ribosome structure and assembly, charging of tRNA, aminoacyl tRNA synthetases, Proteins involved in initiation, elongation and termination of polypeptides. Fidelity of translation. Inhibitors of protein synthesis. **Regulation of translation:** Translation-dependent regulation of mRNA, Protein stability.

BMS-503: Medical Biotechnology **Credits: 3**

Unit 1: Foundations of DNA Technology (9h)

Tools of Genetic Engineering: Organisms as models, Microbial recombination, Restriction Enzymes, Plasmids.

Recombinant DNA experiments: Safety issues.

Unit 2: Methods of DNA Technology (9h)

Biochemistry of gene expression: Obtaining the gene, selecting the vector, selecting the host cell, expressing the gene, collecting the gene product

Gene Libraries: Establishing a library, screening the gene library, cDNA Library.

Unit 3: Pharmaceutical products of DNA Technology (7h)

Introduction:

Human protein replacements: Insulin, Human Growth hormone, Factor VIII.

Human Therapies: Tissue plasminogen Activator, Interferon, Antisense molecules, other innovative pharmaceuticals.

Vaccines: Hepatitis B, AIDS, traditional vaccines, DNA Vaccines.

Unit IV: DNA Analysis and Diagnosis (8h)

Methods of DNA Analysis: DNA Probes, PCR, DNA CHIP, RFLP Analysis.

Diagnosing infectious disease: AIDS, Tuberculosis, Human Papilloma virus and other disease.

Identifying genetic disease: Cystic fibrosis, Duchenne's muscular dysptrophy, Huntington's disease, fragile X syndrome, Retinoblastoma, Alzheimers's disease, ALS, diabetes, Cancer, obesity, parkinson's disease.

Gene Banking

DNA Matching techniques: DNA finger printing

Unit V: Gene Therapy (6h)

Introduction, Somatic cell therapy, Vectors in Gene Therapy

Gene replacement therapy: Retroviral Vectors, Adenoviral vectors, Adeno-associated viral vectors, lentiviral vectors, Challenges in viral gene therapy, nonviral vectors.

Gene-blocking therapies: Antisense therapy, Ribozyme therapy, RNA interference

Unit VI: Transgenic Animals (6h)

Techniques of Placing DNA in mammalian cells: Microinjection

Custom made animals: Human mouse, oncomouse, Alzheimers mouse, knockout mouse.

Lactoferrin, Pharm animals, vegetable vaccines, Examples of transgenic animals, improving animals for the production of transgenic products.

BMS-504: PRACTICAL **Credits: 2**

(Whereever wet lab experiments are not possible the principles & concepts can be demonstrated through any other materials or medium including videos/ virtual labs etc.)

1. Preparation of various stock solutions required for Molecular Biology Laboratory.
2. Isolation of genomic DNA from blood/ tissue.
3. Agarose gel electrophoresis for separation of DNA fragments.
4. Determination of absorption maxima of nucleic acids
5. Isolation of plasmid DNA from E. coli.
6. Transformation of E. coli cells with plasmid DNA.
7. Digestion of plasmid DNA with restriction enzymes.
8. Demonstration of Polymerase Chain Reaction (PCR) technique.
9. Karyotyping
10. Hardy-Weinberg Genetic equilibrium: Study of gene & genotype frequencies. (PTC Tasters & nontasters)
11. To test for colour blindness using Ishihara charts and calculation of allele frequencies.
12. Blood group typing using haemagglutination tests and calculation of allele frequencies.

BMS-601: Immunology **Credits: 4**

Unit 1 Introduction to immunology **(5h)**

Concept of Innate and Adaptive immunity; Contributions of following scientists to the development of field of immunology - Edward Jenner, Karl Landsteiner, Robert Koch, Paul Ehrlich, Elie Metchnikoff.

Unit 2 Immune Cells and Organs **(10h)**

Structure, Functions and Properties of: Immune Cells – Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell; and

Immune Organs – Bone Marrow, Thymus, Lymph Node, Spleen, GALT, MALT, SALT

Unit 3 Antigens **(6h)**

Characteristics of an antigen (Foreignness, Molecular size and Heterogeneity); Haptens; Epitopes (T & B cell epitopes); T-dependent and T-independent antigens; Adjuvants

Unit 4 Antibodies **(9h)**

Structure, Types, Functions and Properties of antibodies; Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic); VDJ rearrangements; Monoclonal and Chimeric antibodies

Unit 5 Major Histocompatibility Complex **(9h)**

Organization of MHC locus (Mice & Human); Structure and Functions of MHC I & II molecules; Antigen processing and presentation (Cytosolic and Endocytic pathways)

Unit 6 Complement System **(6h)**

Components of the Complement system; Activation pathways (Classical, Alternative and Lectin pathways); Biological consequences of complement Activation

Unit 7 Generation of Immune Response **(8h)**

Primary and Secondary Immune Response; Generation of Humoral Immune Response (Plasma and Memory cells); Generation of Cell Mediated Immune Response (Self MHC restriction, T cell activation, Co- stimulatory signals); Killing Mechanisms by CTL and NK cells, Introduction to tolerance

Unit 8 Immunological Disorders and Tumor Immunity **(7h)**

Types of Autoimmunity and Hypersensitivity with examples; Immunodeficiencies - Animal models (Nude and SCID mice), SCID, DiGeorge syndrome, Chediak- Higashi syndrome, Leukocyte adhesion deficiency, CGD; Types of tumors, tumor Antigens, causes and therapy for cancers.

BMS-602: Applied organic chemistry **Credits: 4**

Unit 1: Basics of Green Chemistry **(15h)**

Introduction and Green Chemistry, Goals and Principles of Green chemistry, Designing a Chemical synthesis, Prevention of waste or by- products, Atom Economy, Prevention/minimization of hazardous/toxic products, Green Solvents, Solvent less Processes, Immobilized solvents and ionic liquids, Examples of green synthesis/reactions, Microwave assisted reaction, Ultrasound assisted reactions; **Green Synthesis:** Ibuprofen, Paracetamol, Aspirin, limitations and obstacles in the pursuit of the goals of green chemistry

Unit 2: Stereochemistry (15)

Chirality; Molecules with one chiral centre: Enantiomers, R-S system of configurational nomenclature; Fischer projection**; Effect of chiral molecules on polarized light:** Optical activity and specific rotation, Enantiomeric excess, Racemic mixture; **Molecules with more than one chiral centre:** Diastereomers, Meso compounds; Physical properties of enantiomers and diastereomers, separation of stereoisomers and chiral synthesis

Nomenclature of geometrical isomers: Cis-Trans Nomenclature, EZ Nomenclature, Syn-Anti system; **Conformations and conformational analysis:** Cyclohexane and its derivatives, Ethane and n-butane, Bayer strain Theory and orbital picture of angle

Unit 3: Chemistry of natural products **(15h)**

Occurrence, extraction and properties of Alkaloids: Connine, Nicotine, Atropine, Therapeutically Important alkaloids; **Terpenes :** Isoprene Rule, Classification, Isolation, Properties, Geraniol, Pinene, Camphor, **steroids,** Cholesterol, and Classification of Antibiotics

Unit 4: Reagents and Their Application **(15h)**

Synthetic Reagents: NBS, Diazomethane, **Amide Coupling Reagents:** DCC, **Oxidizing Reagents:** Peracids, Dess-martin Periodinane, OsO_4, $KMnO_4$, PCC, PDC, Peroxides; **Reducing Agents:** LAH, DIBAL, $NaBH_4$, **Borane Reagents and Hydrogenation Reactions:** Homogenous Catalysis, Heterogenous Catalysis, **Role of protection/ deprotection in organic synthesis:** Protection for Hydroxyl group, Protection of 1,2- and 1,3- diols, Protection for the carbonyl group, Protection for the carboxyl group, Protection for the amino group and amino acids. Solid phase peptide synthesis

BMS-603: Medicinal Chemistry **Credits: 2**

Unit 1: Principles of drug discovery **(10h)**

Drug discovered without rational design: Discovery of penicillin & Librium, drug discovered through metabolic studies.

Modern rational drug design: Target based drug design, overview of drug targets

Drug development: Preclinical development, Clinical development

Unit 2: Lead discovery **(5h)**

Basic concept of lead, Sources of Lead compounds, Endogenous ligands, Screening of compounds, desirable properties of compounds for screening.

Unit 3: Lead modification **(10h)**

Identification of pharmacophore, Functional Group Modification, Structure–Activity Relationships, Structure Modifications to Increase Potency, Therapeutic Index, and ADME Properties, Structure Modifications to Increase Oral Bioavailability and Membrane Permeability, Computational Methods in Lead Modification.

Unit 4: Proteins and nucleic acids as drug targets **(5h)**

Drug receptor interactions: general principles, important forces involved in drug receptor complex Role of confirmation in affinity, Types of drug receptors, Design of agonist and antagonists, Concept of partial antagonism, desensitization, tolerance and dependence.

Classes of DNA interactive drugs: Reversible DNA binders, Groove binders (netropsin), DNA intercalators (amsacrine), DNA alkylators (Mechlorethamine, Carmustine).

BMS-604: Practical **Credit: 2**

1) To detect antigen-antibody complex by ring-precipitin test.

2) To detect antigen-antibody complexes by single diffusion method (Ouchterlony)

3) To detect antigen-antibody complexes by double diffusion method (Mancini)

4) To perform immunoelectrophoresis

5) To detect ABO blood blood group type.

6) Introduction and preparation of stereo models: Methane, Ethane, Ethylene, Acetylene, Cis/Trans alkene, substituted cyclohexane

7) Preparation of nylon 66 and urea formaldehyde resin

8) Separation of solid binary mixture of organic compounds- neutral and acidic

9) Thin-Layer Chromatography of Chlorophyll a and b from Spinach

10) Synthesis of phenytoin and aspirin

11) Preparation of biodiesel

12) Extraction of caffeine from Tea leaves and studies its absorption properties.

13) Determination of partition coefficient in octanol water system.

Skill Education Component

Semester I

Skill Qualification pack

Sector Skill Council: Life Sciences Sector Skill Development Council

Job Role: Machine-Life Sciences

NSQF Level: 4

Qualification pack Code: LFS/Q0207

National Occupation Standards

1. LFS/N0213: Prepare machines and accessories for the manufacturing process
2. LFS/N0214: Perform manufacturing operations
3. LFS/N0103: Ensure cleanliness in the work area
4. LFS/N0102: carry out reporting and documentation
5. LFS/N0215: Carry out broad level quality checks before, in process and post manufacturing
6. LFS/N0101: Maintain a healthy, safe and secure working environment in the life sciences facility

Semester II

Skill Qualification pack

Sector Skill Council: Life Sciences Sector Skill Development Council

Job Role: Quality Control Chemist

NSQF Level: 5

Qualification pack Code: LFS/Q1301

National Occupation Standards

1. LFS/N0301 Perform routine analysis in lab while ensuring compliance with Good Manufacturing Practices (GMP) and Good Laboratory Practices (GLP)
2. LFS/N0101 Maintain a healthy, safe and secure working environment in the life sciences facility
3. LFS/N0302 Coordinate with Supervisors and colleagues within and outside the department
4. LFS/N0103 To ensure cleanliness in the work area
5. LFS/N0314 To carry out reporting and documentation to meet quality standards

Semester III & IV

Skill Qualification pack

Sector Skill Council: Life Sciences Sector Skill Development Council

Job Role: Licensing Manager-Life Sciences

NSQF Level: 6

Qualification pack Code: LFS/Q0609

National Occupation Standards

1 LFS/N0622: Regulatory compliance and exchange of information for licensing activities

2 LFS/N0613: Provide analytical support for supply chain management

3 LFS/N0623: Manage, coordinate and interact with people to effectively control licensing operations

4 LFS/N0102: Carry out reporting and documentation

Semester V & VI

Skill Qualification pack

Sector Skill Council: Life Sciences Sector Skill Development Council

Job Role: EHS Manager-Life Sciences

NSQF Level: 7

Qualification pack Code: LFS/Q0214

National Occupation Standards

1. LFS/N0230: Develop, implement and direct a comprehensive environment, health and safety program for the Company
2. LFS/N0231: Prepare and provide training on Environmental, Health and Safety Standards
3. LFS/N0232: Manage and co-ordinate EHS team
4. LFS/N0233: Carry out reporting and documentation as per EHS standards

5. LFS/N0234: Supervise effective working of manufacturing process according to EHS standards and identifying and resolving any issues arising during the process

6. LFS/N0101: Maintain a healthy, safe and secure working environment in the life sciences facilit

प्राप्ति सं./Diary No. 295
दिनांक/Dated 11/02/2021
कुलपति कार्यालय, कुकेवि.
Vice-Chancellor's Office, C.U.H.

Annexure-X

To
The Vice Chancellor
Central University of Haryana
Mahendergarh

Subject: **Regarding Special/Mercy chance to appear in the Exam**

Respected Sir,

I, Anil Kumar s/o Sh. Puran Mal, am a M.Sc. Student (Roll no. 180648, Session: 2018-2020) of department of Statistics. In the 1st Semester, I was failed in the course "Distribution Theory" and 2nd chance also. Now, in the 4th semester, it was my 3rd chance (I got 36 marks in 3rd attempt). My marks in other semesters are good but I can't qualify in "Distribution Theory" paper. In corona pandemic, I had attended all classes regularly during semester. My network was not good at the time of exam. At the exam time, questions were repeated too much (I tried very often to do question change but the question was not happening change that had taken a lot of time). All of this happening because of network. I was also received warning many times due to network and I was very tensed and depressed. Thereby, my exam was spoiled too much.

On the other sides, in the recent (August-December) months during exam time, my family members (Father, Mother and Brother) suffers some health issues in different manners. During exam time, my father suffered from Corona disease and Dengue. Due to this, my study also affected. I am enclosing some medical slips of my family.

For this, I felt very stress, tension and depression. I feel that it is wastage of my important two years of my life. I am interested in statistics subject, so I want to complete my PG degree. So, I request to you that please consider my case. If I go for further PG degree, it will take another two years so overall this is four years of my important life.

Therefore, I request to you to give me a special chance to appear in the exam.

Thanking you

Yours sincerely

Anil Kumar
Roll No. 180648
Department of Statistics
Ph. 9518427761
9996135818

Dean Academics
for examination
13/02/21

Vice Chancellor <vc@cuh.ac.in>

Request for giving mercy chance for upcoming examination to get degree

1 message

Chetana Mehar <chetanamehar1997@gmail.com> Wed, Feb 3, 2021 at 9:22 AM
To: vc@cuh.ac.in

I, Chetna Singh Meena, having roll no. 180617 from MSC Physics department of Central University of Haryana. I here to request you that please give me a mercy chance for appearing in electronics subject to get my degree. As I got reappear in this subject in first term exam and exam branch had already given me three chances to clear it, but I couldn't.
I tried my best but, last time due to Covid-19, exams were online and due to network disturbance again and again I couldn't attempt my exam properly.
So, I request you to please give me a mercy chance to get appear in exam so that I can get my degree as I don't want to waste my two years.
I, therefore, hope that your decision will help me a lot.
Thanking you

Dean Academics

08/02/21

हरियाणाकेंद्रीयविश्वविद्यालय
CENTRAL UNIVERSITY OF HARYANA
(संसदकेअधिनियमसं. 25 (2009) केतहतस्थापित
(Established vide Act no. 25 (2009) of Parliament)
जांट-पाली, महेंद्रगढ़ (हरियाणा) - 123031
Jant-Pali, Mahendergarh (Haryana) – 123031

DEPARTMENT OF PHYSICAL EDUCATION AND SPORTS

MASTER OF PHYSICAL EDUCATION AND SPORTS (M.P.E.S.),

TWO-YEAR PROGRAMME

(2020-2021)

SCHEME AND SYLLABUS

SEMESTER-I					
PART-A Core Course					
Course Code	**Course Title**	**Credit Hours**			
		L	**T**	**P**	**Total Credits**
SOE MPE 010101 C3003	Research Methodology in Physical Education	3	0	0	3
SOE MPE 010102 C3003	Physiology of Exercise	3	0	0	3
SOE MPE 010103 C3003	Tests, Measurement and Evaluation in Physical Education	3	0	0	3
Discipline Centric Elective Courses (DCEC)					
SOE MPE 010101 DCEC3003	Sports Management and Curriculum Designs in Physical Education	3	0	0	3
SOE MPE 010102 DCEC3003	Adapted Physical Education	3	0	0	3

PART-B (Practicum)					
Course Code	**Course Title**	**Credit Hours**			
		L	**T**	**P**	**Total Credits**
SOE MPE 010104 C0143	Teaching of Athletics (Track Events) (Fundamentals of the events, Rules and Regulations, Measurements of fields)	0	1	4	3
SOE MPE 010105 C0143	*Teaching of Games (Basketball, Volleyball, Kabaddi, Kho-Kho, Football, and Table Tennis) and Intramural Note: Students have to select any two games	0	1	4	3
SOE MPE 010106 C0143	Sports Specialization (Practice of any event/ game under supervision)	0	1	4	3
SOE MPE 010107 C0021	Classroom Teaching & Practicals of core Subjects	0	0	2	1
PART-C (Generic Elective Course)					
Course Code	**Course Title**	**Credit Hours**			
		L	**T**	**P**	**Total Credits**
SOE MPE 010101 GEC4004	Wellness through Games and Sports	4	0	0	4

***Note: -** In Part-B,Minimum strength required of the students selecting any of the game will be 10 Students.

SEMESTER-II					
PART-A Core Course					
Course Code	**Course Title**	**Credit Hours**			
		L	**T**	**P**	**Total Credits**
SOE MPE 010208 C3003	Applied Statistics in Physical Education	3	0	0	3
SOE MPE 010209 C3003	Sports Medicine, Athlete's care and Rehabilitation	3	0	0	3
SOE MPE 010210 C3003	Information & Communication Technology (ICT) in Physical Education	3	0	0	3
Discipline Centric Elective Courses (DCEC)					
SOE MPE 010203 DCEC3003	Value and Environmental Education in Physical Education	3	0	0	3
SOE MPE 010204 DCEC3003	Sports Engineering	3	0	0	3
PART-B (Practicum)					
Course Code	**Course Title**	**Credit Hours**			
		L	**T**	**P**	**Total Credits**
SOE MPE 010211 C0143	Teaching of Athletics (Field Events) (Fundamentals of the events, Rules and Regulations, Measurements of fields)	0	1	4	3
SOE MPE 010212 C0143	Advance Teaching, Officiating and Coaching of the Games opted by the student in First Semester	0	1	4	3
SOE MPE 010213 C0143	Sports Specialization (Practice of any event/ game under supervision)	0	1	4	3
SOE MPE 010214 C0021	Classroom Teaching & Practicals of core Subjects	0	0	2	1

SEMESTER-III					
PART-A Core Course					
Course Code	**Course Title**	**Credit Hours**			
		L	**T**	**P**	**Total Credits**
SOE MPE 010315 C3003	Science of Sports Training	3	0	0	3
SOE MPE 010316 C3003	Yogic Sciences	3	0	0	3
SOE MPE 010317 C3003	Sports Biomechanics & Kinesiology	3	0	0	3
Discipline Centric Elective Courses (DCEC)					
SOE MPE 010305 DCEC3003	Research Proposal and Preparation of Synopsis	3	0	0	3
SOE MPE 010306 DCEC3003	Sports Journalism and Mass Media	3	0	0	3
PART-B (Practicum)					
Course Code	**Course Title**	**Credit Hours**			
		L	**T**	**P**	**Total Credits**
SOE MPE 010318 C0143	Coaching and Officiating of Athletics (Track Events) (Sports Theory, Skill Proficiency)	0	1	4	3
SOE MPE 010319 C0143	*Teaching of Games (Handball, Wrestling, Gym Training, Badminton, Hockey, and Cricket)/ Intramural (Note: Students have to select any two games)	0	1	4	3
SOE MPE 010320 C0143	Sports Specialization (Practice of any event/ game under supervision)	0	1	4	3
SOE MPE 010321 C0021	Classroom Teaching & Practicals of core Subjects	0	0	2	1

PART-C (Generic Elective Course)					
Course Code	**Course Title**	**Credit Hours**			
		L	**T**	**P**	**Total Credits**
SOE MPE 010302 GEC4004	Physical Fitness & Conditioning	4	0	0	4

***Note: -**

1. In Part-B, Minimum strength required of the students selecting any of the game will be 10 Students.

2. The students opting for Research Proposal as Discipline Centric Elective Course will be encouraged to take Dissertation in Discipline Centric Elective Course (DCEC) inthe fourth semester.

3. Research Proposal and Dissertation would be evaluated as per the University Ordinance No-XV.

SEMESTER-IV					
PART-A Core Course					
Course Code	**Course Title**	**Credit Hours**			
		L	**T**	**P**	**Total Credits**
SOE MPE 010422 C3003	Sports Psychology	3	0	0	3
SOE MPE 010423 C3003	Health Education and Sports Nutrition	3	0	0	3
SOE MPE 010424 C3003	Theory of Athletics	3	0	0	3
Discipline Centric Elective Courses (DCEC)					
SOE MPE 010407 DCEC0303	*Dissertation	0	3	0	3
SOE MPE 010408 DCEC3003	Physical Fitness and Wellness	3	0	0	3
PART-B (Practicum)					
Course Code	**Course Title**	**Credit Hours**			
		L	**T**	**P**	**Total Credits**
SOE MPE 010425 C0143	Officiating and Coaching of Athletics (Field Events) (Sports Theory, Skill Proficiency).	0	1	4	3
SOE MPE 010426 C0143	Advance teaching, Officiating and Coaching of the games opted by the student in Third Semester.	0	1	4	3
SOE MPE 010427 C0143	Sports Specialization (Practice of any event/ game under supervision).	0	1	4	3
SOE MPE 010428 C0021	Classroom Teaching & Practicals of core Subjects.	0	0	2	1

***Note:** For more details regarding Credit and other Academic requirements Ordinance No-XV of the University may be referred.

M.P.E.S. (First Year)

SEMESTER-I

RESEARCH METHODS IN PHYSICAL EDUCATION

Course Code: SOE MPE 010101 C3003

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Develop Understanding about the different Types of Research.
- Understand about the Review of Literature and Formulation of Hypotheses.
- Analyse the different Methods of Research.
- Explain the Process of Selecting Sample and techniques of Data Collection.
- Practice the ethics of Research.
- Explain the identification and development of research problem.
- Understand the usage of various library resources.

UNIT- I

1. Meaning and Definition of Research – Need, Nature and Scope of research in Physical Education.
2. Scientific and Unscientific method of Problem Solving.
3. Review of Related Literature.
4. Identification of Research Problem.
5. Criteria for selecting research problem.
6. Characteristics of a good research and good researcher.
7. Classification of Research.

UNIT- II

1. Formulation and Classification of Research Hypothesis.
2. Limitations and Delimitations.
3. Needs of Significance of the Study.
4. Analytical Research:
    a) Historical Research,
    b) Philosophical Research.
5. Descriptive Research:
    a) Survey Research,
    b) Tools of Survey Research.

6. Case Study.
7. Experimental Research and Design.

UNIT-III

1. Meaning and Definition of Sample and Population.
2. Types of Sampling Techniques:
    a) Probability Sampling Techniques,
    b) Non-Probability Sampling Techniques.
3. Construction and Development of Questionnaire.
4. Data Collection Tools & Techniques.

UNIT- IV

1. The Proposal Process (Introduction, Review of Related Literature, Methods and Bibliography).
2. The Research Process (Introduction, Review of Related Literature, Describing Method, Results and Discussion).
3. Preparation and uses of tables and figures.
4. Guidelines for Writing Research Report.
5. Writing Formats:
    c) Traditional Format,
    d) Journal Format.
6. Format of writing abstracts.
7. Oral and poster presentation.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Ahlawat, R. P. (2016). *Research Process in Physical Education& Sports Sciences*.Friends Publication.

Flick, U. (2017). *Introducing Research Methodology*.Sage Publications.

Flick, U. (2019). *An Introduction to Qualitative Research*. Sage Publications.

Kahn, J. V. (2016). *Research in Education*(Vol. 10). Pearson Education Inc.

Kamlesh, D. M. (2019). *Methodology of Research in Physical Education and Sports*. Sports Publication.

Kothari, C. (2019). *Research Methodology: Methods and Techniques*. New Age International Publishers.

Mishra, P. D. (2018). *Research and Statistics in Physical Education*. Sports Publication.

Thomas, J. R. (2016). *Research Method in Physical Activity*. US: Human Kinetics.

PHYSIOLOGY OF EXERCISE

Course Code: SOE MPE 010102 C3003

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Explain the role, meaning and definition of Exercise Physiology in Physical Education and Sports.
- Explain about the Muscles-types, functions and, characteristics.
- Reflect the effect of exercise on various systems.
- Understand about Bio-chemical aspects of exercise.
- Analyze the relation between Metabolism and Energy Transfer.
- Explain about the Diet before, during & after the athletic performance.
- Explain Ergogenic aids and Doping in Sports.

UNIT-I

1. Meaning and Definition of Exercise & exercise physiology
2. Role & Importance of Exercise Physiology in the field of Physical Education & Sports.
3. Impact of Exercise on work at cellular level.
4. Muscle- its types, characteristics and functions. Microscopic structure of muscle fibre. Sliding filament theory of muscular contraction. Types of muscle fibres and sports performance. Muscular adaptations to exercise.

UNIT-II

1. The basic energy systems (carbohydrate metabolism)
    a) ATP- PC system,
    b) Glycoltic system,
    c) Oxidative system.
2. Bio-chemical aspects of exercise
    a) Metabolism of food products.
    b) Direct and indirect methods of measuring energy cost of exercise.
3. Recovery process – Physiological aspects of fatigue and Restoration of energy stores.
4. Electrolyte balance & Water balance.

UNIT - III

1. Work capacity under different environmental conditions
    a) Hot, Humid and Cold
    b) High Altitude
2. Immediate effect of exercise/work on various systems of body.
3. Cardio-respiratory, muscular and thermo-regulatory systems.
4. Alveolar ventilation & second wind.
5. Physiological Factors influencing Sports Performance.

UNIT - IV

1. Ergogenic aids and Doping in Sports.
2. Effect of drugs & doping on athletic performances.
3. Diet before, during & after the athletic performance.
4. Exercise and training in females and older people.
5. Physiological aspects of development of strength, endurance, speed, agility & coordination.

Practicals

1. Measurement of heart rate and Estimation of Target Heart Rate.
2. Body composition analysis with various methods.
3. Measurement of VO2 Max (Field and Laboratory Method).
4. Blood Pressure measurement (Sphygmomanometer).
5. Anthropometric equipment's.
6. Measurement of various lung volumes through spirometer, peak flow meter.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue

Suggested Readings:

Brown, R. G.(2015). *Fundamentals of Exercise Physiology.* Friends Publication.

Chandi, C. C. (2018). *Human Physiology* (Vol. 12). CBS Publishers.

Fox Stuart Ira (2016). *Human Physiology* (15th Edition). McGraw-Hill Education.

Porcari, J., Bryant, C., & Comana, F. (2015). *Exercise Physiology*. FA Davis.

Varshney & Mona Bedi (2018). *Ghai's Textbook of Practical Physiology*. Jaypee Brothers Medical Publishers.

William D. McArdle (2014). *Exercise Physiology: Nutrition, Energy, And Human Performance* (8th Edition). Lippincott Williams and Wilkins.

TEST, MEASUREMENT AND EVALUATION IN PHYSICAL EDUCATION

Course Code: **SOE MPE 010103 C3003**

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Explain about the meaning and principles of Measurement and Evaluation.
- Understand about the basic concepts and practices adopted in evaluation.
- Analyse the various tests used in Physical education.
- Categorise Anthropometric and Aerobic-Anaerobic Tests.
- Reflect about the Concepts and Assessment of Physical Fitness.
- Explain various skill tests in Physical education.

UNIT- I

1. Meaning of Test, Measurement and Evaluation.
2. Principles of Measurement and Evaluation.
3. Domains of Human Performance - cognitive, affective and psychomotor.
4. Meaning and establishing Validity, Reliability and Objectivity.
5. Norm referenced and Criterion referenced standards.

UNIT-II

1. Criteria of test selection.
2. Factors Affecting Scientific Authenticity.
3. Procedure to Establish Scientific Authenticity.
4. Guidelines for constructing knowledge test.
5. Steps for construction of skill test / specific fitness test.

UNIT-III

1. Concepts and Assessment of Physical Fitness:
    a) AAHPERD Health Related Fitness Test and Tuttle Pulse ratio test,
    b) Roger's PFI.
2. Test for fitness components- strength, endurance, speed, flexibility and coordinative abilities.
3. Motor Fitness:
    a) Indiana Motor Fitness Test,
    b) Oregon Motor Fitness Test,
    c) JCR Test.
4. Motor Ability:
    a) Mc Cloy's General Motor Ability Test,
    b) Barrow Motor Ability Test.

5. Motor Educability:
    a) Methany Johnson Test,
    b) Larson Test.
6. Skill Test:
    a) Badminton: French Short Serve and Clear Test,
    b) Basketball: AAHPERD Basketball Test,
    c) Hockey: Henry Fridel Hockey Skill Test,
    d) Soccer: Warner Test for Soccer Skills,
    e) Tennis: Miller Wall Valley Test,
    f) Volleyball: Russell and Longe Test.

UNIT-IV

1. Basic Concept of Psychological Traits:
    a) SCAT Anxiety scale,
    b) Aggression,
    c) Team cohesion,
    d) Self-Motivation Inventory,
    e) Self-concept and Personality Questionnaire.
2. Basic concept of Anthropometric Measurements:
    a) Height & Weight: standing & sitting height and body weight.
    b) Girth Measurement: upper arm, forearm, calf and chest.
    c) Width Measurement: biacromial, chest, Illocrestol, Epicondyler (Femur &Humerous).
3. Assessment of Body Composition:
    a) Skin Fold Caliper,
    b) BMI and Waist Hip Ratio,
    c) IOWA posture test.

Practicals

The conducted practicals should be written in a Practical Note-Book and must be signed by the Supervisor. For practicals there will be a Practical Test and Viva-Voce Examination.

1. Assessment of endurance through-twelve minute run/walk test; six hundred yards run walk test; Harvard step test.
2. Assessment of resting physiological parameters- Heart rate, respiratory rate.
3. Anthropometric measurement.
4. Somatotyping, somatocharts & indices.
5. Basketball (Johnson basketball ability test).
6. Volleyball (Braddy volleyball test and Russel & lounge volleyball test).
7. Hockey (French hockey test, Friedal hockey test).

8. Football (mc Donald soccer test).
9. Badminton (Lockhart & Mc Phearson badminton skill).

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue

Suggested Readings:

Alan C. Lacy & Skip M. Williams (2018). *Measurement and Evaluation in Physical Education and Exercise Science* (Ed. 8). Routledge.

American College of Sports Medicine (2013). *ACSM's Health-Related Physical Fitness Assessment Manual*. Lippincott Williams & Wilkins.

American College of Sports Medicine (2017). *ACSM's Health-Related Physical Fitness Assessment Manual*. Lippincott Williams & Wilkins.

Karad, P.L. (2017). *Test, Measurement and Evaluation in Physical Education.* Khel Sahitya Kendra.

Lacy, A. C., & Williams, S. M. (2018). *Measurement and Evaluation in Physical Education and Exercise Science*. Routledge.

Miller, D. (2019). *Measurement by the Physical Educator Why and How* (8th Edition). McGraw-Hill Higher Education.

Yobu, A. (2010). *Test, Measurement and Evaluation in Physical Education in Physical Education and Sports*. Friends Publications.

SPORTS MANAGEMENT AND CURRICULUM DESIGNS IN PHYSICAL EDUCATION

Course Code: SOE MPE 010101 DCEC3003

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Explain about the meaning, definition, scope, principles and functions of management.
- Understand about role and qualities of manager.
- Reflect about Financial management and Class management.
- Explain about Tournament organization and intramurals.
- Understand about importance of Curriculum Development.

UNIT–I

1. Management: Meaning, definition, scope, principles, functions of management: Planning, Organizing, Staffing, Directing, Controlling, Coordinating, Evaluating and innovating.
2. Roles of manager: Interpersonal roles, Informational roles, Decisional roles.
3. Qualities of a manager.

UNIT–II

1. Programme planning, Steps in programme planning, Principles of programme planning, Evaluation of physical education programme.
2. Public relations: Meaning, Definitions, Principles, Planning and organizing public relations programme.
3. Financial management: Need for financial management, Principles of financial Management, preparation of budget, Sources of funds, Expenditure.
4. Class management: Meaning, Principle, Steps in class management: Strength of class, Place and time, Uniform, Class formation, Safety measures and Discipline.

UNIT–III

1. Facilities and Equipment management: Types of facility/infrastructure-indoor, outdoor, Purchase, Care and Maintenance.
2. Tournament organization: Types of tournament-Knock out or Elimination, League or Round Robin, Combination, Consolation, Challenge Tournaments.
3. Intramural Competitions: Meaning and Importance of Intramural, Objectives of Intramural, Conduct of Intramural.
4. Process of organizing sports events, Notifications, Invitations, Selection of officials, Monitoring, Writing reports, maintaining records.

UNIT–IV

1. Meaning and importance of Curriculum Development.
2. Principles of Curriculum Construction: Students centred, Activity centred, Community centred, Forward looking principle, Principles of integration.
3. The Role of the teacher in curriculum development.
4. Approaches to Curriculum; Subject centred, Learner centred and Community centred, Curriculum Framework and Evaluation of Curriculum.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Dhull, D. S. & Goel, M. (2015). *Handbook of Sports Management and Administration*. Friends Publications.

Lisa P. M. (2018). *Principles and Practice of Sport Management* (6th Edition). Jones & Bartlett Learning.

NCERT (2018). *National Curriculum Framework for School Education.* NCERT.

Pargaonkar, G. V. (2016). *Sports Management.* Friends Publications.

Sahil K. (2017). *Organization and Administration in Physical Education.* Sports Publication.

Singh, D. (2015). *Sports Management and Curriculum Designs in Phy Edu.* Friends Publications.

Vandana Meshram (2017). *Sports Management and Curriculum Designs in Physical Education.* Khel Sahitya Kendra.

ADAPTED PHYSICAL EDUCATION (ELECTIVE)

Course Code: SOE MPE 010102 DCEC3003

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Explain about the various aspects of Adapted Physical Education.
- Develop understanding on different types of disability.
- Aware about Recreational Sports Opportunities and Competition Opportunities.
- Explain about special adapted programme for various types and categories of physical disability.
- Understand about different social welfare programs for disabled Manage Stress and Develop Resilience through Meditation.
- Understand about Classification of Disability.

UNIT-I

1. Meaning & definitions, Aims and objectives of Adapted Physical Education.
2. Need and importance of Adapted Physical Education.
3. Role of physical education in adapted physical education.
4. Specific learning disabilities: Common types of learning disabilities their causes, treatment and intervention.
5. Recreational Sports Opportunities, Competition Opportunities - Special Olympics, Paralympics and Deaflympics. Inclusive Education: Meaning, Definition, Aim and Objectives.

UNIT-II

1. Physical education programme for disabled of: - Elementary School, Middle School and High School.
2. Class organization strategies: identifying the cause, embrace special needs, setting high expectations and goals.
3. Managing individual programmes: specially designed instructions, programme modifications, classroom accommodations, supplementary aids and services, transportation.
4. Special adapted programme for various types and categories of physical disability.
5. Classification of Disability: Visual, auditory, Neuro Muscular, Mental and Emotional Specific Guidelines for: Visual Impairment, Hearing Impairment, Intellectually challenged, Orthopedically Handicapped – Parent Teacher Association – Parents Advisory Committee, Unified Sports.

UNIT-III

1. History of Paralympics.
2. Paralympics events: list of IPC summer and winter sports.
3. Aquatic activity programme for disabled.
4. Nature of aquatic activity programme based on types of various disability.
5. Rehabilitative role and importance of aquatic activity.
6. Orientation on Types of Equipment- Minimum equipment, Additional Equipment, Evaluation of Equipment.

UNIT-IV

1. Aims and objectives of rehabilitation.
2. Meaning of functional and occupational rehabilitation.
3. Psychological rehabilitation- adjustment, environmental and personality development.
4. Provisions of special rights and privilege for disabled through legislations.
5. Adapted Games for the blind: Adapted Volleyball, Kabaddi, Tennis, Table Tennis and Adapted minor games and Track and Field events.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Auxter, H. (2001). *Adapted Physical Education and Reactions.* Morbey- St: Louis Mirrauri.

Auxter, D., & Pyfer, J. (1989). *Principles and Methods of Adapted Physical Education and Recreation.* Times Mirror Magazine.

Clarke, H. H., & Clarke, D. H. (1978). *Developmental and Adapted Physical Education.*

Kasser, Susan (2013). *Inclusive Physical Activity* (2nd Edition). Knowledge Warehouse Khel.

Kumar, P., Singh, R. M., & Ratnakar, A. (2018). "Role of physical education research activities and their impact in modern day life". *Asian Journal of Multidimensional Research*, 7(2), 420-425.

Sahitya Kendra (2017). *A Text Book of Adapted Physical Education & Sports.*

Sharma, S.R (2019). *Adapted Physical Education*, Friends Publication.

Thind, M. N. (2010), *Special Olympics Bharat Trainer Manuel*. Special Olympics Bharat.

Winnick, J., & Porretta, D. L. (2016). *Adapted Physical Education and Sport* (Ed. 15). Human Kinetics.

TEACHING OF ATHLETICS (TRACK EVENTS)
(FUNDAMENTALS OF THE EVENTS, RULES AND REGULATIONS, MEASUREMENTS OF FIELDS)

Course Code: SOE MPE 010104 C0143

L	T	P	Credits
0	1	4	3

Each student teacher is expected to take at least five lessons during the course of the semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these lessons, the duration should slowly increase and all the parts of the lesson covered progressively.

TEACHING OF GAMES (BASKETBALL, VOLLEYBALL, KABADDI, TABLE-TENNIS, KHO-KHO, AND FOOTBALL)/ INTRAMURAL

(Note: Students have to select any two games)

Course Code: SOE MPE 010105 C0143

L	T	P	Credits
0	1	4	3

General out-line of the contents of teaching of theory of Games and Sports

Introduction of the game/sport and historical development with special reference to India, Orientation of the students to the play area and equipment used in the game/sport, Important tournaments held at National and International levels, Distinguished sports awards and personalities related to the Game/sport. Warming-up- General free hand exercises, specific work out using equipment. Fundamental skills, Lead up activities, General rules and their interpretations, Duties of officials, officiating in class competitions and Intramurals, Marking of the play area.

Each student teacher is expected to take at least five lessons during the course of the semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these lessons, the duration should slowly increase and all the parts of the lesson covered progressively.

SPORTS SPECIALIZATION

(PRACTICE OF ANY EVENT/ GAME UNDER EXPERT SUPERVISION)

Course Code: SOE MPE 010106 C0143

L	T	P	Credits
0	1	4	3

Each student teacher is expected to take at least five lessons during the course of the semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these lessons, the duration should slowly increase and all the parts of the lesson covered progressively.

(Course contents in the game of specialization should be chalked out internally considering advance level of students and suitable to their age and gender).

CLASS ROOM TEACHING & PRACTICALS OF THEORY SUBJECTS

(LESSONS ON THEORY OF DIFFERENT TOPICS OF CORE SUBJECTS)

Course Code: SOE MPE 010107 C0021

L	T	P	Credit
0	0	2	1

Each student teacher is expected to take at least five lessons during the course of the semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these lessons, the duration should slowly increase and all the parts of the lesson covered progressively.

WELLNESS THROUGH GAMES AND SPORTS

Course Code: SOE MPE 010101 GEC4004

L	T	P	Credits
4	0	0	4

Learning Outcomes

After completion of the course, the students will be able to;

- Understand about the Wellness, Health and Physical Education and Recreation.
- Develop understanding about Olympic Games, Asian Games and Commonwealth games.
- Explain about Facilities and measurement of different games and sports.
- Aware about Warming-up and cooling down importance.
- Understand about Ergogenic aids, Doping and its types.

UNIT-1

1. Meaning and definition of Wellness, Meaning, objectives and aims of Health, Health and Physical Education and Recreation.
2. Meaning of the Physical Culture, Physical Training, Drill, Games and Sports, Gymnastics, Athletics, Aquatics.
3. Introduction of Olympic Games, Asian Games, Commonwealth games.

UNIT-II

1. Introduction to track and field events.
2. Facilities and measurement of Track and fields.
3. Facilities and measurement of play field: hockey, football, Volleyball, and badminton.

UNIT-III

1. Meaning and methods of Warming-up and cooling down.
2. Aerobic and anaerobic training.
3. Different methods of Aerobic and Anaerobic training.
4. Facilities required for Aerobic and Anaerobic training.

UNIT-IV

1. Introduction of Ergogenic aids, Doping and its types, Physiological and Psychological Effects of Doping, Advantage and disadvantage of narcotics and drugs. Role of agencies to control the use of drugs in sports.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Brymer, E. (2009). "The role of extreme sports in lifestyle enhancement and wellness". *In Proceedings of the 26th Achper International Conference: Creating Active Futures* (pp. 285-299). Australia: School of Human Movement Studies, Queensland University of Technology, Brisbane, QLD 4059.

Campbell, B. (2013). *Sports Nutrition: Enhancing Athletic Performance*. CRC Press.

Katz, L., Parker, J., Tyreman, H., Kopp, G., Levy, R., & Chang, E. (2006). "Virtual Reality in Sport and Wellness: Promise and Reality". *International Journal of Computer Science in Sport*, 4(1), 4-16.

Reaburn, P. R. (2014). *Nutrition and Performance in Masters Athletes*. CRC Press.

Sharma, O.P. (2010). *Handbook of Health Education & Sports*. Khel Sahitya Kendra.

SEMESTER II

APPLIED STATISTICS IN PHYSICAL EDUCATION

Course Code: SOE MPE 010208 C3003

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Understand about the importance of statistics in the field of physical education
- Use different statistical techniques to different problems
- Interpret the analyzed data

UNIT-I

1. Meaning of Statistics and Importance of Statistics in Physical Education.
2. Meaning of raw data, single score, grouped data and Discrete & continuous Variables.
3. Type of statistical process – descriptive, inferential, comparative, relationship and predictive.
4. Parametric and Non parametric statistics, Four Levels of Data – Nominal, Ordinal, Interval & Ratio.
5. Graphical representation of Data: Line Diagram, Pie Diagram and Bar Diagram, Frequency Polygon, Frequency Curve, Histogram and Ogives.

UNIT-II

1. Construction of frequency table – Range of score, Number of intervals, intervals size, tabulation of frequency table.
2. Application of Measures of Central tendency- Mean, Median and Mode.
3. Computation of Mean, Median and Mode for grouped and ungrouped data.
4. Application of Measures of Variability- Range, Quartile deviation, Mean deviation, Standard deviation and absolute & relative variability.
5. Computation of Quartile deviation, mean deviations and standard deviation for grouped and ungrouped data.
6. Meaning and Properties of Normal Curve and relationship of normal curve to binomial distribution.
7. Divergence from normality – Skewness and kurtosis.
8. Developing norms in the form of grading, Percentile Scale, T- Scale, Scales based on difficulty ratings.

UNIT-III

1. Concept of correlation & regression: Scatter diagram, linear correlation, rank correlation.
2. Liner regression equation with two variables.
3. Partial correlation coefficients of first and second order.
4. Multiple correlation coefficients involving three variables.
5. Sampling Distribution of Means, Standard Error of Mean, Interval estimates and Point estimates; Coefficients interval for mean.

UNIT-IV

1. Testing of Hypothesis : Region of Acceptance & Region of Rejection null & alternative Hypotheses: Level of Significance, type I & Type II errors, one tailed & two tailed Tests, degrees of freedom, procedure in testing of hypothesis.
2. Large Sample test (z-test) for means for one sample and two samples; Small sample test (t-test) for means for one sample and two samples – dependent and independent samples**,** F-test and interpretation of results.
3. Chi- Square Test for goodness of fit and testing independence of attributes with interpretation of results.
4. One way Analysis of Variance, Post- hoc Tests – LSD & Scheffe with interpretation of results.
5. One Way Analysis of Co-variance (ANCOVA) with interpretation of results.

Practicals

1. To prepare the class intervals & write the frequencies by using the tally counts.
2. Computation of Correlation matrix.
3. Calculation of partial correlation and multiple correlation.
4. Calculation of t- ratio for related and unrelated groups.
5. Calculation of Z- ratio for testing the hypothesis.
6. Preparing the Percentile Scale.
7. Calculation of Chi-Square.
8. Calculation of the One Way ANOVA with equal & unequal sample sizes.
9. Calculation of the One Way ANCOVA.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Gaur Ajai S & Sanjaya S (2009). *Statistical Methods for Practice and Research: A Guide to Data Analysis Using SPSS.* SAGE Publications Pv.t Ltd.

Bhunia, A. (2013). "Statistical methods for practice and research (A guide to data analysis using SPSS)". *South Asian Journal of Management*, 20(1), 154.

Cooke, D., & Clarke, G. M. (1989). *A Basic Course in Statistics*. Arnold.

De Muth, J. E. (2014). *Basic Statistics and Pharmaceutical Statistical Applications.* CRC Press.

Dhinu, M.R. (2017). *Applied Statistics in Physical Education & Sports.* Friends Publications.

Gupta, B. C., & Walker, H. F. (2005). *Applied Statistics for the Six Sigma Green Belt.* ASQ Press.

Kaur, S. (2017). *Research & Statistics inPhysical Education*. Friends Publications.

Rajalakshmi, D. (2018). *Advanced Statistics for Physical Education*. Friends Publications.

Verma, J.P. (2011). *Statistical Methods for Sports and Physical Education*. Tata McGraw Hill Education.

SPORTS MEDICINE, ATHLETE'S CARE AND REHABILITATION

Course Code: **SOE MPE 010209 C3003**

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Understand the concept of sports medicine and its significance.
- Develop the understanding about various therapeutic modalities.
- Understand about the importance of massage techniques in sports.
- Aware about the management of sports injuries.

UNIT-I

1. Definition and Concept of Sports Medicine.
2. Need and importance of sports medicine.
3. Role of Sports Physician and Athletic Trainer in Sports Medicine.
4. Categories of Athletic Injuries: Traumatic and Overuse.
5. Signs and Symptoms of Inflammation and Stages of Healing.
6. Introduction to Athletic Rehabilitation, Role of Therapeutic Exercises in Rehabilitation of musculo-skeletal athletic injuries.

UNIT-II

1. Meaning and Concept of Therapeutic Modalities.
2. Therapeutic effects, uses, and contraindications of following therapeutic modalities:
    a) Cryotherapy (Ice Therapy),
    b) Short wave Diathermy,
    c) Ultra sound Therapy,
    d) Transcutaneous Nerve Stimulation (TNS),
    e) LASER Therapy.

UNIT-III

1. Meaning and Definition of Massage.
2. Role of Massage in the treatment and rehabilitation of sports injuries.
3. Massage and Prevention of sports injuries.
4. Massage and Sports Performance, Pre-Competition and Post-Competition phase.
5. Psychological Aspect of Sports Massage.

UNIT-IV

1. Importance of rehabilitation equipment (Traction units, sliding sheet, shoulder wheel, quadriceps table, wrist rotators, leg curl, wall pulley, finger board).
2. Bandage –Types of Bandages –strapping/tapping - Application of strapping/tapping and bandage for major joints and body parts.
3. Low back pain, Common causes, General Care, Stretching and strengthening exercises for low back pain.
4. Classification of Therapeutic exercise- Active and passive exercise.
5. Balance training, gait training, gym bell exercise.

Practicals

1. Visit to Physiotherapy centre and Orientation of most commonly used Therapeutic Modalities (Ultrasound, Short wave Diathermy, TNS, and LASER Therapy).
2. Orientation of most commonly used Massage Techniques in the treatment of sports injuries.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

American College of Sports Medicine (2019). *ACSM's Body Composition Assessment with Web Resource*. Knowledge Warehouse.

Bindal, V.D. (2016). *Therapeutic and Sports Massage*. Agra: Associated Publishing House.

Johnson, J. C. (2011). *Postural Assessment.* Human Kinetics.

Kumar, P. (2019). "Management of Obesity Induced Forward Head Posture Deformities Through Sports". *International Journal of Physical Education, Sports and Health* 6(3): 106-107.

Madden, C. & Netter, F. (2010). *Netter's Sports Medicine*. PA: Philadelphia. Saunders/Elsevier.

Norris, C. M. (2018). *Sports and Soft Tissue Injuries: A Guide for Students and Therapists.* Routledge.

Singh, A. (2014). *Complete Guide to Sports Injuries*. Friends Publications.

Singh, A. (2016). *Athletic Care and Rehabilitation*. Friends Publications.

Uppal, A. K. (2015). *Posture, Athletic Care and First Aid.* Friends Publications.

INFORMATION& COMMUNICATION TECHNOLOGY (ICT) IN PHYSICAL EDUCATION

Course Code- SOE MPE 010210 C3003

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Explain the necessity of information and communication technology in physical education.
- Understand the computer assisted works in Physical education and sports.
- Develop understanding about the applications of computer in Physical education and sports.
- Understand about E-Learning & Web-Based Learning.

UNIT-I

1. Concept, Elements, Process & Types of Communication.
2. Communication Barriers & Facilitators of communication.
3. Communicative kills of English-Listening, Speaking, Reading & Writing.
4. Concept & Importance of ICT Need of ICT in Physical Education.
5. Scope of ICT: Teaching Learning Process, Publication Evaluation and Research.
6. Administration Challenges in Integrating ICT in Physical Education.

UNIT-II

1. Characteristics, Types & Applications of Computers Hardware of Computer: Input, Output & Storage Devices Software of Computer: Concept & Types.
2. Computer Memory: Concept & Types Viruses & its Management.
3. Concept, Types & Functions of Computer Networks Internet and its Applications Web Browsers & Search Engines Legal & Ethical Issues.

UNIT-III

1. MS Word: Main Features & it's Uses in Physical Education.
2. MS Excel: Main Features & it's Applications in Physical Education.
3. MS Access: Creating a Database, Creating a Table, Queries, Forms & Reports on Tables and its Uses in Physical Education.
4. MS Power Point: Preparation of Slides with Multimedia Effects.
5. MS Publisher: Newsletter & Brochure.
6. Windows Accessories: Notepad, Paint, Calculator, Word pad.

UNIT-IV

1. E-Learning & Web Based Learning:
    a) E-Learning,
    b) Web Based Learning,
    c) Visual Classroom,
    d) Mail Merging,
    e) Video Conferencing,
    f) Searching and Browsing Security.
2. Using grammar, spell check utilities and printing a document.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Ambekar, A. (2019). *Advanced Computing & Ict in Physical Education*. Friends Publication.

Gupta, R. (2019). *Education Technology in Phy Edu, Friends Publication*. Friends Publication.

Gupta, R. (2019). *Information & Communication Technology (Ict) in Physical Education.* Friends Publication.

Singh, D. (2019). *Educational Technologies And Methods Of Teaching in Physical Education.* Friends Publication.

Singh, T. N. (2019). *Computer Application in Physical Education*. Friends Publication.

VALUE AND ENVIRONMENTAL EDUCATION
IN PHYSICAL EDUCATION

Course Code: **SOE MPE 010203 DCEC3003**

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Aware about the meaning, objectives and importance of Value Education.
- Understand about the Environmental Studies
- Aware about Rural and Urban Health Problems and there Sanitation.
- Develop understanding about the Pollution and its issues.

UNIT-I

1. Meaning and Definition of Value Education.
2. Need, Importance and Objectives of Value Education.
3. Need and Theories of Moral Values.
4. Human Value foundation.
5. Classification of Values: Basic Values of Religions.

UNIT-II

1. Meaning and Definition of Value System.
2. Personal and Communal Values - Consistency, Internally consistent, internally in consistent, Judging Value System.
3. Commitment and commitment to values.

UNIT-III

1. Meaning and Definition of Environmental Studies.
2. Scope and Importance of environmental studies.
3. Historical background of environmental education.
4. Celebration of various days in relation with environment.
5. Plastic recycling & prohibition of plastic bag/cover.
6. Role of school in environmental conservation and sustainable development, Pollution free eco-system.

UNIT-IV

1. Rural and Urban Health Problems and their causes.
2. Improvement of Rural Sanitation.
3. Education Activity and Services of Urban, Slum Area and Urban Area.
4. Fairs & Festivals of Rural Area.
5. Meaning, Causes and Prevention of Air Pollution, Water Pollution, Noise Pollution and Thermal Pollution.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Athman, J., & Monroe, M. (2004). The Effects of Environment-Based Education on Students' Achievement Motivation. *Journal of Interpretation Research*. 9(1), 9-25.

Jadhav, H., & Bhosale, V. M. (1995). *Environmental Protection and Laws*. Himalaya Pub. House.

Jitendra Kumar Thakur (2019). *Value and Environmental Education.* Sports Publication.

Mohit Chakrabarti (2008). *Value Education: Changing Perspective*.Kanishka Publication.

Singh, B. (2018). *Value and Environmental Education.* Friends Publications.

Vandana MeshramIngle (2017). *Value and Environmental Education.* Educational Publishers and Distributors.

SPORTS ENGINEERING

Course Code: SOE MPE 010204 DCEC3003

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Understand about the sports engineering and their aspects in Physical Education.
- Explain about the Mechanics of engineering materials and concepts.
- Aware about Sports Infrastructure and Maintenance.
- Develop Basics Understanding of theoretical analysis of cost and price.

UNIT -I

Introduction to Sports Engineering and Technology:

1. Meaning of sports engineering, human motion detection and recording, human performance, assessment, equipment and facility designing and sports related instrumentation and measurement.

UNIT-II

Mechanics of Engineering Materials:

1. Concept of internal force, axial force, shear force, bending movement, torsion, energy method to find displacement of structure, strain energy. Biomechanics of daily and common activities –Gait, Posture, Body levers, ergonomics, Mechanical principles in movements such as lifting, walking, running, throwing, jumping, pulling, pushing etc.

UNIT-III

Sports Dynamics and Facility life cycle costing:

1. Introduction to Dynamics, Kinematics to particles – rectilinear and plane curvilinear motion coordinate system. Kinetics of particles – Newton's laws of Motion, Work, Energy, Impulse and momentum.
2. Basics of theoretical analysis of cost, total life cost concepts, maintenance costs, energy cost, capital cost and taxation.

UNIT-IV

Building and Maintenance:

1. Sports Infrastructure- Gymnasium, Pavilion, Swimming Pool, Indoor Stadium, Out-door Stadium, Play Park, Academic Block, Administrative Block, Research Block, Library, Sports Hostels, etc.
2. Requirements: Air ventilation, Day light, Lighting arrangement, Galleries, Store rooms, Office, Toilet Blocks (M/F), Drinking Water, Sewage and Waste Water disposal system, Changing

Rooms (M/F), Sound System (echo-free), Internal arrangement according to need and nature of activity to be performed, Corridors and Gates for free movement of people, Emergency provisions of lighting, fire and exits, Eco-friendly outersurrounding.

3. Maintenance staff, financial consideration.
4. Building process: - design phase (including brief documentation), construction phase functional (occupational) life, Re-evaluation, refurnish, demolish.
5. Maintenance policy, preventive maintenance, corrective maintenance, record and register for maintenance.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Charles J.A. Crane, F.A.A. and Furness, J.A.G. (1987). *Selection of Engineering Materials*. Butterworth Heiremann.

Eric C. (2010). *Sports Facility Operations Management* . Routledge.

Finn, R.A. and Trojan P.K. (1999). *Engineering Materials and Their Applications*. Jaico Publisher.

Franz K. F (2007). *The Impact of Technology on Sports II*. Springer Science & Business Media.

Franz K. F(2013). *Routledge Handbook of Sports Technology and Engineering.* Routledge.

Jenkins M.,(2003). *Materials in Sports Equipment* (Vol. I). Elsevier.

Steve Hake, (1996). *The Engineering of Sport*. CRC Press.

Verma, A.(2015). *Sports Engineering*. Friends Publications.

White, C. (2010). *Projectile Dynamics in Sport: Principles and Applications.* Routledge.

TEACHING OF ATHLETICS (FIELD EVENTS) (FUNDAMENTALS OF THE EVENTS, RULES AND REGULATIONS, MEASUREMENTS OF FIELDS)

Course Code: SOE MPE 010211 C0143

L	T	P	Credits
0	1	4	3

Each student teacher is expected to take at least five lessons during the course of the semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these lessons, the duration should slowly increase and all the parts of the lesson covered progressively.

ADVANCE TEACHING, OFFICIATING AND COACHING OF THE GAMES OPTED BY THE STUDENTS IN FIRST SEMESTER

Course Code: SOE MPE 010212 C0143

L	T	P	Credits
0	1	4	3

Each student teacher is expected to take at least five lessons during the course of the semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these lessons, the duration should slowly increase and all the parts of the lesson covered progressively.

SPORTS SPECIALIZATION (PRACTICE OF ANY EVENT/ GAME UNDER EXPERT SUPERVISION)

Course Code: SOE MPE 010213 C0143

L	T	P	Credits
0	1	4	3

Each student teacher is expected to take at least five lessons during the course of the semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these lessons, the duration should slowly increase and all the parts of the lesson covered progressively.

(Course contents in the game of specialization should be chalked out internally considering advance level of students and suitable to their age and gender).

CLASSROOM TEACHING & PRACTICALS OF THEORY SUBJECTS (LESSONS ON THEORY OF DIFFERENT TOPICS OF CORE SUBJECTS).

Course Code: SOE MPE 010214 C0021

L	T	P	Credit
0	0	2	1

Each student teacher is expected to take at least five lessons during the course of the semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these lessons, the duration should slowly increase and all the parts of the lesson covered progressively.

M.P.E.S. (2nd Year)

SEMESTER III

SCIENCE OF SPORTS TRAINING

Course Code: **SOE MPE 010315 C3003**

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Understand the concept of training and planning.
- Develop mastery on training sessions.
- Understand about how the psychological factors affect sports performance.
- Develop the concept of periodization.
- Aware about the preparation for competition.

UNIT-I

1. Sports training- its characteristics and principles.
2. Training load, its features, principles and adaptation process.
3. Means and methods of executing training load.
4. Overload its Causes, symptoms and remedial measures.

UNIT-II

1. Strength- its characteristics, types of strength, factors determining strength and strength development. Endurance- its characteristics, types of endurance, factors determining endurance and endurance development.
2. Speed- its characteristics, types of Speed, factors determining Speed and speed development.
3. Flexibility-its characteristics, types of flexibility, factors determining flexibility and flexibility development.
4. Coordinative abilities- its characteristics, types of coordinative abilities, factors determining coordinative abilities and development of coordinative abilities.

UNIT-III

1. Technique and skill- its characteristics and importance. Different stages of technique development and technique training. Tactics and strategy.
2. Planning- its importance and principles. Types of planning.

UNIT-IV

1. Periodization- its importance, objectives and types of periodization. Concept of different periods - Preparatory, competition and transitional.
2. Competition and types of competition.
3. Talent identification- process and procedure.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Bompa, T. O., & Buzzichelli, C. (2018). *Periodization-: Theory and Methodology of Training*. Human kinetics.

Bompa, T., Bompa, T. O., & Carrera, M. (2005). *Periodization Training for Sports*(Ed. 2). Human Kinetics.

Jesudoss,S. J. (2015). *Principles of Sports Training.* Friends Publications.

Kurz, T. (2001). *Science of Sports Training: How to Plan and Control Training for Peak Performance*. Stadion.

Loehr, J. E. (1995). *PDF The New Toughness Training for Sports: Mental Emotional Physical Conditioning From One of the Worlds Premier Sports Psychologists Online Book.*

OBE, F. W. D. (2014). *Sports Training Principles: An Introduction to Sports Science*. Bloomsbury Publishing.

Singh, H. (1984). *Sports Training: General Theory & Methods*. Netaji Subhas. Nat. Inst. of Sports.

Viru, A. (2017). *Adaptation in Sports Training*. Routledge.

YOGIC SCIENCES

Course Code: SOE MPE 010316 C3003

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Understand the concept of Yogic Practices and Relaxation Techniques.
- Develop concept of *Pranayama Techniques.*
- Understand about the various *Kriyas* and *Mudras*.
- Aware about the importance of *yoga* for competition preparation.

UNIT-I

Introduction:

1. Meaning and Definition of Yoga. *Astanga Yoga: Yama, Niyama, Aasna, Pranayama, Prathyahara, Dharana, Dhyana, Samadhi*, Concept of Yogic Practices; Principles of Breathing– Awareness – Relaxation, Sequence – Counter pose – Time – Place – Clothes – Bathing – Emptying the bowels – Stomach – Diet – No Straining – Age – Contra- Indication – Inverted asana – Sunbathing.

UNIT-II

Asanas and Pranayama:

1. Loosening exercise: Techniques and benefits. *Asanas*: Types- Techniques and Benefits, *Surya Namaskar*: Methods and benefits. *Pranayama:* Types- Methods and benefits. *Nadis:* Meaning, methods and benefits, *Chakras:* Major *Chakaras*- Benefits of clearing and balancing *Chakras*.

UNIT-III

Kriyasand Mudras:

1. *Shat Kriyas*- Meaning, Techniques and Benefits of *Neti – Dhati – Kapalapathi- Trataka –Nauli – Basti, Bandhas:* Meaning, Techniques and Benefits of *Jalendra Bandha, Jihva Bandha, Uddiyana Bandha, Mula Bandha.*Meaning, Techniques and Benefits of *Hasta.*
2. *Mudras, Asamyuktahastam, Samyuktahastam , Mana Mudra, Kaya Mudra, Banda Mudra, Adhara Mudra.* Meditation: Meaning, Techniques and Benefits of Meditation – Passive and active, *Saguna* Meditation and *Nirguna* Meditation.

UNIT-IV

Yoga and Sports:

1. Yoga Supplemental Exercise – Yoga Compensation Exercise – Yoga Regeneration Exercise-Power Yoga. Role of Yoga in Psychological Preparation of athlete: Mental Wellbeing, Anxiety, Depression Concentration, Self-Actualization. Effect of Yoga on Physiological System: Circulatory, Skeletal, Digestive, Nervous, Respiratory, Excretory System.

Note: Laboratory Practicals be designed and arranged internally.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Anatharaman, T.N., (1996). *Ancient Yoga and Modern Science.Project of History of Indian Sciences Philosophy & Culture*.

Arya, K. (2011). *Yogic Science*. Friends Publication.

Arya, K. (2013). *Yogic Education*. Friends Publication.

Debnath, K. K. (2010). *Yogic Sciences*. Friends Publication.

Horovitz, E. G., & Elgelid, S. (2015). *Yoga Therapy: Theory and Practice*. Routledge.

Kotecha, Vaidya Rajesh. (2016). *A Beginner's Guide to Ayurveda.* Chakrapani Publications.

Kumar, Dr. Kamakhya, (2008). *Super Science of Yoga.* Standard Publications. Leslie Kamin off & Amy Matthews (2011). *Yoga Anatomy*. Human Kinetics.

Nathial, M. S. (2013). *Yogic Education*. Friends Publication.

Niranjanananda Saraswati, Swami (2012). *Gherenda Samhita*.

Pramod Kumar Sethi (2017). *Yoga and Skin Diseases*. Sports Publication.

Saini, N. (2011). *Yogic and Stress Management.* Friends Publication.

Swami Vivekananda, (2019). *The Complete Book of Yoga : Karma Yoga, Bhakti Yoga, Raja Yoga, Jnana Yoga*. Fingerprint! Publishing.

Tarak Nath Pramanik (2018). *Yoga Education*. Sports Publication.

SPORTS BIOMECHANICS AND KINESIOLOGY

Course Code: SOE MPE 010317 C3003

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Understand about the importance of applied kinesiology and Sports Biomechanics.
- Analyse the action of muscles.
- Classify the different types of motion and force and its application in sports.
- Understand about the Methods of Analysis of Human Movements.

UNIT-I

Introduction:

1. Meaning, nature, role and scope of applied kinesiology and Sports Biomechanics.
2. Meaning of Axis, Planes, Plane of the body and axis of motion.
3. Dynamics, Kinematics, Kinetics, Static.
4. Centre of gravity & Line of gravity.
5. Meaning and definition of Motion. Types of Motion: Linear motion, angular motion, circular motion, uniform motion and Newton's Law.

UNIT-II

Muscle Action and force:

1. Origin, Insertion and action of muscles:
    a) **Upper Extremities**: Pectoralis major and minor.
    Deltoid, Biceps, Triceps (Anterior and Posterior). Trapezius, Serratus, Rectus Abdominis.
    b) **Lower Extremities:** Sartorius, Quadriceps, Hamstring, and Gastrocnemius.
2. Muscle size and its force production.
3. Meaning and definition of force and its type.
4. Force applied at an angle Pressure -Friction -Buoyancy, Spin.

UNIT-III

Projectile and Lever:

1. Freely falling bodies.
2. Projectiles -Equation of projectiles stability.
3. Factors influencing equilibrium - Guiding principles for stability -static and dynamic stability. Meaning of work, power, energy, kinetic energy and potential energy.
4. Leverage -classes of lever - practical application.
5. Water resistance, Air resistance & Aerodynamics.

UNIT-IV

Methods of Analysis of Human Movements:

1. Analysis of static positions of the body:
    a) Sitting
    b) Standing
    c) Lying
2. Analysis of Locomotion:
    a) Walking
    b) Running
    c) Jumping
    d) Throwing

Practicals:

1. Determination of centre of Gravity, Centre of gravity, line of gravity.
2. Anatomical standing position and fundamental standing position.
3. Handling of various equipment and software related to Sports Biomechanics.
4. Mechanical analysis of techniques skills of major sports/games.
5. Action of muscles of upper extremities by palpations method.
6. Action of Muscles of lower extremities by palpations method.
7. Manual calculations of various kinetic and kinematic parameters – distance, displacement, speed, velocity, acceleration, momentum, force, mass, weight, resultant vector, pressure, work, power, energy etc.
8. Stick diagram (basic techniques; anatomical posture, walking, push up, sit ups etc).
9. Goniometry – measurement of joint ROM / Elgon.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Ackland, T. R., Elliott, B., & Bloomfield, J. (2009). *Applied Anatomy and Biomechanics in Sport*. Human Kinetics.

Bartlett, R. (2014). *Introduction to Sports Biomechanics: Analysing Human Movement Patterns*. Routledge.

Chapman, A. E. (2008). *Biomechanical Analysis of Fundamental Human Movements*. Human Kinetics. Knowledge Warehouse.

Kumar, P. (2019). "Biomechanical Analysis of Forward Head Posture among Pondicherry University Research Scholars Based On the Laptop Working Hours: An Analytical Study". *International Journal Of Emerging Technologies And Innovative Research*, 6 (6), 463-466.

Kumar, P., & Singh, R. R. M. (2019). "Biomechanical analysis of anisomelia among the young children's in Puducherry". *Discrepancy (LLD)*, 330, 19.

Singh, R. R. M. (2019). "Biomechanical Analysis of Footprint Measurement among School Boys: A Positive Approach to Posture". *Journal of the Gujarat Research Society*, 21(1), 167-169.

Uppal, A. K. (2018). *Kinesiology and Biomechanics.* Friends Publications.

RESEARCH PROPOSAL

Course Code: **SOE MPE 010305 DCEC3003**

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Explain the identification and development of research problem.
- Understand the usage of various library resources.
- Write a research proposal.
- Eliminate or reduce plagiarism from thesis / dissertation.

Outline of Syllabus:

1. Identifying an appropriate methodology for a research problem.
2. Effective use of library resources for research.
3. Developing a conceptual model relevant to research.
4. Construction of tools for different types of research.
5. Formulation and classification of research hypothesis.
6. Developing a research proposal.
7. Different writing format in preparing the research proposal.
8. Identifying and reducing/eliminating barriers which may interfere with the development of a high quality thesis/dissertation.
9. Developing and following an appropriate timeline for completion of the thesis/dissertation.
10. Format for writing abstract.
11. Oral and poster presentation.
12. Academic dishonesty.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

1. Kamlesh, D. M. (2019). Methodology of Research in Physical Education and Sports. Sports Publication.
2. Klopper, H. (2008). The Qualitative Research Proposal. Curationis, 31(4), 62-72.
3. Kothari, C. (2019). Research Methodology: Methods and Techniques. New Age International Publishers.
4. Mishra, P. D. (2018). Research and Statistics in Physical Education. Sports Publication.
5. Vivar, C. G., McQueen, A., Whyte, D. A., &Armayor, N. C. (2007). Getting Started With Qualitative Research: Developing a Research Proposal. Nurse researcher, 14(3).

SPORTS JOURNALISM AND MASS MEDIA (ELECTIVE)

Course Code: SOE MPE 010306 DCEC3003

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Explain the Meaning and Definition of Journalism.
- Understand the importance of media in sports.
- Develop understanding how to organize sports events.
- Understand the concept of Sports Bulletin, Journalism and sports education.
- Aware about how to prepare report on sports events.

UNIT-1

1. Sports Journalism: Meaning, Definition and Historical Background.
2. National and International Sports News Agencies.
3. Mode of Sport Journalism: Print, Electronic and Informal Media.

UNIT-II

1. News: Definition, basic news elements, organisation of sports news desk, Pitfalls in use of language, Proof Reading, Qualities and responsibilities of sports news reporters.
2. Organization of Pre & Post Sports Event Press Meet.
3. Coverage: Covering Local / National/ International sports competitions and writing of press release.

UNIT-III

1. Review Writing: Brief review of Olympic Games, Asian Games, Common Wealth Games World Cup, National Games and Indian Traditional Games.
2. Writing Sports Features: Types of sports features, sports personalities and their thumb nail sketches, Writing Sports Editorials, Blogs & Column.
3. Art of Commentating and interviewing: Commentating sports for radio and television channels and Interview with and elite Players and Coaches.

UNIT-IV

1. Amateurism v/s professionalism: Invasion of private life, emphasis on winning, sports for charity.
2. Role of Advertisement in Sports Journalism.
3. Career in Sports Photography: Equipment's, Editing and Publishing.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Dhananjay Joshi (2010). *Value Education in Global Perspective*. Lotus Press.

Kathryn T. Stofer, James R. Schaffer (2019). *Sports Journalism: An Introduction to Reporting And Writing.* Rowman & Littlefield Publishers.

Koak, S & Sharma, R. (2015). *Media and Career in Phy Edu*. Friends Publications.

Lal, R. (2013). *Sports Journalism*. Friends Publications.

Malik, (2010). *Sports Journalism and Mass Media.* Friends Publications.

Phil Andrews (2013). *Sports Journalism* (Ed. 2). SAGE Publications Ltd.

COACHING AND OFFICIATING OF ATHLETICS (TRACK EVENTS) (SPORTS THEORY, SKILL PROFICIENCY)

Course Code: SOE MPE 010318 C0143

L	T	P	Credits
0	1	4	3

The students of M.P.E.S. – III Semester need to develop proficiency in taking officiating lesson on selected above discipline. In view of this, the students shall be provided with advance mechanism of officiating in selected discipline. The duration of the lesson to be conducted by these students shall be in the range of 30 to 40 minutes depending on the class time they are going to handle at school and collegelevel.

Each student teacher is expected to take at least five lessons during the course of the fourth semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these officiating lessons, the duration should slowly increase and all the parts of the lesson coveredprogressively.

TEACHING OF GAMES (HANDBALL, WRESTLING, GYM TRAINING, BADMINTON, HOCKEY, AND CRICKET) AND INTRAMURAL

(Note: Students have to select any two games)

Course Code: SOE MPE 010319 C0143

L	T	P	Credits
0	1	4	3

General out-line of the contents of teaching of theory of Games and Sports

Introduction of the game/sport and historical development with special reference to India, Orientation of the students to the play area and equipment used in the game/sport, Important tournaments held at National and International levels, Distinguished sports awards and personalities related to the Game/sport. Warming-up-General free hand exercises, specific work out using equipment. Fundamental skills, Lead up activities, General rules and their interpretations, Duties of officials, officiating in class competitions and Intramurals, Marking of the play area.

Each student teacher is expected to take at least five lessons during the course of the semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these lessons, the duration should slowly increase and all the parts of the lesson covered progressively.

SPORTS SPECIALIZATION (PRACTICE OF ANY EVENT/ GAME UNDER EXPERT SUPERVISION)

Course Code: SOE MPE 010320 C0143

L	T	P	Credits
0	1	4	3

Each student teacher is expected to take at least five lessons during the course of the semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these lessons, the duration should slowly increase and all the parts of the lesson covered progressively.

(Course contents in the game of specialization should be chalked out internally considering advance level of students and suitable to their age and gender).

CLASS ROOM TEACHING &PRACTICALS OF THEORY SUBJECTS (LESSONS ON THEORY OF GAMES) ANY TWO.

Course Code: SOE MPE 010321 C0021

L	T	P	Credit
0	0	2	1

Each student teacher is expected to take at least five lessons during the course of the semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these lessons, the duration should slowly increase and all the parts of the lesson covered progressively.

PHYSICAL FITNESS & CONDITIONING

Course Code: SOE MPE 010302 GEC4004

L	T	P	Credits
4	0	0	4

Learning Outcomes

After completion of the course, the students will be able to;

- Understand the concept of warming and cool down.
- Explain concept of physical and motor fitness.
- Perform exercise with modern fitness gadgets.
- Explain how to design fitness training programme.
- Develop the concept of somatotyping.

UNIT-I

1. Warming up and cool down exercise for body.
2. Understanding about Calisthenics exercise.
3. Calculate target heart rate zones for various aerobic and anaerobic exercise intensities.
4. Assessment of Health Related Fitness.

UNIT-II

1. Variation of sets and repetitions for weight training.
2. Exercise with Swiss & medicine ball, Theraband and tubing.
3. Weight training exercises for upper body.
4. Weight training exercises for lower body.

UNIT-III

1. Anthropometric measurement for somatotyping body type.
2. Assessing body composition.
3. Plyometric exercises.
4. Circuit training exercises.

UNIT-IV

1. Flexibility development Exercises.
2. Exercise during pregnancy.
3. Exercise for Back and Neck pain Management.
4. Method for determining 1-RM.
5. Concept of designing different fitness training programme for different age group.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

American Alliance for Health, Physical Education, Recreation and Dance (1999). *Physical Education for Lifelong Fitness, The Physical Best Teacher's Guide.* Human Kinetics, P.O. Box 5076, Champaign, IL 61825-5076

Emily R. Foster, Karyn Hartiger & Katherine A. Smith.(2002). *Fitness Fun*, Human Kinetics Publishers.

Fahey D. Thomas (2005). *Weight Training Basis, A Complete Guide for Men and Women.* Mcgraw-Hill Companies.

Getchell, B. (1979). *Physical Fitness: A Way of Life.*

Lawrence, Debbie. (1999). *Exercise to Music.* A & C Black Publishers Ltd. 37, Sohe Square.

Miller, D. K., & Allen, T. E. (1990). *Fitness: A Lifetime Commitment*. Macmillan Publishing Company.

Robert Malt. (2001). *90-Day Fitness Plan.* D.K. publishing, Inc. 95, Madison Avenue.

The National Association for Sport and Physical Education (1900). *Concepts of Physical Education, What Every Student Needs to Know.* Association Drive Reston, VA 20191-1599 (703) 476-3410.

SEMESTER IV

SPORTS PSYCHOLOGY

Course Code: **SOE MPE 010422 C3003**

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Understand the concept and meaning of sports psychology.
- Develop understanding about various learning, personality and motivation theories.
- Understand about how the psychological factors affect sports performance.
- Develop the concept of team cohesion and leadership.
- Understand how to assess anxiety, coordination and reaction of athletes.

UNIT-I

1. Meaning, Definition and Scope of Sports Psychology.
2. Importance of Sports Psychology for enhancing sport performance.
3. Meaning of Learning -Theories of Learning and there implication in teaching Learning Process.
4. Meaning and types of Motivation - Theories of motivation (Abraham Maslow, Need Achievement by McClelland, Weiner Attribution).
5. Measurement of Motivation and Techniques for Developing Motivation.

UNIT-II

1. Meaning and Definition of Motor Learning, Activity & Skill.
2. Learning & Learning Theories.
3. Motivation – Types, Theories & Techniques of motivation.
4. Stages of Motor Learning and Plateau effect.

UNIT-III

1. Meaning and Definition of Personality and Personality Traits.
2. Theories of Personality.
3. Role of Personality in Sports and Exercise.
4. Measurement of Personality:
    a) Eysneck – EPQ (R)
    b) Cattle- R.B. Cattle 16 PF
5. Individual Difference and its types.
6. Areas of Individual differences.

UNIT-IV

1. Concept of Group Dynamics, Team Cohesion, Characteristics of Team Cohesion.
2. Guidelines for Developing Team Cohesion.
3. Measurement of Cohesion.
4. Meaning of Leadership and Component of Effective Leadership.
5. Measurement of Leadership.
6. Problems and issues working with Individual and Team Sports.
7. Career Transition in Athletes and Retirement Issues, Developing Life Skills in Athletes.

Practicals

1. Assessment of Reaction Time (Hard-Eye).
2. Assessment of Coordination (Foot-Eye).
3. Analysis of Personality (Eysinck Personality Questionnaire), Big Five Personality Test.
4. Assessment of Achievement Motivation.
5. Assessment of Sport competitive anxiety test.
6. Inventory for factors influencing sports.
7. Assessment of Sociometry Questionnaire.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Horn, Thelma (2008). *Advances in Sport Psychology*. Champaign IL : Human Kinetics Publishers, Inc.

Huber, Jeffrey (2012). *Applying Educational Psychology in Coaching Athletes*. Knowledge Warehouse.

Kamlesh, M.L. (2011). *Psychology in Physical Education and Sport* (Ed. 3). Delhi : Metropolitan Book Co. Pvt. Ltd.

Pargonkar, G. V (2015). *Sports Psychology*. Friends Publications.

Taylor, Jim (2017). *Assessment in Applied Sport Psychology*. Knowledge Warehouse.

Weinberg, R.S & Gould, Daniel (2015). *Foundations of Sport and Exercise Psychology* (Ed. 6). Champaign IL: Human Kinetics Publishers, Inc.

HEALTH EDUCATION AND SPORTS NUTRITION

Course Code: SOE MPE 010423 C3003

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Understand the concept of health education and latest health policies.
- Explain the health problems in India.
- Develop understanding about communication and non-communication diseases.
- Know about various school health services.
- Understand about nutrition requirements for athletes.

UNIT-I

1. Concept of Health and Health Education.
2. Latest trends in Health Education and global strategy in the field of Health.
3. Role of physical Education Professional on Individual and family in relation to Health and Health Education.
4. Epidemiology of Communicable Diseases: Agent factor, Host factor, Environment factors, Mode of Transmission and Prevention of following diseases:
    a) Tuberculosis
    b) Chicken Pox
    c) Malaria
    d) COVID-19

UNIT-II

1. Epidemiology of Non Communicable Diseases : Risk factors and Prevention of following diseases :
    a) Cardiovascular Diseases.
    b) Hypertension.
    c) Cancer.
2. Diseases and their Controlling Programme:
    a) National Family Welfare Programme
    b) STD Control Programme
    c) National Cancer Control Programme
    d) National Tuberculosis Control Programme
    e) National Malaria Control Programme

UNIT-III

1. Schools Health Services:
    a) Meaning & Objective of School Health Service
    b) Health Problem of School Child
    c) Role of health education in schools
    d) Health Services - Health record, Healthful school environment, first- aid and emergency care
    e) Mid-day School Programme.
2. Role of International Organization in the Development of Health:
    a) WHO & UNICEF
    b) FAO & UNESCO
    c) International Red Cross Society
    d) FSSAI.

UNIT-IV

1. Nutrition and Training Adaptations.
2. Nutrition and Immune Function in Athletes.
3. Eating Disorders in Athletes - Personalized Nutrition and Menu Planning (Meal Timing and Spacing).
4. Nutrition for popular team sports (Basketball, Hockey, Football, Volleyball, Kabaddi and Cricket).
5. Nutrition for Athletics and Endurance Sports (Long distance Swimming, Cycling and Marathon).
6. Nutrition for Strength and Combat sport (Wrestling, Weightlifting, Judo, Boxing, Taekwondo and Fencing).

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Campbell, B. (2013). *Sports Nutrition: Enhancing Athletic Performance*. CRC Press.

Eberle, S. G. (2013). *Endurance Sports Nutrition* (Ed. 3). Human Kinetics.

Fink, H. H., & Mikesky, A. E. (2017). *Practical Applications in Sports Nutrition*. Jones & Bartlett Learning.

Kumar.P (2020). "Changing The Lifestyle of Present Health Care: A Much Required Step for A Secured Future The Transmission or Reminder ff Ancestor's Way of Life once again".*AlochanaChakra Journal*. Vol. IX. Issue-V. Pg-2789-2793. doi:10.01011.ACJ.2020.V9I5.00068749.01683.

Maughan, R. J., & Shirreffs, S. M. (Eds.). (2013). *Food, Nutrition and Sports Performance Iii*. Routledge.

Reaburn, P. R. (Ed.). (2014). *Nutrition and Performance In Masters Athletes*. CRC Press.

Ryan, M. (2012). *Sports Nutrition for Endurance Athletes*. Velo Press.

Sharma, O.P., (2010). *Handbook of Health Education & Sports*. Khel Sahitya Kendra .

Zinner, C., & Sperlich, B. (Eds.). (2016). *Marathon Running: Physiology, Psychology, Nutrition and Training Aspects* (pp. 1-171). Springer.

THEORY OF ATHLETICS

Course Code: SOE MPE 010424 C3003

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Explain about Lay out and marking of Track & field.
- Aware of latest IAAF General Rules and Regulation.
- Understand about the training of different events of Track & field.
- Understand the importance of warm up and cool down in sports.

UNIT-I

1. Introduction and history of athletics.
2. IAAF General Rules and rules pertaining to specific events.
3. Combined Events (Pentathlon- Order of events, Heptathlon - Order of events, Octathlon- Order of events and Decathlon - Order of events).

UNIT-II

Standard and non-standard Track Marking procedure:

a) Stagger
b) Diagonal excess
c) Relay Zone Marking
d) Hurdles and Steeplechase races marking.

UNIT-III

Track events marking with rules and regulation:

a) Sprinting , Middle and Long Distance Events
b) Cross country races and Race Walking
c) Hurdles
d) Relays.

UNIT-IV

Field events marking with rules and regulation:

a) High jump and Pole vaulting
b) Long Jump and Tribble Jump
c) Shotput and Hammer
d) Discuss throw and Javelin throw.

Practicals

1. Track and Field Lay out and marking.
2. Track and Field Rules and Regulation.
3. Track and Field Performance.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Schneider, R. C. (2009). *Ethics of Sport and Athletics: Theory, Issues, and Application*. Wolters Kluwer Health/Lippincott Williams & Wilkins, xxi, 392 p.: ill.; 24 cm.

Zeigler, E. F., &Spaeth, M. J. (1975). *Administrative Theory and Practice in Physical Education and Athletics*.

https://www.worldathletics.org/about-iaaf/documents/book-of-rules

https://sportsauthorityofindia.nic.in/showimg.asp?ID=580

DISSERTATION

Course Code: **SOE MPE 010407 DCEC0303**

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

Develop competency in the process of conducting research

1. A candidate shall have dissertation for M.P.E.S. – IV Semester and must submit his/her Synopsis in department and get it approved by the D.R.C. (Departmental Research Committee).
2. A candidate selecting dissertation must submit his/her dissertation not less than one week before the beginning of the IVth Semester Examination.
3. The candidate has to face the Viva-Voce conducted by D.R.C. (Departmental Research Committee) with external examiner.

PHYSICAL FITNESS AND WELLNESS

Course Code: SOE MPE 010408 DCEC3003

L	T	P	Credits
3	0	0	3

Learning Outcomes

After completion of the course, the students will be able to;

- Understand the concept of fitness and wellness.
- Explain latest trends in fitness and conditioning.
- Explain the importance of nutrition and calories requirements.
- Understand the various stress management techniques.
- Develop the concept of establishing fitness centre.

UNIT-I

1. Meaning & Definition of Physical Fitness and Wellness.
2. Components of Physical Fitness and Wellness.
3. Techniques and Principles of Physical fitness.
4. Leisure time physical activity for community development.
5. Current trends in fitness and conditioning.
6. Relationship between physical activity and lifelong wellness.

UNIT-II

1. Meaning and Definition of Nutrition.
2. Daily calories intake & burning.
3. Food Guide Pyramid.
4. Influences of food on social cultural values.
5. Exercise and metabolism & burning.

UNIT-III

1. Stress assessment & its management.
2. Prominent health problem associated with inactivity.
3. Measurement of Body Composition.
4. Safety techniques (Spotting, proper body alignment, lifting techniques, spatial, awareness. and proper breathing techniques).
5. Concept of free weight vs. machine, variation of sets and repetitions, Exercise with Swiss & Medicine Ball, Theraband and Tubing.
6. Concepts of designing fitness training programme.

UNIT-IV

1. Establishment and Management of Fitness Centre.
2. Principles of starting a fitness centre-environment, location, policy, offer of programmes, record keeping, and public relation.
3. Fitness centre membership and its types.
4. Safety aspects in a fitness centre.
5. Qualification and qualities for a fitness trainer.

Practicals

1. Orientation and management of fitness centre, various equipment's and wet zone.
2. Different methods of measuring Body Composition (BMI, Waist Hip Ratio, Skinfold Calliper).
3. Different Fitness Test (Cardio-respiratory Endurance, Strength, Strength Endurance, Flexibility, Body Composition, Anthropometric Measurements and Grip Dynamometer).

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue.

Suggested Readings:

Agrawal, M.(2016). *Aerobics Fitness & Style.* Friends Publications.

Corbin, C. (2011). *Concepts of Physical Fitness.* McGraw-Hill Higher Education.

Fahey D. Thomas(2005). *Weight Training Basis, A Complete Guide for Men and Women.* Mcgraw-Hill Companies.

Greenberg, J., Dintiman, G., & Myers Oakes, B. (2004). *Physical Fitness and Wellness.* Champaign, IL: Human Kinetics.

Hoeger, W., & Hoeger, S. (2013). *Fitness & Wellness.* Wadsworth, Cengage Learning.

Prabha, S.(2015). *Basic Fitness Assessment.* Friends Publications.

Rathee, S.(2017). *Physical Fitness and Wellness.* Friends Publications.

Robert Malt.(2001). *90-Day Fitness Plan*. D.K. publishing, Inc. 95, Madison Avenue.

The National Association for Sport and Physical Education (1900). *Concepts of Physical Education, What Every Student Needs to Know.* Association Drive Reston, VA 20191-1599 (703) 476-3410.

Uppal, A.K. (2016). *Physical Fitness and Wellness.* Friends Publications.

OFFICIATING AND COACHING OF ATHLETICS (FIELD EVENTS) (SPORTS THEORY, SKILL PROFICIENCY)

Course Code: SOE MPE 010425 C0143

L	T	P	Credits
0	1	4	3

The students of M.P.E.S. – IV Semester need to develop proficiency in taking officiating lesson on selected above discipline. In view of this, the students shall be provided with advance mechanism of officiating in selected discipline. The duration of the lesson to be conducted by these students shall be in the range of 30 to 40 minutes depending on the class time they are going to handle at school and collegelevel.

Each student teacher is expected to take at least five lessons during the course of the fourth semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these officiating lessons, the duration should slowly increase and all the parts of the lesson coveredprogressively.

ADVANCE TEACHING, OFFICIATING AND COACHING OF THE GAMES OPTED BY THE STUDENT IN THIRD SEMESTER

Course Code: SOE MPE 010426 C0143

L	T	P	Credits
0	1	4	3

Each student teacher is expected to take at least five lessons during the course of the semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these lessons, the duration should slowly increase and all the parts of the lesson covered progressively.

(Course contents in the game of specialization should be chalked out internally considering advance level of students and suitable to their age and gender).

SPORTS SPECIALIZATION (PRACTICE OF ANY EVENT/ GAME UNDER EXPERT SUPERVISION)

Course Code: SOE MPE 010427 C0143

L	T	P	Credits
0	1	4	3

Each student teacher is expected to take at least five lessons during the course of the semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these lessons, the duration should slowly increase and all the parts of the lesson covered progressively.

(Course contents in the game of specialization should be chalked out internally considering advance level of students and suitable to their age and gender).

CLASS ROOM TEACHING &PRACTICALS OF THEORY SUBJECTS (LESSONS ON THEORY OF GAMES) ANY TWO

Course Code: SOE MPE 010428 C0021

L	T	P	Credit
0	0	2	1

Each student teacher is expected to take at least five lessons during the course of the semester. The lessons will be supervised by the faculty members and experts who would discuss the merits and demerits of the concerned lesson and guide them for the future. In these lessons, the duration should slowly increase and all the parts of the lesson covered progressively.

हरियाणा केन्द्रीय विश्वविद्यालय
(संसद के अधिनियम 25(2009) के तहत स्थापित)
जांट-पाली, महेन्द्रगढ़, (हरियाणा) 123031

CENTRAL UNIVERSITY OF HARYANA
(Established vide Act No. 25 (2009) of Parliament)
Jant-Pali, Mahendergarh (Haryana)-123031

संस्कृत विभाग/ DEPARTMENT OF SANSKRIT

PROCEEDINGS OF THE BOARD OF STUDIES (BOS) MEETING

A meeting of Board of Studies of the Department of Sanskrit held through virtual mode at 4.00PM on 25.01.2021. The following members of the BOS have participated in a virtual mode in the meeting.

1. Prof. Uma C. Vaidya : External Member
   Member-UGC
   & Former Vice-Chancellor,
   Kavikulaguru Kalidas Sanskrit University
   Ramtek, Nagpur, Maharashtra

2. Prof. Surendra Kumar : External Member
   Professor and Head
   Department of Sanskrit, Pali and Prakrit
   Maharshi Dayanand University
   Rohtak, Haryana

3. Prof. Ranvir Singh : Internal Member & Chairman
   Chair Professor, SDS Chair
   & Coordinator, Dept. of Sanskrit
   Central University of Haryana
   Mahendergarh, Haryana

At the outset Prof. Ranvir Singh, Chairman and Convener of the meeting welcomed the esteemed external experts and conveyed the New Year 2021 greetings to both the experts. He also conveyed the warm wishes of Hon'ble Vice-Chancellor and apprised the various developmental works of the University in the leadership of Hon'ble Vice-Chancellor Prof. R C Kuhad.

The committee discussed the agenda, i.e. approval of the syllabus of IV Semester; 3 courses of the Bharatiya Darshana/Indian Philosophy Specialised elective group of III Semester; and finalization of the panel of paper setters/moderators/examiners for MA Sanskrit programme of the Department, extensively. The external members have suggested various additions and alterations for modification of the proposed syllabus which was later on accepted unanimously by the Board and the suggestions/corrections made were also carried out. The following points have been approved unanimously by the BOS:

संस्कृत विभाग/ DEPARTMENT OF SANSKRIT

i. Addition of 3 courses of Bharatiya Darshana /Indian Philosophy group (specialised elective-group 4) in the III Semester syllabus of the MA Sanskrit program of the Department in addition to existing three groups, i.e. Veda, Vyakarana and Sahitya.

ii. Finalization of 3 core courses (including one course as Dissertation) and 8 specialized elective courses spread over 4 specialised groups (i.e. Veda, Vyakarana, Sahitya and Bharatiya Darshana).

iii. Finalization of the panel of paper setters/moderators/examiners for all the I, II, III, IV Semester courses of the MA Sanskrit programme of the Department.

The meeting concluded with thanks to the chair.

U. C. Vaidya.
(Prof. Uma C. Vaidya)
External Member
Chairman

(Prof. Surendra Kumar)
External Member

[redacted]
(Prof. Ranvir Singh)
Internal Member &

School Of Humanities and Social Science <deanshss@cuh.ac.in>

Request for the approval of BOS approved Syllabus- M.A. Sanskrit

14 messages

Ranvir Singh <professor.ranvir@gmail.com> Wed, Feb 17, 2021 at 5:04 PM
To: deanshss@cuh.ac.in
Cc: "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, HOD Psychology <hodpsychology@cuh.ac.in>, hodpolscience@cuh.ac.in, CUH Rajbir Dalal Pol Sc Prof <rajbirdalal@cuh.ac.in>, rinueng@cuh.ac.in, vinay kumar rao <vinay@cuh.ac.in>, arvindtejawat@cuh.ac.in, narender parmar <narenderparmar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, sbargujar@gmail.com, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Rajeev Kumar Singh" <rajeevsingh@cuh.ac.in>, "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>, pradeeppsy@cuh.ac.in, reemagill@cuh.ac.in, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, rajeshgill@pu.ac.in, rameshkgautam.du@gmail.com, Jaiveer Dhankhar <jaiveer3133@gmail.com>, C R Darolia <crdarolia@yahoo.com>, vkaushik24@gmail.com, crdarolia@kuk.ac.in

Dear Sir,

NamonamaH.

The syllabus of IV Semester & syllabus of Indian Philosophy Special Group (3 nos.) of III Semester of M.A. Sanskrit program of the Department of Sanskrit was approved by the BOS in its meeting held on 25.01.2021 through virtual mode. Necessary corrections and additions have been incorporated as per the advice of the respected BOS members.

Now the final draft of syllabus of III Semester (Philosophy Special Group) and IV Semester M.A. Sanskrit is hereby submitted for approval of the School Board through circulation so that the approved syllabus may be submitted to the Academic Council for approval.

Kindly find the attachment.

Thanking you,

सादर / Regards
आत्मीय / Yours sincerely
डॉ. रणवीर सिंह / Dr. Ranvir Singh
पीठ आचार्य / Chair Professor
स्वामी दयानन्द सरस्वती पीठ / Swamy Dayanand Saraswati Chair
शैक्षणिक ब्लॉक क्र. 04, प्रकोष्ठ क्र. 229 / Academic Block No.04, Room No. 229
अध्यक्ष/Head : संस्कृत विभाग /Sanskrit Department
हरियाणा केन्द्रीय विश्वविद्यालय / Central University of Haryana
जांट-पाली / Jant-Pali, महेन्द्रगढ़ / Mahendergarh - 123 031
हरियाणा / Haryana
चलद्वरभाष / Mobile : Whats App no. 9996347469; 09416334660

3 attachments

- **MA SANSKRIT 3RD SEM (PHILOSOPHY SPECIAL PAPER).pdf** 922K
- **MA SANSKRIT 4TH SEM SYLLABUS.pdf** 1866K
- **proceedings of BOS 25.02.2021.pdf** 1239K

School Of Humanities and Social Science <deanshss@cuh.ac.in> Wed, Feb 17, 2021 at 5:11 PM
To: "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, HOD Psychology <hodpsychology@cuh.ac.in>, hodpolscience@cuh.ac.in, CUH Rajbir Dalal Pol Sc Prof <rajbirdalal@cuh.ac.in>, "Ms. Rinu" <rinueng@cuh.ac.in>, vinay

kumar rao <vinay@cuh.ac.in>, arvindtejawat@cuh.ac.in, narender parmar <narenderparmar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, surender bargujar <sbargujar@gmail.com>, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Rajeev Kumar Singh" <rajeevsingh@cuh.ac.in>, "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>, pradeeppsy@cuh.ac.in, reemagill@cuh.ac.in, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, rajeshgill@pu.ac.in, Ramesh Kumar Gautam <rameshkgautam.du@gmail.com>, Jaiveer Dhankhar <jaiveer3133@gmail.com>, C R Darolia <crdarolia@yahoo.com>, vkaushik24@gmail.com, crdarolia@kuk.ac.in
Cc: ranvirsingh@cuh.ac.in, hodsanskrit@cuh.ac.in, Academic Branch <academicbranch@cuh.ac.in>

Dear Sir/Madam
As submitted by the TIC (Sanskrit) and Coordinator, M.A. Sanskrit programme, you are kindly requested to consider the syllabus approved by the Board of Studies (Sanskrit) for approval so that the Department may submit it for the final approval of the Academic Council. Thanks and regards
[Quoted text hidden]

3 attachments

MA SANSKRIT 3RD SEM (PHILOSOPHY SPECIAL PAPER).pdf
922K

MA SANSKRIT 4TH SEM SYLLABUS.pdf
1866K

proceedings of BOS 25.02.2021.pdf
1239K

HOD Sanskrit <hodsanskrit@cuh.ac.in> Wed, Feb 17, 2021 at 5:11 PM
To: deanshss@cuh.ac.in

--
सादर / Regards
आत्मीय / Yours sincerely
डॉ. रणवीर सिंह / Dr. Ranvir Singh
पीठ आचार्य / Chair Professor
स्वामी दयानन्द सरस्वती पीठ / Swamy Dayanand Saraswati Chair
शैक्षणिक ब्लॉक क्र. 04, प्रकोष्ठ क्र. 229 / Academic Block No.04, Room No. 229
अध्यक्ष/Head : संस्कृत विभाग /Sanskrit Department
हरियाणा केन्द्रीय विश्वविद्यालय / Central University of Haryana
जांट-पाली / Jant-Pali, महेन्द्रगढ़ / Mahendergarh - 123 031
हरियाणा / Haryana
चलदूरभाष / Mobile : 09416334660

C.R. DAROLIA <crdarolia@kuk.ac.in> Wed, Feb 17, 2021 at 7:09 PM
To: School Of Humanities and Social Science <deanshss@cuh.ac.in>

Dear Prof Singh,
I have gone through the syllabi of M A Sanskrit Sem III and Sem IV as approved by the BOS. I find it well comprehensive and up to level of the degree, hence accord approval for further necessary action as per University rules.
Regards,

Keep in touch with nature!
Prof C R Darolia
Formerly Head Psychology
Dean Social Sciences
K U Kurukshetra

On 17-Feb-2021, at 5:11 PM, School Of Humanities and Social Science <deanshss@cuh.ac.in> wrote:

[Quoted text hidden]
<MA SANSKRIT 3RD SEM (PHILOSOPHY SPECIAL PAPER).pdf>
<MA SANSKRIT 4TH SEM SYLLABUS.pdf>
<proceedings of BOS 25.02.2021.pdf>

School Of Humanities and Social Science <deanshss@cuh.ac.in> Wed, Feb 17, 2021 at 7:27 PM
To: "C.R. DAROLIA" <crdarolia@kuk.ac.in>

Thanks a lot, respected Sir.
[Quoted text hidden]

---

surender bargujar <sbargujar@gmail.com> Thu, Feb 18, 2021 at 4:44 AM
To: School Of Humanities and Social Science <deanshss@cuh.ac.in>

Good morning sir,
I approved the syllabus.
Thanks & Regards
Dr.surender,JMC
[Quoted text hidden]

Dr. Payal Chandel <paayalchandel@cuh.ac.in> Thu, Feb 18, 2021 at 8:47 AM
To: Ranvir Singh <professor.ranvir@gmail.com>
Cc: School Of Humanities and Social Science <deanshss@cuh.ac.in>, "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, HOD Psychology <hodpsychology@cuh.ac.in>, hodpolscience@cuh.ac.in, CUH Rajbir Dalal Pol Sc Prof <rajbirdalal@cuh.ac.in>, rinueng@cuh.ac.in, vinay kumar rao <vinay@cuh.ac.in>, arvindtejawat@cuh.ac.in, narender parmar <narenderparmar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, sbargujar@gmail.com, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Rajeev Kumar Singh" <rajeevsingh@cuh.ac.in>, pradeeppsy@cuh.ac.in, reemagill@cuh.ac.in, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, rajeshgill@pu.ac.in, rameshkgautam.du@gmail.com, Jaiveer Dhankhar <jaiveer3133@gmail.com>, C R Darolia <crdarolia@yahoo.com>, vkaushik24@gmail.com, crdarolia@kuk.ac.in

Dear Sir,
Greetings of the day!!!

The syllabus is acknowledged and approved by my side.

Regards,
Dr. Payal Chandel
Associate Professor
Department of Psychology
Central University of Haryana
Ph: 9530025450
[Quoted text hidden]

Dr. Rajbir Singh Dalal <rajbirdalal@cuh.ac.in> Thu, Feb 18, 2021 at 9:49 AM
To: Ranvir Singh <professor.ranvir@gmail.com>
Cc: School Of Humanities and Social Science <deanshss@cuh.ac.in>, "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, HOD Psychology <hodpsychology@cuh.ac.in>, hodpolscience@cuh.ac.in, rinueng@cuh.ac.in, vinay kumar rao <vinay@cuh.ac.in>, arvindtejawat@cuh.ac.in, narender parmar <narenderparmar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, sbargujar@gmail.com, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Rajeev Kumar Singh" <rajeevsingh@cuh.ac.in>, "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>, pradeeppsy@cuh.ac.in, reemagill@cuh.ac.in, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, rajeshgill@pu.ac.in, rameshkgautam.du@gmail.com, Jaiveer Dhankhar <jaiveer3133@gmail.com>, C R Darolia <crdarolia@yahoo.com>, vkaushik24@gmail.com, crdarolia@kuk.ac.in

Dr Sahib, The Syllabus is acknowledged and approved .
Dr Rajbir Singh Dalal Head Dept of Pol Science CUH Mahendergarh.
[Quoted text hidden]

HOD Psychology <hodpsychology@cuh.ac.in> Thu, Feb 18, 202[illegible]

To: Ranvir Singh <professor.ranvir@gmail.com>
Cc: School Of Humanities and Social Science <deanshss@cuh.ac.in>, "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, hodpolscience@cuh.ac.in, CUH Rajbir Dalal Pol Sc Prof <rajbirdalal@cuh.ac.in>, rinueng@cuh.ac.in, vinay kumar rao <vinay@cuh.ac.in>, arvindtejawat@cuh.ac.in, narender parmar <narenderparmar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, sbargujar@gmail.com, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Rajeev Kumar Singh" <rajeevsingh@cuh.ac.in>, "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>, pradeeppsy@cuh.ac.in, reemagill@cuh.ac.in, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, rajeshgill@pu.ac.in, rameshkgautam.du@gmail.com, Jaiveer Dhankhar <jaiveer3133@gmail.com>, C R Darolia <crdarolia@yahoo.com>, vkaushik24@gmail.com, crdarolia@kuk.ac.in

Dear Sir,
I acknowledge and approve the attached syllabus.
Regards,
Dr. VN Yadav
HOD Psychology
[Quoted text hidden]

Dr. Rajeev Kumar Singh <rajeevsingh@cuh.ac.in> Thu, Feb 18, 2021 at 10:55 AM
To: HOD Psychology <hodpsychology@cuh.ac.in>
Cc: Ranvir Singh <professor.ranvir@gmail.com>, School Of Humanities and Social Science <deanshss@cuh.ac.in>, "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, Political Science <hodpolscience@cuh.ac.in>, CUH Rajbir Dalal Pol Sc Prof <rajbirdalal@cuh.ac.in>, rinueng@cuh.ac.in, vinay kumar rao <vinay@cuh.ac.in>, Arvind Singh Tejawat <arvindtejawat@cuh.ac.in>, narender parmar <narenderparmar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, sbargujar@gmail.com, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>, pradeeppsy@cuh.ac.in, reema gill <reemagill@cuh.ac.in>, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, rajeshgill@pu.ac.in, Ramesh Kumar Gautam <rameshkgautam.du@gmail.com>, Jaiveer Dhankhar <jaiveer3133@gmail.com>, C R Darolia <crdarolia@yahoo.com>, vkaushik24@gmail.com, crdarolia@kuk.ac.in

Acknowledge and Approved from my side.

Regards

Dr. Rajeev Kumar Singh
Assistant Professor
Department of Political Science
Central University Of Haryana
Mahendergarh, Haryana

[Quoted text hidden]

---

narender parmar <narenderparmar@cuh.ac.in> Thu, Feb 18, 2021 at 11:08 AM
To: School Of Humanities and Social Science <deanshss@cuh.ac.in>
Cc: Academic Branch <academicbranch@cuh.ac.in>, C R Darolia <crdarolia@yahoo.com>, CUH Rajbir Dalal Pol Sc Prof <rajbirdalal@cuh.ac.in>, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>, "Dr. Rajeev Kumar Singh" <rajeevsingh@cuh.ac.in>, "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, HOD Psychology <hodpsychology@cuh.ac.in>, Jaiveer Dhankhar <jaiveer3133@gmail.com>, "Ms. Rinu" <rinueng@cuh.ac.in>, Ramesh Kumar Gautam <rameshkgautam.du@gmail.com>, arvindtejawat@cuh.ac.in, crdarolia@kuk.ac.in, hodpolscience@cuh.ac.in, hodsanskrit@cuh.ac.in, pradeeppsy@cuh.ac.in, rajeshgill@pu.ac.in, ranvirsingh@cuh.ac.in, reemagill@cuh.ac.in, surender bargujar <sbargujar@gmail.com>, vinay kumar rao <vinay@cuh.ac.in>, vkaushik24@gmail.com

Dear Sir,
I acknowledge and approve the attached syllabus.

with Regards,
Dr. Narender Parmar
[Quoted text hidden]
--
--
Dr. Narender Parmar
Assistant Professor
Department of History and Archaeology
Central University of Haryana
Jant-Pali, Mahendergerh - 123029
Haryana, India

Mob: +91 8950238575

Ramesh Kumar Gautam <rameshkgautam.du@gmail.com> Thu, Feb 18, 2021 at 11:42 AM
To: School Of Humanities and Social Science <deanshss@cuh.ac.in>

मैंने पाठ्यक्रम का ध्यानपूर्वक मूल्यांकन किया और पाया कि पाठ्यक्रम को अध्ययन मण्डल द्वारा संस्तुति प्रदान कि जा सकती है.
प्रो. रमेश गौतम
[Quoted text hidden]

Dr. Rinu Yadav <rinueng@cuh.ac.in> Thu, Feb 18, 2021 at 1:31 PM
To: professor.ranvir@gmail.com
Cc: School Of Humanities and Social Science <deanshss@cuh.ac.in>, Academic Branch <academicbranch@cuh.ac.in>, C R Darolia <crdarolia@yahoo.com>, CUH Rajbir Dalal Pol Sc Prof <rajbirdalal@cuh.ac.in>, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>, "Dr. Rajeev Kumar Singh" <rajeevsingh@cuh.ac.in>, "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, HOD Psychology <hodpsychology@cuh.ac.in>, Jaiveer Dhankhar <jaiveer3133@gmail.com>, Ramesh Kumar Gautam <rameshkgautam.du@gmail.com>, Arvind Singh Tejawat <arvindtejawat@cuh.ac.in>, crdarolia@kuk.ac.in, hodpolscience@cuh.ac.in, hodsanskrit@cuh.ac.in, pradeeppsy@cuh.ac.in, rajeshgill@pu.ac.in, "Prof. Ranvir Singh" <ranvirsingh@cuh.ac.in>, reema gill <reemagill@cuh.ac.in>, surender bargujar <sbargujar@gmail.com>, vinay kumar rao <vinay@cuh.ac.in>, vkaushik24@gmail.com

Respected Sir

The attached syllabi is approved.
[Quoted text hidden]

Arvind Singh Tejawat <arvindtejawat@cuh.ac.in> Fri, Feb 19, 2021 at 7:01 AM
To: Ranvir Singh <professor.ranvir@gmail.com>
Cc: School Of Humanities and Social Science <deanshss@cuh.ac.in>, "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, HOD Psychology <hodpsychology@cuh.ac.in>, hodpolscience@cuh.ac.in, CUH Rajbir Dalal Pol Sc Prof <rajbirdalal@cuh.ac.in>, rinueng@cuh.ac.in, vinay kumar rao <vinay@cuh.ac.in>, narender parmar <narenderparmar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, sbargujar@gmail.com, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Rajeev Kumar Singh" <rajeevsingh@cuh.ac.in>, "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>, pradeeppsy@cuh.ac.in, reemagill@cuh.ac.in, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, rajeshgill@pu.ac.in, rameshkgautam.du@gmail.com, Jaiveer Dhankhar <jaiveer3133@gmail.com>, C R Darolia <crdarolia@yahoo.com>, vkaushik24@gmail.com, crdarolia@kuk.ac.in

I acknowledge and approve the attached syllabus.
Arvind Singh Tejawat, PhD
Dept. of Hindi, CUH

On Wed, 17 Feb 2021, 17:04 Ranvir Singh, <professor.ranvir@gmail.com> wrote:
[Quoted text hidden]

Gmail

Ranvir Singh <professor.ranvir@gmail.com>

Request for the approval of BOS approved Syllabus- M.A. Sanskrit

14 messages

Ranvir Singh <professor.ranvir@gmail.com> Wed, Feb 17, 2021 at 5:04 PM
To: deanshss@cuh.ac.in
Cc: "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, HOD Psychology <hodpsychology@cuh.ac.in>, hodpolscience@cuh.ac.in, CUH Rajbir Dalal Pol Sc Prof <rajbirdalal@cuh.ac.in>, rinueng@cuh.ac.in, vinay kumar rao <vinay@cuh.ac.in>, arvindtejawat@cuh.ac.in, narender parmar <narenderparmar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, sbargujar@gmail.com, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Rajeev Kumar Singh" <rajeevsingh@cuh.ac.in>, "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>, pradeeppsy@cuh.ac.in, reemagill@cuh.ac.in, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, rajeshgill@pu.ac.in, rameshkgautam.du@gmail.com, Jaiveer Dhankhar <jaiveer3133@gmail.com>, C R Darolia <crdarolia@yahoo.com>, vkaushik24@gmail.com, crdarolia@kuk.ac.in

Dear Sir,

NamonamaH.

The syllabus of IV Semester & syllabus of Indian Philosophy Special Group (3 nos.) of III Semester of M.A. Sanskrit program of the Department of Sanskrit was approved by the BOS in its meeting held on 25.01.2021 through virtual mode. Necessary corrections and additions have been incorporated as per the advice of the respected BOS members.

Now the final draft of syllabus of III Semester (Philosophy Special Group) and IV Semester M.A. Sanskrit is hereby submitted for approval of the School Board through circulation so that the approved syllabus may be submitted to the Academic Council for approval.

Kindly find the attachment.

Thanking you,

सादर / Regards
आत्मीय / Yours sincerely
डॉ. रणवीर सिंह / Dr. Ranvir Singh
पीठ आचार्य / Chair Professor
स्वामी दयानन्द सरस्वती पीठ / Swamy Dayanand Saraswati Chair
शैक्षणिक ब्लॉक क्र. 04, प्रकोष्ठ क्र. 229 / Academic Block No.04, Room No. 229
अध्यक्ष/Head : संस्कृत विभाग /Sanskrit Department
हरियाणा केन्द्रीय विश्वविद्यालय / Central University of Haryana
जांट-पाली / Jant-Pali, महेन्द्रगढ़ / Mahendergarh - 123 031
हरियाणा / Haryana
चलद्वरभाष / Mobile : Whats App no. 9996347469; 09416334660

3 attachments

- **MA SANSKRIT 3RD SEM (PHILOSOPHY SPECIAL PAPER).pdf** 922K
- **MA SANSKRIT 4TH SEM SYLLABUS.pdf** 1866K
- **proceedings of BOS 25.02.2021.pdf** 1239K

Pradeep Kumar <pradeeppsy@cuh.ac.in> Thu, Feb 18, 2021 at 8:04 AM
To: Ranvir Singh <professor.ranvir@gmail.com>

Thanks for communication sir and I approved the same.
[Quoted text hidden]

Dr. Payal Chandel <paayalchandel@cuh.ac.in> Thu, Feb 18, 2021 at 8:47 AM
To: Ranvir Singh <professor.ranvir@gmail.com>
Cc: School Of Humanities and Social Science <deanshss@cuh.ac.in>, "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, HOD Psychology <hodpsychology@cuh.ac.in>, hodpolscience@cuh.ac.in, CUH Rajbir Dalal Pol Sc Prof <rajbirdalal@cuh.ac.in>, rinueng@cuh.ac.in, vinay kumar rao <vinay@cuh.ac.in>, arvindtejawat@cuh.ac.in, narender parmar <narenderparmar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, sbargujar@gmail.com, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Rajeev Kumar Singh" <rajeevsingh@cuh.ac.in>, pradeeppsy@cuh.ac.in, reemagill@cuh.ac.in, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, rajeshgill@pu.ac.in, rameshkgautam.du@gmail.com, Jaiveer Dhankhar <jaiveer3133@gmail.com>, C R Darolia <crdarolia@yahoo.com>, vkaushik24@gmail.com, crdarolia@kuk.ac.in

Dear Sir,
Greetings of the day!!!

The syllabus is acknowledged and approved by my side.

Regards,
Dr. Payal Chandel
Associate Professor
Department of Psychology
Central University of Haryana
Ph: 9530025450

On Wed, 17 Feb 2021, 17:04 Ranvir Singh, <professor.ranvir@gmail.com> wrote:
[Quoted text hidden]

Dr. Rajbir Singh Dalal <rajbirdalal@cuh.ac.in> Thu, Feb 18, 2021 at 9:49 AM
To: Ranvir Singh <professor.ranvir@gmail.com>
Cc: School Of Humanities and Social Science <deanshss@cuh.ac.in>, "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, HOD Psychology <hodpsychology@cuh.ac.in>, hodpolscience@cuh.ac.in, rinueng@cuh.ac.in, vinay kumar rao <vinay@cuh.ac.in>, arvindtejawat@cuh.ac.in, narender parmar <narenderparmar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, sbargujar@gmail.com, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Rajeev Kumar Singh" <rajeevsingh@cuh.ac.in>, "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>, pradeeppsy@cuh.ac.in, reemagill@cuh.ac.in, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, rajeshgill@pu.ac.in, rameshkgautam.du@gmail.com, Jaiveer Dhankhar <jaiveer3133@gmail.com>, C R Darolia <crdarolia@yahoo.com>, vkaushik24@gmail.com, crdarolia@kuk.ac.in

Dr Sahib, The Syllabus is acknowledged and approved .
Dr Rajbir Singh Dalal Head Dept of Pol Science CUH Mahendergarh.
[Quoted text hidden]

Ranvir Singh <professor.ranvir@gmail.com> Thu, Feb 18, 2021 at 9:59 AM
To: Pradeep Kumar <pradeeppsy@cuh.ac.in>

Dear Dr.Pradeep Kumar Ji,
Thank you very much for your quick reply.

सादर / Regards
आत्मीय / Yours sincerely
डॉ. रणवीर सिंह / Dr. Ranvir Singh
पीठ आचार्य / Chair Professor
स्वामी दयानन्द सरस्वती पीठ / Swamy Dayanand Saraswati Chair
शैक्षणिक ब्लॉक क्र. 04, प्रकोष्ठ क्र. 229 / Academic Block No.04, Room No. 229
अध्यक्ष/Head : संस्कृत विभाग /Sanskrit Department
हरियाणा केन्द्रीय विश्वविद्यालय / Central University of Haryana
जांट-पाली / Jant-Pali, महेन्द्रगढ़ / Mahendergarh - 123 031
हरियाणा / Haryana
चलदूरभाष / Mobile : Whats App no. 9996347469; 09416334660

[Quoted text hidden]

Ranvir Singh <professor.ranvir@gmail.com> Thu, Feb 18, 2021 at 10:00 AM
To: "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>

Dear Madam Payal Ji,
Thank you very much for your quick reply.

सादर / Regards
आत्मीय / Yours sincerely
डॉ. रणवीर सिंह / Dr. Ranvir Singh
पीठ आचार्य / Chair Professor
स्वामी दयानन्द सरस्वती पीठ / Swamy Dayanand Saraswati Chair
शैक्षणिक ब्लॉक क्र. 04, प्रकोष्ठ क्र. 229 / Academic Block No.04, Room No. 229
अध्यक्ष/Head : संस्कृत विभाग /Sanskrit Department
हरियाणा केन्द्रीय विश्वविद्यालय / Central University of Haryana
जांट-पाली / Jant-Pali, महेन्द्रगढ़ / Mahendergarh - 123 031
हरियाणा / Haryana
चलदूरभाष / Mobile : Whats App no. 9996347469; 09416334660

[Quoted text hidden]

Ranvir Singh <professor.ranvir@gmail.com> Thu, Feb 18, 2021 at 10:01 AM
To: "Dr. Rajbir Singh Dalal" <rajbirdalal@cuh.ac.in>

Dear Dr. Rajbir Ji,
Thank you very much for your quick reply.

सादर / Regards
आत्मीय / Yours sincerely
डॉ. रणवीर सिंह / Dr. Ranvir Singh
पीठ आचार्य / Chair Professor
स्वामी दयानन्द सरस्वती पीठ / Swamy Dayanand Saraswati Chair
शैक्षणिक ब्लॉक क्र. 04, प्रकोष्ठ क्र. 229 / Academic Block No.04, Room No. 229
अध्यक्ष/Head : संस्कृत विभाग /Sanskrit Department
हरियाणा केन्द्रीय विश्वविद्यालय / Central University of Haryana
जांट-पाली / Jant-Pali, महेन्द्रगढ़ / Mahendergarh - 123 031
हरियाणा / Haryana
चलदूरभाष / Mobile : Whats App no. 9996347469; 09416334660

[Quoted text hidden]

HOD Psychology <hodpsychology@cuh.ac.in> Thu, Feb 18, 2021 at 10:23 AM
To: Ranvir Singh <professor.ranvir@gmail.com>
Cc: School Of Humanities and Social Science <deanshss@cuh.ac.in>, "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, hodpolscience@cuh.ac.in, CUH Rajbir Dalal Pol Sc Prof <rajbirdalal@cuh.ac.in>, rinueng@cuh.ac.in, vinay kumar rao <vinay@cuh.ac.in>, arvindtejawat@cuh.ac.in, narender parmar <narenderparmar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, sbargujar@gmail.com, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Rajeev Kumar Singh" <rajeevsingh@cuh.ac.in>, "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>, pradeeppsy@cuh.ac.in, reemagill@cuh.ac.in, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, rajeshgill@pu.ac.in, rameshkgautam.du@gmail.com, Jaiveer Dhankhar <jaiveer3133@gmail.com>, C R Darolia <crdarolia@yahoo.com>, vkaushik24@gmail.com, crdarolia@kuk.ac.in

Dear Sir,
I acknowledge and approve the attached syllabus.
Regards,
Dr. VN Yadav
HOD Psychology
[Quoted text hidden]

---

reema gill <reemagill@cuh.ac.in> Thu, Feb 18, 2021 at 10:28 AM
To: Ranvir Singh <professor.ranvir@gmail.com>

Dear Sir,

It's approved from my end.

Regards,

Reema Gill
[Quoted text hidden]

Dr. Rajeev Kumar Singh <rajeevsingh@cuh.ac.in> Thu, Feb 18, 2021 at 10:55 AM
To: HOD Psychology <hodpsychology@cuh.ac.in>
Cc: Ranvir Singh <professor.ranvir@gmail.com>, School Of Humanities and Social Science <deanshss@cuh.ac.in>, "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, Political Science <hodpolscience@cuh.ac.in>, CUH Rajbir Dalal Pol Sc Prof <rajbirdalal@cuh.ac.in>, rinueng@cuh.ac.in, vinay kumar rao <vinay@cuh.ac.in>, Arvind Singh Tejawat <arvindtejawat@cuh.ac.in>, narender parmar <narenderparmar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, sbargujar@gmail.com, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>, pradeeppsy@cuh.ac.in, reema gill <reemagill@cuh.ac.in>, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, rajeshgill@pu.ac.in, Ramesh Kumar Gautam <rameshkgautam.du@gmail.com>, Jaiveer Dhankhar <jaiveer3133@gmail.com>, C R Darolia <crdarolia@yahoo.com>, vkaushik24@gmail.com, crdarolia@kuk.ac.in

Acknowledge and Approved from my side.

Regards

Dr. Rajeev Kumar Singh
Assistant Professor
Department of Political Science
Central University Of Haryana
Mahendergarh, Haryana

[Quoted text hidden]

---

surender bargujar <sbargujar@gmail.com> Thu, Feb 18, 2021 at 11:08 AM
To: Ranvir Singh <professor.ranvir@gmail.com>

Good morning sir,
Sir I approved the syllabus.
Thanks & Regards
Dr .surender, JMC

On Wed, 17 Feb 2021, 17:04 Ranvir Singh, <professor.ranvir@gmail.com> wrote:
[Quoted text hidden]

Dr. Rinu Yadav <rinueng@cuh.ac.in> Thu, Feb 18, 2021 at 1:31 PM
To: professor.ranvir@gmail.com
Cc: School Of Humanities and Social Science <deanshss@cuh.ac.in>, Academic Branch <academicbranch@cuh.ac.in>, C R Darolia <crdarolia@yahoo.com>, CUH Rajbir Dalal Pol Sc Prof <rajbirdalal@cuh.ac.in>, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>, "Dr. Rajeev Kumar Singh" <rajeevsingh@cuh.ac.in>, "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, HOD Psychology <hodpsychology@cuh.ac.in>, Jaiveer Dhankhar <jaiveer3133@gmail.com>, Ramesh Kumar Gautam <rameshkgautam.du@gmail.com>, Arvind Singh Tejawat <arvindtejawat@cuh.ac.in>, crdarolia@kuk.ac.in, hodpolscience@cuh.ac.in, hodsanskrit@cuh.ac.in, pradeeppsy@cuh.ac.in, rajeshgill@pu.ac.in, "Prof. Ranvir Singh" <ranvirsingh@cuh.ac.in>, reema gill <reemagill@cuh.ac.in>, surender bargujar <sbargujar@gmail.com>, vinay kumar rao <vinay@cuh.ac.in>, vkaushik24@gmail.com

Respected Sir

The attached syllabi is approved.

On Thu, Feb 18, 2021, 11:08 AM narender parmar <narenderparmar@cuh.ac.in> wrote:
> Dear Sir,
> I acknowledge and approve the attached syllabus.
>
> with Regards,
> Dr. Narender Parmar

On Wed, Feb 17, 2021 at 5:11 PM School Of Humanities and Social Science <deanshss@cuh.ac.in> wrote:
> Dear Sir/Madam

As submitted by the TIC (Sanskrit) and Coordinator, M.A. Sanskrit programme, you are kindly requested to consider the syllabus approved by the Board of Studies (Sanskrit) for approval so that the Department may submit it for the final approval of the Academic Council. Thanks and regards

[Quoted text hidden]

--

Dr. Narender Parmar
Assistant Professor
Department of History and Archaeology
Central University of Haryana
Jant-Pali, Mahendergerh - 123029
Haryana, India

Mob: +91 8950238575

Arvind Singh Tejawat <arvindtejawat@cuh.ac.in> Fri, Feb 19, 2021 at 7:01 AM
To: Ranvir Singh <professor.ranvir@gmail.com>
Cc: School Of Humanities and Social Science <deanshss@cuh.ac.in>, "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, HOD Psychology <hodpsychology@cuh.ac.in>, hodpolscience@cuh.ac.in, CUH Rajbir Dalal Pol Sc Prof <rajbirdalal@cuh.ac.in>, rinueng@cuh.ac.in, vinay kumar rao <vinay@cuh.ac.in>, narender parmar <narenderparmar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, sbargujar@gmail.com, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Rajeev Kumar Singh" <rajeevsingh@cuh.ac.in>, "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>, pradeeppsy@cuh.ac.in, reemagill@cuh.ac.in, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, rajeshgill@pu.ac.in, rameshkgautam.du@gmail.com, Jaiveer Dhankhar <jaiveer3133@gmail.com>, C R Darolia <crdarolia@yahoo.com>, vkaushik24@gmail.com, crdarolia@kuk.ac.in

I acknowledge and approve the attached syllabus.
Arvind Singh Tejawat, PhD
Dept. of Hindi, CUH

On Wed, 17 Feb 2021, 17:04 Ranvir Singh, <professor.ranvir@gmail.com> wrote:
[Quoted text hidden]

Dr. Kumuda Prasad Acharya <kumuda@cuh.ac.in> Fri, Feb 19, 2021 at 10:57 AM
To: Ranvir Singh <professor.ranvir@gmail.com>

Respected Sir,
I acknowledge and approve the syllabus

On Wed, Feb 17, 2021 at 5:04 PM Ranvir Singh <professor.ranvir@gmail.com> wrote:
[Quoted text hidden]

--
सादर / Regards
आत्मीयः / Yours sincerely
डॉ. कुमुदप्रसादाचार्यः / Dr. Kumuda Prasad Acharya
सहायकाचार्यः / Assistant Professor
संस्कृतविभागः / Department of Sanskrit
शैक्षणिक ब्लॉक क्र. 04, प्रकोष्ठ क्र. 229 / Academic Block No.04, Room No. 229
हरियाणा-केन्द्रीय-विश्वविद्यालयः / Central University of Haryana
जांट-पाली / Jant-Pali, महेन्द्रगढ़म् / Mahendergarh - 123 031
हरियाणा / Haryana
चलद्वरभाषः / Mobile : 7750809762

CENTRAL UNIVERSITY OF HARYANA
MAHENDERGARH

(Established vide Central Universities Act 2009)
NAAC Accredited 'A' Grade University

SCHEME, SYLLABUS AND COURSES OF READING FOR

M. A. SANSKRIT (FINAL)
SEMESTER: III
(INDIAN PHILOSOPHY SPECIALISED ELECTIVE)

CHOICE BASED CREDIT SYSTEM

(Proposed w.e.f. the Academic Session: 2020-2021)

Option (IV)
वर्गः - घ (भारतीयदर्शनम्)
Group-D (Indian Philosophy)

COURSE CODE: SHSS SKT 13 D 10 SE 4105
त्रयोदशं पत्रम् : भारतीयदर्शनस्य इतिहासः
Paper-XIII: Bhāratīyadarśanasya Itihāsaḥ

L	T	P	Credits
4	1	0	5

घटकम्-1: वैदिक-दर्शनम् (वेदेषु, ब्राह्मणग्रन्थेषु उपनिषत्सु च विद्यमानानां दार्शनिकतत्त्वानां परिचयः), पुराण-दर्शनम् (अग्निपुराणे विद्यमानानां दार्शनिकतत्त्वानां परिचयः) च।

घटकम्-2: नास्तिक-दर्शनानि (षड्-नास्तिकदर्शनानां – माध्यमिकः, योगाचारः, सौत्रान्तिकः, वैभाषिकः, चार्वाकः दिगम्बरश्च – सामान्यपरिचयः)

घटकम्-3: सांख्यदर्शनम्, योगदर्शनम्, न्यायदर्शनम्, वैशेषिकदर्शनम् चैतेषां दर्शनानां सामान्यपरिचयः।

घटकम्-4: पूर्वमीमांसा-दर्शनम्, उत्तरमीमांसा-दर्शनं चैतयोः दर्शनयोः सामान्यपरिचयः।

अनुशंसितग्रन्थाः

1. शर्मा, उमाशंकर ऋषि (व्या०), *सर्वदर्शनसंग्रहः*, चौखम्बा विद्याभवन, वाराणसी (पुनर्मुद्रित), 2019.
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3. Vidyabhushan, Satis Chandra, *History of Indian Logic: (Ancient, Mediaeval and Modern Schools)* (Reprint), Motilal Banarsidass, New Delhi, 2015.
4. Chattopadhyaya, D.P., *Lokāyata: A Study in Ancient Indian Materialism*, People's Publishing House (Reprint), 2006.
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7. शर्मा, डॉ० चन्द्रधर, *भारतीय दर्शन का तात्त्विक सर्वेक्षण*, मोतीलाल बनारसीदास, दिल्ली, 2013.
8. Chaterjee, Sarat Chandra, *An Introduction to Indian Philosophy* (Reprint), Rupa & Co., Delhi, 2012.
9. Radhakrishnan, S., *Indian Philosophy* (Reprint), Oxford, 2008.
10. उपाध्याय, आचार्य बलदेव, *पुराण–विमर्श*, चौखम्बा विद्याभवन, वाराणसी, (Reprint) 2007.
11. Sinha, Jadunath, *Outlines of Indian Philosophy*, Pilgrims Publishings, 2007.
12. अलंकार, वीरेन्द्र कुमार, *मीमांसा दर्शन (तर्क-अध्ययन)*, भारतीय विद्या प्रकाशन, दिल्ली, 2006.
13. वेदवाचस्पति, प्रियव्रत, *वेद और उसकी वैज्ञानिकता*, गुरुकुल काँगड़ी विश्वविद्यालय, हरिद्वार, 2005.
14. वेदालंकार, जयदेव, *भारतीय दर्शन (तत्त्व और ज्ञानमीमांसा के मौलिक सम्प्रत्यय)*, न्यू भारतीय बुक कॉर्पोरेशन, नई दिल्ली, 2004.
15. देवराज, नन्द किशोर, *भारतीय दर्शन*,उत्तर प्रदेश हिन्दी संस्थान, लखनऊ, 2002.
16. चतुर्वेदी, गिरिधर शर्मा, *पुराणपरिशीलनम्*, बिहार राष्ट्रभाषा परिषद्, पटना, 2000.
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20. अभिमन्यु, *वेदान्तविमर्श*, परिमल पब्लिकेशन्स, दिल्ली,1991.
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25. पाठक, सर्वानन्द, *चार्वाकदर्शन की शास्त्रीय समीक्षा*, चौखम्बा विद्याभवन, वाराणसी, 1968.
26. उपाध्याय, आचार्य बलदेव, *भारतीय दर्शन*, शारदा मन्दिर, वाराणसी, 1942.
27. Jha, Ganganath, *Vaisheshika Darshana*, Nagari Pracharini Sabha, Benares, 1921.
28. Cowell, E.B. & Gough A.E. (Eng. Tr.), *Sarvadarśanasaṁgraha*, Trubner & Co, Ludgate Hill, London, 1882.
29. त्रिपाठी, श्रीकृष्णमणि, पुराणपर्यालोचनम्, चौखम्बा सुरभारती प्रकाशन, वाराणसी
30. उपाध्यायः, वाचस्पति, *मीमांसादर्शनविमर्शः*, भारतीय विद्या प्रकाशन, दिल्ली.

★★★

COURSE CODE : SHSS SKT 13 D 11 SE 4105

चतुर्दशं पत्रम् : न्यायदर्शनम्, पूर्वमीमांसादर्शनं काश्मीरशैवदर्शनञ्च

Paper-XIV : Nyāyadarśanam, Pūrvamīmāṃsādarśanaṁ Kāśmīraśaivadarśanañca

L	T	P	Credits
4	1	0	5

घटकम्-1: भाषापरिच्छेदः मुक्तावलीसहितः, प्रत्यक्षखण्डः - (1-32 कारिकाः)

घटकम्-2: भाषापरिच्छेदः मुक्तावलीसहितः, प्रत्यक्षखण्डः - (33-65 कारिकाः)

घटकम्-3: मानमेयोदयः (केवलं मेयभागः)

घटकम्-4: षट्त्रिंशतत्त्वसन्दोहः राजानकानन्दवृत्तिसहितः

अनुशंसितग्रन्थाः –

1. मिश्र, सच्चिदानन्द, *न्यायदर्शनम्*, भारतीय विद्या प्रकाशन, दिल्ली, 2018.
2. शास्त्री, धर्मेन्द्रनाथ (व्या०), *न्यायसिद्धान्तमुक्तावली, प्रत्यक्षखण्डः*, मोतीलाल बनारसीदास, दिल्ली, 2017.
3. Swami Lakshmanjoo, *Kashmir Shaivism*, The Secret Supreme, Ishwar Ashram Trust, Srinagar, 2016.
4. मुसलगांवकर, गजानन शास्त्री मुसलगांवकर (व्या०), *न्यायसिद्धान्तमुक्तावली, प्रत्यक्षखण्डः*, चौखम्बा, वाराणसी, 2014.
5. मुसलगांवकर, गजानन शास्त्री मुसलगांवकर (व्या०), *मीमांसापरिभाषा*, चौखम्बा, वाराणसी, 2014.
6. शर्मा, डॉ० चन्द्रधर, *भारतीय दर्शन का तात्त्विक सर्वेक्षण*, मोतीलाल बनारसीदास, दिल्ली, 2013.
7. स्वामी योगीन्द्रानन्दः (व्या०), *मानमेयोदयः नारायणद्वयीप्रणीतः*, चौखम्बा विद्याभवन, वाराणसी, 2009.
8. शास्त्री, अशोक चन्द्र गौर, *न्यायसिद्धान्तमुक्तावली, दिनकरी-रामरुद्री-टीकासहिता*, चौखम्बा, वाराणसी, 2005.
9. वेदवाचस्पति, प्रियव्रत, *वेद और उसकी वैज्ञानिकता*, गुरुकुल काँगड़ी विश्वविद्यालय, हरिद्वार, 2005.
10. वेदालंकार, जयदेव, *भारतीय दर्शन (तत्त्व और ज्ञानमीमांसा के मौलिक सम्प्रत्यय)*, न्यू भारतीय बुक कॉर्पोरेशन, नई दिल्ली, 2004.
11. भार्गव, दयानन्द, *वेद-विज्ञान-वीथिका*, नाग प्रकाशन, दिल्ली, 1996.
12. वेदालंकार, जयदेव, भारतीय दर्शन की समस्याएँ, प्राच्य विद्याशोध प्रकाशन, हरिद्वार, 1986.
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18. शास्त्री, टी. गणपति, *मानमेयोदयः नारायणभट्ट–नारायणपण्डिताभ्यां प्रणीतः*, तिरुवनन्तपुरम्, 1912.
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21. Swami Madhavananda (Eng. Tr. & Notes), *Bhāṣāpariccheda with Muktāvalī*, Advaita Ashram, Calcutta.

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24. पण्डित, बलजिन्नाथ, *काश्मीर शैवदर्शन*.
25. झा, अनिरुद्ध, *तत्त्व-मीमांसा की रूपरेखा*, दिल्ली.
26. वेदालंकार, जयदेव, *भारतीय दर्शन (तत्त्व और ज्ञानमीमांसा के मौलिक सम्प्रत्यय)*, मोतीलाल बनारसीदास, दिल्ली.
27. भारतीय, महेश, भारतीय दर्शन की मुख्य समस्याएँ, गाजियाबाद.
28. भार्गव, दयानन्द, *वेद-विज्ञान-वीचिका*, नाग प्रकाशन, दिल्ली.

★★★

COURSE CODE: SHSS SKT 13 D 12 SE 4105

पञ्चदशं पत्रम् : प्रमुखदार्शनिकसिद्धान्ताः

Paper-X: Pramukha-dārśanika-siddhāntāḥ

L	T	P	Credits
4	1	0	5

घटकम्-1: सर्वदर्शनसंग्रहः, माधवाचार्यकृतः - बौद्धदर्शनम्
घटकम्-2: सर्वदर्शनसंग्रहः, माधवाचार्यकृतः - आर्हतदर्शनम्
घटकम्-3: सर्वदर्शनसंग्रहः, माधवाचार्यकृतः - रामानुजदर्शनम्
घटकम्-4: सर्वदर्शनसंग्रहः, माधवाचार्यकृतः - पूर्णप्रज्ञदर्शनम्

अनुशंसितग्रन्थाः

1. शर्मा, उमाशंकर ऋषि (व्या०), *सर्वदर्शनसंग्रहः*, चौखम्बा विद्याभवन, वाराणसी (पुनर्मुद्रित), 2019.
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CENTRAL UNIVERSITY OF HARYANA
MAHENDERGARH

(Established vide Central Universities Act 2009)
NAAC Accredited 'A' Grade University

SCHEME, SYLLABUS AND COURSES OF READING FOR

M. A. SANSKRIT (FINAL)
SEMESTER: IV
CHOICE BASED CREDIT SYSTEM
(Proposed w.e.f. the Academic Session: 2020-2021)

Semester – IV Examination

हरियाणा-केन्द्रीय-विश्वविद्यालयः, महेन्द्रगढ़म्

(2009 तम-वर्षगत-केन्द्रीय-विश्वविद्यालय-अधिनियम द्वारा स्थापितः)

Central University of Haryana, Mahendergarh

(Established vide Central Universities Act 2009)

NAAC Accredited 'A' Grade University

एम० ए० संस्कृतम् (द्वितीयं वर्षम्), तृतीय-चतुर्थसत्त्रात्मकम्

चयनाधारित-श्रेयोदानपद्धत्यनुसारेण प्रस्तावितम्

M. A. Sanskrit (Final)

Semester: IV

CHOICE BASED CREDIT SYSTEM

योजना, पाठ्यक्रमः, पाठचर्या च

(2020-2021शैक्षिक-सत्त्रतः प्रस्तावितम्)

SCHEME, SYLLABUS AND COURSES OF READING

(Proposed w.e.f. the Academic Session 2020-2021)

एम०ए० (संस्कृत) कक्षायाः द्वितीय-वर्षस्य पाठ्यक्रमः सत्त्रद्वये (तृतीय-सत्त्रे चतुर्थ-सत्त्रे च) विभक्तः वर्तते। तत्र प्रत्येकं सत्त्रे **चत्वारः** वैकल्पिक-वर्गाः [(क) वेद-वर्गः, (ख) व्याकरण-वर्गः, (ग) साहित्य-वर्गः, (घ) भारतीय-दर्शन–वर्गश्च] सन्ति, येषां मध्ये विद्यार्थी/परीक्षार्थी सत्त्रद्वयार्थं यथेच्छं कमपि **एकं** वर्गं ग्रहीष्यति। तृतीयसत्त्रे प्रत्येकं वर्गे अध्ययनार्थं त्रीणि पत्त्राणि निर्धारितानि सन्ति, अपि च चतुर्थसत्त्रे प्रत्येकं वर्गे अध्ययनार्थं पत्त्रद्वयं निर्धारितमस्ति। एतदतिरिक्तं तृतीते सत्त्रे द्वे अनिवार्यपत्त्रे, चतुर्थे सत्त्रे त्रीणि अनिवार्याणि पत्त्राणि निर्धारितानि सन्ति। यथा तृतीये सत्त्रे **एकादशं पत्त्रम् : प्राच्य-वाङ्गमयस्य विशिष्टमध्ययनम् (१); द्वादशं पत्त्रम् : संस्कृत-कवयः काव्यशास्त्रञ्च (१)**। चतुर्थे सत्त्रे **षोडशं पत्त्रम्– प्राच्य-वाङ्गमयस्य विशिष्टमध्ययनम् (२); सप्तदशं पत्त्रम्– संस्कृत-कवयः काव्यशास्त्रञ्च (२); अष्टादशं पत्त्रम्– लघुशोधप्रबन्धश्च**। एतदतिरिच्य छात्त्राः तेषां क्रेडिट् (credit)–इति पूरणार्थम् अन्यविभागेभ्यः प्रदत्तेभ्यः पत्त्रेभ्यः एकं ततोधिकं वा पत्त्राणि नेतुं समर्थाः सन्ति।

The syllabus of M.A. Sanskrit (Final) class is bifurcated into two semesters, namely, Semester-III and Semester-IV. There are four optional Groups (Group-A: Veda; Group-B: Grammar; Group-C: Literature; Group-D: Indian Philosophy) out of which the student/examinee can opt any one Group for the both semesters. In third Semester three papers are given in each Group and 2 papers are given in each Group in fourth Semester. Besides, two and three compulsory papers are prescribed in third and fourth Semesters respectively, e.g. for the third Semester **Paper-XI:** ***Prācya-vāṅmayasya Viśiṣṭamadhyayanam (1)***; **Paper-XII:** ***Saṁskṛtakavayaḥ Kāvyaśāstrañca (1)*** and for 4th Semester **Paper XVI**: ***Prācya-vāṅmayasya Viśiṣṭamadhyayanam (2)***; **Paper-XVII**: ***Saṁskṛtakavayaḥ Kāvyaśāstrañca (2)***; **Paper- XVIII: Dissertation.** Besides, the

students may opt one or more courses from other Departments to meet the credit requirements.

एम०ए० संस्कृतम् , द्वितीयवर्षस्य पाठ्यक्रमस्य तृतीय-चतुर्थ-सत्त्रयो: वैकल्पिका: समूहा: -

Optional Groups for 3rd & 4th Semesters of M.A. Sanskrit (Final) Course -

विकल्प: (Option)	समूह: (Group)	समूह-नाम (Name of Group)
I	क/ A	वेद:(Veda)
II	ख/ B	व्याकरणम्(Grammar)
III	ग/ C	साहित्यम्(Literature)
IV	घ/D	भारतीय–दर्शनम् (Indian Philosophy)

Course Code	Title of Paper	Type	L	T	P	Credits
SHSS SKT 1413 C 3104	Prācya-Vāṅmayasya Viśiṣṭam-adhyayanam – (2) [Common paper for all Groups (A, B, C, D)	C	3	1	0	4
SHSS SKT 1414 C 3104	Saṁskṛta-kavayaḥ Kāvya-śāstrañca – (2) [Common paper for all Groups (A, B, C, D)	C	3	1	0	4
SHSS SKT 1415 C 001212	Dissertation[Common paper for all Groups (A, B, C, D)	C	0	0	12	12
Option (I) - Group-A (Veda) Specialized Elective						
SHSS SKT 14A 13 SE 3104	Atharvasaṁhitā Sāmasaṁhitā Ca	SE	3	1	0	4
SHSS SKT 14A 14 SE 3104	Āraṇyakopaniṣatsāhityam	SE	3	1	0	4
Option (II) - Group-B (Grammar) Specialized Elective						
SHSS SKT 14B 15 SE 3104	Vyākaraṇaparamparā (2)	SE	3	1	0	4
SHSS SKT 14B 16 SE 3104	Vyākaraṇadarśanam (2)	SE	3	1	0	4
Option (III) - Group-C (Literature) Specialized Elective						
SHSS SKT 14C 17 SE 3104	Padya-gadya-campū-sāhityam	SE	3	1	0	4
SHSS SKT 14C 18 SE 3104	Kāvyaśāstram	SE	3	1	0	4
Option (IV) - Group-D (Indian Philosophy) Specialized Elective						
SHSS SKT 14 D 19 SE 3104	Yogadarśanam Ādhunika-Yogavyākhyātāraśca	SE	3	1	0	4
SHSS SKT 14 D 20 SE 3104	Advaitavedāntadarśanam, Dārśanikasiddhāntāḥ Ādhunikavijñānam Ca	SE	3	1	0	4

एम० ए० संस्कृतम् (द्वितीयं वर्षम्), चतुर्थं सत्रम्
(2020-2021 शैक्षिकसत्रतः प्रस्तावितम्)

M.A. Sanskrit (Final), Fourth Semester
(Proposed w.e.f. Academic Session: 2020-2021)

लिखितपत्राणां विस्तृतः पाठ्यक्रमः
Detailed Syllabus for written papers

COURSE CODE: SHSS SKT 1413 C 3104
षोडशं पत्रम् : प्राच्यवाङ्मयस्य विशिष्टमध्ययनम् (२)
Paper-XVI : Prācyavaṅmayasya Viśiṣṭamadhyayanam (2)

L	T	P	Credits
3	1	0	4

घटकम्-1: वाङ्मयम्– रामायणम्, महाभारतम्, पुराणानि, अर्थशास्त्रम् चैतेषां ग्रन्थानां सामान्यपरिचयः।
विधयः– अग्निहोत्रम्, अग्निष्टोमः, दर्शपूर्णमासयज्ञः, पञ्चमहायज्ञाः चैतेषां विधीनां सामान्यपरिचयः।

घटकम्-2: अधोलिखितानां ग्रन्थाणां विशिष्टपरिचयः –

१. शब्दकल्पद्रुमः, पं. राधाकान्तदेब-कृतः (Śabdakalpadrumaḥ of Pt. Rādhākānta Deba)
२. संस्कृत-जर्मन-वर्टर-बुख्, आटो-बोथलिंक रुडोल्फ-रॉथ इत्येतौ कृतम् (Sanskrit-German Worterbuch of Otto Bohtlingk and Rudolf Roth)
३. वाचस्पत्यम्, तारानाथ-तर्कवाचस्पति-कृतम् (Vācaspatyam of Tārānātha Tarkavācaspati, Kolkata)
४. संस्कृत-आङ्ग्ल-शब्दकोशः, वामन-शिवराम-आप्टे-कृतः (The Students Sanskrit-English Dictionary by V.S. Apte; Containing Appendices on Sanskrit prosody and Important Literary and Geographical names in the Ancient History of India)
५. कैटॉलोगस कैटॉलोगुरम्- टी. ऑफ्रेक्ट-कृतम् (Catalogus Catalogorum by T. Aufretcht)
६. संस्कृत-आङ्ग्ल-शब्दकोशः, मोनियर-विलियम्स-कृतः (Sanskrit-English Dictionary by Monier Williams, Etymologically and Philologically arranged with special reference to cognate Indo-European Languages)
७. वैदिक-पदानुक्रमकोशः, मोरिस्-ब्लुम्फील्ड-कृतः (A Vedic Concordance by Mourice Bloomfield) (Being an Alphabetical Index to every line of every stanza of the published Vedic Literature and to the Liturgical formulas thereof that is an Index to the Vedic Mantras, together with an account of their variations in the different Vedic Books)
८. वैदिकानुक्रमकोशः, मैकडॉनल-कृतः (Vedic Index by A. A. Macdonell)

९. वैदिक-पदानुक्रमकोशः, विश्वबन्धु-सम्पादितः (A Vedic Word Concordance, edited by Vishvabandhu) (Being a Universal vocabulary register of about 400 Vedic works with complete textual reference and critical commentary bearing on phonology, accent, etymo-morphology, grammar, metre and text-criticism.)

१०. न्यू कैटॉलोगस कैटॉलोगुरम्, आद्य-सम्पादकः वी. राघवन (New Catalogus Catalogorum, Initial Ed. V. Raghavan), (An Alphabetical Register of Sanskrit and Allied Works and Authors), University of Madras, Chennai

११. पुराण-विश्वकोशः, वेत्तम्-मणिकृतः (Puranic Encyclopaedia by Vettam Mani)

१२. वैदिक-विब्लिओग्रैफी, आर्. एन्. दाण्डेकर-कृता (Vedic Bibliography by R.N. Dandekar)

१३. विश्वकोशात्मकः संस्कृत-कोशः (Encyclopaedic Dictionary of Sanskrit on Historical Principles, Deccan College, Pune)

१४. महाभारत-पदानुक्रमकोषः, गोपिकामोहन-भट्टाचार्येण प्रायोजितः (Mahābhārata-padānukrama-kośaḥ, Promoted by G. Bhattacharya), Institute of Sanskrit and Indological Studies, Kurukshetra University, Kurukshetra

१५. नाट्यशास्त्र-विश्वकोशः, राधावल्लभ-त्रिपाठी-कृतः (Nāṭyaśāstra-Viśvakośaḥ by Radhavallabh Tripathi)

घटकम्-3: अधोलिखितानां प्राचीनभारतीय-लिपीनां शिलालेखानाञ्चाध्ययनम् -

१. प्राचीन-भारतीयाः लिपयः – खरोष्ठी, ब्राह्मी, शारदा, नागरी, ग्रन्थ च इत्येतासां सामान्यमध्ययनम्।

२. अशोकस्य धउलि-शिलालेखः, समुद्रगुप्तस्य प्रयागप्रशस्तिः, यशोधर्मणः मन्दसोर-शिलालेखः, हर्षस्य बांसखेडा-ताम्रपटः चैतेषां शिलालेखानां सामान्यपरिचयः।

३. गिरनार-शिलालेखः – रुद्रदाम्नः इत्यस्य शिलालेखस्य विशिष्टमध्ययनम्।

घटकम्-4: प्राकृत-भाषायाः सामान्यपरिचयः।

अनुशंसितग्रन्थाः

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★★★

COURSE CODE: SHSS SKT 1414 C 3104

सप्तदशं पत्रम् : संस्कृतकवयः काव्यशास्त्रञ्च (२)

Paper-XVII : Samskṛtakavayaḥ Kāvyaśāstrañca (2)

L	T	P	Credits
3	1	0	4

घटकम्-1: ध्वन्यालोकः, आनन्दवर्धन-कृतः (प्रथमोद्योत-मात्रः)।

घटकम्-2: अधोलिखितानां छन्दसामलङ्काराणाञ्च विशिष्टमध्ययनं गङ्गादासकृतं छन्दोमञ्जर्यनुसारं मम्मटकृत-काव्यप्रकाशानुसारञ्च।

छन्दांसि – इन्द्रवज्रा, उपेन्द्रवज्रा, उपजातिः, वसन्ततिलका, उपजातिः, वंशस्थम्, द्रुतविलम्बितम्, शालिनी, मालिनी, शिखरिणी, मन्दाक्रान्ता, शार्दूलविक्रीडितम्, सग्धरा च।

अलङ्काराः – वक्रोक्तिः, अनुप्रासः, यमकम्, श्लेषः, उपमा, रूपकम्, उत्प्रेक्षा, समासोक्तिः, अपह्नुतिः, निदर्शना, अर्थान्तरन्यासः, दृष्टान्तः, विभावना, विशेषोक्तिः, स्वभावोक्तिः, विरोधाभासः, सङ्करः, संसृष्टिश्च।

घटकम्-3: अधोलिखितानामाधुनिकसंस्कृत-कवीनां जीवनानां कृतीनाञ्च विषयेऽध्ययनम्

१. अम्बिकादत्तव्यासः, २. पण्डिता-क्षमारावः, ३. वी. राघवन्, ४. श्रीधरभास्कर-वर्णेकरः, ५. सत्यव्रत-शास्त्रिः, ६. शिवप्रसादो भारद्वाजः, ७. श्यामदेवो पाराशरः, ८. अभिराजो राजेन्द्रमिश्रः, ९. राधावल्लभः त्रिपाठीः, १०. गो.-ब. पळसुले च।

घटकम्-4: पाश्चात्य-काव्यशास्त्रम् – अरस्तू, लान्जाइनस्, क्रोचे, होरास्, आई. ए. रिचार्ड चैतेषां मतानां परिचयः।

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COURSE CODE: SHSS SKT 1415 C 001212

अष्टादशं पत्रम् : लघुशोधप्रबन्धः

Paper-XVIII : Dissertation

L	T	P	Credits
0	0	12	12

उद्देश्यम् – संस्कृत–विषयकस्याधुनिकेन लेखनेन, शोधेन, शोधप्रविध्या च व्यावहारिक–परिचयार्थम्; शोधस्य विभिन्न–पक्षेषु प्रचलितयोः प्राचीनमधुनातनञ्च दृष्टीनां विषये सौकर्यार्थम्; सर्वेभ्यः विद्यार्थिभ्यः कृते लघुशोधप्रबन्धः निश्चितं विद्यते। एषः लघुप्रकल्पः शोधार्थं सुरुचिमुत्पादयिष्यति, मनोनुकूलविशिष्टविषयस्योपरि गहनाध्ययनस्य प्रवृत्तिं च वर्धयिष्यति।

आकारः - लघुशोधप्रबन्धस्य पृष्ठाङ्काः ४०तः ५०पृष्ठपरिमिताः टङ्किताः च स्युः (८०००तः १००००शब्दात्मकाः वा)।

मार्गदर्शकः – लघुशोधप्रबन्ध–प्रस्तुत्यर्थं विभागीयाध्यापकेषु कोऽप्येकः विद्यार्थिनामनुसन्धानेच्छानुसारं विशिष्ट–विषये विशेषज्ञतानुसारञ्च मार्गदर्शकरूपेणावस्थाप्यते, यस्य-यस्य मार्गदर्शनेन प्रत्येकः विद्यार्थी: स्व-स्वलघुशोधप्रबन्धं प्रस्तोष्यति। लघुशोधप्रबन्धः विश्वविद्यालयेन निर्धारित-मानकानुसारं मौलिकं भवेयुः, मौलिकता-परीक्षानन्तरं प्रमाणपत्रमानेतव्यं तदैव परीक्षार्थं स्वीकृष्यते।

लघुशोधप्रबन्धस्य मूल्याङ्कनं मौखिकी परीक्षा च – विभागे समर्पितं लघुशोधप्रबन्धं परीक्षकैः मूल्याङ्कितं भविष्यति। अपि च परीक्षकाणां सन्तोषप्रद-संस्तुत्यनन्तरमेव विद्यार्थीनां मौखिकी परीक्षा भविष्यति।

माध्यमम् – लघुशोधप्रबन्धस्य माध्यमं संस्कृतमेव भविष्यति।

अवधिः – चतुर्थसत्रस्य अन्तिमपरीक्षायाः आरम्भात् पूर्वमेव विद्यार्थिभिः स्व-स्व-लघुशोधप्रबन्धं विभागे समर्पणीयम्।

Option (I)
वर्गः 'क' वेदः
Group-A (Veda)

COURSE CODE : SHSS SKT 14A 13 SE 3104

एकोनविंश-पत्रम् : अथर्वसंहिता सामसंहिता च

Paper-XVIX : Atharvasaṁhitā Sāmasaṁhitā Ca

L	T	P	Credits
3	1	0	4

घटकम्-1: शौनकीयाथर्ववेदस्य अधोलिखित-सूक्तानां पारम्परिक-पाश्चात्यभाष्यकारानुसारेण गहनमध्ययनम्-
राष्ट्राभिवर्धनम् (1.29), महद्ब्रह्मः (1.32), क्रिमिजम्भनम् (2.31),
कृमिनाशनम् (2.32), यक्ष्मविवर्हणम् (2.33), दीर्घायुःप्राप्तिः (3.11), सीता (3.17), वनस्पतिः(3.24), आत्मा (4.2), रोहिणी-वनस्पतिः (4.12), अपामार्गो वनस्पतिः (4.17), ओषधिः (4.20), ब्रह्मौदनम् (4.34)

घटकम्-2: शौनकीयाथर्ववेदस्य अधोलिखित-सूक्तानां पारम्परिक-पाश्चात्यभाष्यकारानुसारेण गहनमध्ययनम्-
कुष्ठस्तक्मनाशनः (5.4), सर्पविषनाशनम् (5.13), मधुला ओषधिः (5.15), ब्रह्मगवी (5.18), कृत्याप्रतिहरणम् (5.31), ईर्ष्याविनाशनम् (6.18), दुःष्वप्ननाशनम् (6.46), सांमनस्यम् (6.64), रोहितसूक्तम् (13.3.1-10), सूर्यासूक्तम् (14.1.1-16), कालः (19.53)

घटकम्-3: सामवेदः (कौथुमः), पूर्वार्चिकः, आग्नेयकाण्डः (सम्पूर्णम्) - पारम्परिकभाष्यकारानुसारेण गहनमध्ययनम्

घटकम्-4: ऋग्वेदादिभाष्यभूमिका, स्वामि-दयानन्दकृता, अधोलिखित-विषयाणामध्ययनम् –

ईश्वरप्रार्थनाविषयः, वेदोत्पत्तिविषयः, वेदानां नित्यत्वविचारविषयः, वेदविचारविषयः, वेदसंज्ञाविचारविषयः, ब्रह्मविद्याविषयः, वेदोक्तधर्मविषयः, सृष्टिविद्याविषयश्च।

अनुशंसितग्रन्थाः

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★★★

COURSE CODE : SHSS SKT 14A 14 SE 3104

विंश-पत्रम् : आरण्यकोपनिषत्साहित्यम्

Paper-XX : Āraṇyakopaniṣatsāhityam

L	T	P	Credits
3	1	0	4

घटकम्-1: तैत्तिरीयारण्यकस्य गहनमध्ययनम्- (प्रपाठकः 2, अनुवाकाः 1-10)

घटकम्-2: तैत्तिरीयारण्यकस्य गहनमध्ययनम्- (प्रपाठकः 2, अनुवाकाः 11-20)

घटकम्-3: तैत्तिरीयोपनिषदः शांकरभाष्यानुसारेण गहनमध्ययनम् – (शिक्षावल्ली ब्रह्मानन्दवल्ली च केवलम्)

घटकम्-4: मुण्डकोपनिषदः शांकरभाष्यानुसारं गहनमध्ययनम् – (तृतीय-मुण्डक-मात्रम्)

अनुशंसितग्रन्थाः

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★★★

Option (II)
वर्गः 'ख' व्याकरणम्
Group-B (Grammar)

COURSE CODE : SHSS SKT 14B 15 SE 3104

एकोनविंश-पत्रम् :व्याकरणपरम्परा(2)
Paper-XIX : Vyākaraṇaparamparā (2)

L	T	P	Credits
3	1	0	4

घटकम्-1: पतञ्जलिः, भर्तृहरिः, कौण्डभट्टः, नागेशभट्टः, भट्टोजीदीक्षितः, स्वामी-दयानन्द-सरस्वती, युधिष्ठिरो मीमांसकः चैतेषां व्याकरणशास्त्रं प्रत्यवदानस्य परिचयः

घटकम्-2: महाभाष्यम्, पतञ्जलि-कृतम्, द्वितीयं प्रत्याहाराह्निकम्

घटकम्-3: वैयाकरणसिद्धान्तपरमलघुमञ्जूषा, नागेशभट्ट-कृता, धात्वर्थनिर्णयः

घटकम्-4: वैयाकरणसिद्धान्तकौमुदी, भट्टोजिदीक्षित-कृता (उत्तरार्द्धम्), उणादिप्रकरणम्, प्रथमः पादः (सोदहरणं सूत्रव्याख्या)

अनुशंसितग्रन्थाः

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COURSE CODE : SHSS SKT 14B 16 SE 3104

विंश-पत्रम् :व्याकरणदर्शनम्(2)

Paper-XX : Vyākaraṇadarśanam (2)

L	T	P	Credits
3	1	0	4

घटकम्-1: पाणिनीयशिक्षा (सम्पूर्णा)
घटकम्-2: लिङ्गानुशासनम्, महर्षिपाणिनिप्रणीतम्
घटकम्-3: वैयाकरणनिकाये स्फोटनिरूपणम्
घटकम्-4: वैयाकरणसिद्धान्तपरमलघुमञ्जूषा, नागेशभट्ट-कृता, कारकनिरूपणम्

अनुशंसितग्रन्थाः

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Option (III)
वर्ग: 'ग' संस्कृतसाहित्यम्
Group-C (Sanskrit Literature)

COURSE CODE : SHSS SKT 14C 17 SE 3104
एकोनविंश-पत्रम्: पद्यगद्यचम्पूसाहित्यम्
Paper-XIX: Padya-gadya-campū-sāhityam

L	T	P	Credits
3	1	0	4

घटकम्-1 बुद्धचरितम्, अश्वघोष-कृतम् (प्रथमः सर्गः)
घटकम्-2: हर्षचरितम्, बाणभट्ट-कृतम् (पञ्चमोच्छ्वासः)
घटकम्-3: दशकुमारचरितम्, दण्डि-कृतम्, (अष्टमोच्छ्वासः)
घटकम्-4: नलचम्पू, त्रिविक्रमभट्ट-कृतम् (प्रथमोच्छ्वासः)

अनुशंसितग्रन्थाः

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COURSE CODE : SHSS SKT 14C 18 SE 3104
विंश-पत्रम्: काव्यशास्त्रम्
Paper-XX : Kāvyaśāstram

L	T	P	Credits
3	1	0	4

घटकम्-1: काव्यप्रकाशः, मम्मट-कृतः (सप्तमः उल्लासः - पददोषाः, वाक्यदोषाः, अर्थदोषाः, रसदोषाश्च)
घटकम्-2: वक्रोक्तिजीवितम्, कुन्तक-कृतम् (प्रथमः उन्मेषः)
घटकम्-3: काव्यमीमांसा, राजशेखरकृता (आदितः चतुर्थाध्यायपर्यन्तम्)
घटकम्-4: रसगङ्गाधरः, पण्डितराज-जगन्नाथ-कृतः (प्रथमाननम्)

अनुशंसितग्रन्थाः

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Option (IV)
वर्गः 'घ' भारतीयदर्शनम्
Group-D (Indian Philosophy)

CODE: SHSS SKT 14 D 19 SE 3104

एकोनविंश-पत्रम्: योगदर्शनम् आधुनिक-योगव्याख्यातारः

Paper-XIX : Yogadarśanam Ādhunika-Yogavyākhyātāraśca

L	T	P	Credits
3	1	0	4

घटकम्-1: योगसूत्रम्, पतञ्जलि-कृतम्, व्यासभाष्यसहितम्, समाधिपादः, सूत्राणि - 1-25
घटकम्-2: योगसूत्रम् -पतञ्जलिकृतम्, व्यासभाष्यसहितम्, समाधिपादः, सूत्राणि - 26-51
घटकम्-3: ऋग्वेदादिभाष्यभूमिकातः उपासनाविधान-विषयः मुक्तिविषयश्च इत्यनयोः गहनमध्ययनम्
घटकम्-4: अधोलिखितानामाधुनिक-दार्शनिकानां योगविषयकव्याख्यानानां विषये गहनमध्ययनम् –
महर्षि-दयानन्दः, स्वामी-विवेकानन्दः, योगी-अरविन्दः, रमण-महर्षिः, राधाकृष्णन्, उदयवीर-शास्त्री च

अनुशंसितग्रन्थाः

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COURSE CODE : SHSS SKT 14 D 20 SE 3104

विंश-पत्रम् : अद्वैतवेदान्तदर्शनम्, दार्शनिकसिद्धान्ताः, आधुनिकविज्ञानञ्च

Paper-XX : Advaitavedāntadarśanam, Dārśanikasiddhāntāḥ, Ādhunikavijṅānam Ca

L	T	P	Credits
3	1	0	4

घटकम्-1: ब्रह्मसूत्रम्, चतुःसूत्री, शाङ्करभाष्य-सहिता

घटकम्-2: वेदान्तपरिभाषा,धर्मराजाध्वरीन्द्र-कृता (प्रत्यक्षपरिच्छेदः)

घटकम्-3: भारतीयदर्शनेषु आधुनिकविज्ञानतत्त्वानि
यज्ञविज्ञानम्, पर्यावरणविज्ञानम्, आरोग्यविज्ञानम्, सृष्टिविज्ञानम्, मनोविज्ञानम्

घटकम्-4: भारतीयदर्शनेषु आधुनिकविज्ञानतत्त्वानि -
शब्दोत्पत्तिविज्ञानम्, दिक्कालाकाशविचारः, परमाणुवादः, भौतिकविज्ञानम्, सापेक्षतासिद्धान्तः

अनुशंसितग्रन्थाः

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17. Sinha, Jadunath, *Outlines of Indian Philosophy*, Pilgrims Publishings, 2007.
18. *Pride of India*, Sanskrit Bharati, New Delhi, 2006.
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21. वेदालंकार, जयदेव, *भारतीय दर्शन (तत्त्व और ज्ञानमीमांसा के मौलिक सम्प्रत्यय)*, न्यू भारतीय बुक कॉर्पोरेशन, नई दिल्ली, 2004.
22. Gambhirananda, Swami (Eng. Tr. & Notes), *Brahmasūtrabhāṣya of Śaṅkarācārya*, Advaita Ashram, Kolkata, 2000.
23. Janki, S.S., *Sanskrit and Science*, K.S.R. Institute, Chennai, 1997.
24. भार्गव, दयानन्द, *वेद-विज्ञान-वीथिका*, नाग प्रकाशन, दिल्ली, 1996.
25. Arya, Ravi Prakash, *Vedic Meteorology*, Parimal Publications, New Delhi, 1995.
26. Prime, Ranchor, *Hinduism and Ecology*, Continuum International Publishing Group Ltd., 1992.
27. आचार्य, विश्वेश्वर (व्या०), *ब्रह्मसूत्र–चतुःसूत्री*, चौखम्बा विद्या भवन, वाराणसी (पुनर्मुद्रित), 1992.
28. Dasgupta, Surendra Nath, *Natural Science of the Ancient Hindus*, Motilal Banarsidass, Delhi, 1987.
29. Swami, Madhavananda (Eng. Tr. & Notes), *Vedānta Paribhāṣā*, Advaita Ashram, Kolkata, 1986.
30. मुसलगाँवकर, गजानन शास्त्री (व्या०), *वेदान्तपरिभाषा*, चौखम्बा विद्या भवन, वाराणसी (पुनर्मुद्रित), 1983.
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34. शास्त्री, अनन्तकृष्ण (संस्कृतटीका), *धर्मराजाध्वरीन्द्र–वेदान्तपरिभाषा*, कोलकाता विश्वविद्यालय, कोलकाता, 1930.
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★★★

CENTRAL UNIVERSITY OF HARYANA
SCHOOL OF INTERDISCIPLINARY AND APPLIED SCIENCES
DEPARTMENT OF YOGA

Structure and curriculum for course work for PhD in Yoga Science

Scheme and Syllabus (w.e.f. Session 2020-21)

Course code	Course title	L	T	P	Type of course	Credit
SIAS YOGA 2101 C 3104	Research Methodology, Quantitative methods and Computer Applications for Yoga	3	1	0	Core	4
SIAS YOGA 2102 C 2103	Fundamentals and elements of Yoga	2	1	0	Core	3
SIAS YOGA 2101 E 2103	Fundamentals of Yoga Therapy	2	1	0	Departmental elective	3
SIAS YOGA 2103 C 2002	Research and Publication Ethics	2	0	0	Core	2
Total Credit						12

Core Course

Course Code - SIAS YOGA 2101 C 3104

Research Methodology, Quantitative methods and Computer Applications for Yoga

4 hrs per week **Total Credits: 4**

General objective of the paper:

- To provide knowledge about basics of research.
- To enhance the understanding about area of research
- To endow with familiarity about collecting, handling and appropriate use of data

Outcome of the paper:

- Students will be aware about research area and gap of research
- They equipped with tools of research
- They will be familiar with plagiarism and how to avoid it

A. Research Methodology

UNIT I

Research problems: Meaning, Motivation" Objectives and types of research. Significance of research, Research proposals and aspects, Criteria of good research, Research formulation and hypotheses. Selection and necessity of defining the problem, Literature review, Primary and secondary sources- Reviews, Treatise, Mono graphs, Patents

UNIT II

Research Design: Need. Problem Definition, Variables, Research design concepts, Research design process, Research Modeling: Types of models, Model building and stages, Data collection, processing and analysis, Simulation techniques using computer software(s). Design and planning of Experiments: Aims and objectives, expected outcome, methodology to be adopted, importance of reproducibility of research work, Interpolation, Extrapolation, Types of errors (rounding. truncation, machine and random), Error analysis and least square curve fitting Analysis of Variance components (ANOVA) for fixed effect model, Objectives and basic principles of designs of experiments. Complete randomized design (CRD), Randomized block design (RBD) and Latin square design (LSD)

UNIT III

Data mining and Report Writing: Library resources, Internet, Scientific search engines, Introduction to Latex/Google docs, Structure and component of research paper, Presenting the research paper/thesis, Journal impact factor, Citation index, References and bibliography, Copyright. Plagiarism and ethics in research, Communication and presentation

UNIT IV

Research design and methods as applied to Chemical Sciences: Experiment design-monitoring- laboratory safety- Laboratory notebook keeping- data collection-coding of samples and experiments- storage of samples- Use of Chemistry Software like ChemDraw and MNova.

Teaching Assistance: Tutorials

Suggested Readings:

1. Kothari. C. R and Garg Gaurav (2014). Research Methodology: Methods and Techniques, 3rd Edition, New Age International Publishers, New Delhi.
2. Pannerselvan, R. (2009). Research Methodology, Prentice Hall of India, New Delhi.
3. Singh. Y. K. (2008). Fundamental of research Methodology and Statistics, New Age International Publishers" New Delhi.
4. Montgomery, D.C. (2013). Design and Analysis of Experiments, 8th Edition. Wiley India.
5. Prathapan. K, Research Methodology for Scientific Research. IK International, New Delhi.
6. Leedy, P.D. and Ormrod, J.E., Practical Research: Planning and Design, Prentice Hall, 2004

Syllabus for PhD Yoga

Core Course
Course Code - SIAS YOGA 2102 C 2103
Fundamentals and elements of Yoga

3 hrs per week **Total Credits: 4**

General objective of the paper:

- To provide knowledge about basics Yogic texts
- To enhance the understanding about ancient and modern Yogis
- To endow with introspection with special reference of Shrimad Bhavad Gita

Outcome of the paper:

- Students will be aware about Yogic texts like Hathapradipika and Patanjal Yoga sutra
- They will be familiar with Yogis like Maharṣi Dayānanda Sarasvatī and T. Kṛṣṇāmacārya
- They will be well-known about ethics, duties and Dharma

B. Fundamentals of Yoga

UNIT I

Yoga its meaning and definitions according to different texts with their commentaries, Difference between modern and ancient Yoga text books, Principles of Yogic practices, Different schools of Yoga (Rajyoga, Hathayoga, Mantrayoga and), Names and methods of Shatkarmas, Asanas (10 From Hathpradipika and 32 from Gherandasamhita), Pranayama (Hathpradipika, Gherandasamhita and Hathratnavali), Mudra & Bandha (Hathpradipika and Gherandasamhita), Panch-Dharna, Dhyan and Nadanushandhan.

UNIT II

History of Patajali and Patajal Yoga Sutra, , Cittabhumis, Cittavritis, Abhyasa &Vairagya as the tools, Yog Antraya, Chitta Prasadana, Kriya Yoga & its Kind, Concept of Ishwar, Panch Klesha, Chaturviyuvad, Karma Theory, Eight Steps of Yoga, Yamas & Niyamas: Vitarka and Mahavrata, Asana, Pranayama, Pratyahara & its Siddhis, Introduction of Dharana, Dhyan and Samadhi, Nature of Sanyama, Kinds of Samadhi- Samprajnata, Asampragyat, Ritambhara Prajna, Vivekkhyati, Dharammed Samadhi**,** Recitation of Yoga sutra (195)

UNIT III

Short Introduction and contribution of Prominent modern Yogis regarding yoga- Maharṣi Dayānanda Sarasvatī, Swami Vivekananda, Shri Aurobindo, Maharṣi Ramaṇa, Maharṣi Śivānanda, T. Kṛṣṇāmacārya, Pt. Śrīrām Śarmā,
Short Introduction of The Chief Yoga Schools in India: Kaivalyadhāma- Lonavla; Bihar Yoga Bhāratī, Munger, Gurukul Kangri Vishwavidyalaya, Haridwar and Dev Sanskriti Vishwavidyalaya, Haridwar. Relevance of Ancient Indian Wisdom for contemporary society, Background of Srimadbhagavadgita, Need of Srimadbhagavadgita in

Education, Concepts of Self and origin of Mind, Mind and mental fluctuations, Know your Mind, Physical and Mental discipline for balanced life, Diet and sleeping pattern, Process for controlling Mind and difficulties in it, Mediation the solution, Hierarchy of Shad Ripu, Causes of Shad Ripus, Problems due to Shad Ripus, Management of Shad Ripus, Impact of Yogic management on mental ability

Unit IV

Minute Introspection, Know your strength and weakness, Need to cultivate values and ethics, Role of Dharma (Duty) in enrichment of principles of life, Role of faith in the development of Dharma (Duty), Meaning and definition of Karma (Action), Gyan (Knowledge), Mind as a key player in an individual, Meaning and definition of Bhakti (Dedication for education), Yukti (Intellect of classmates) and Mukti (Freedom from bad habits), Meaning and definition of Warrior (As a student), Sarathi (As a teacher), Principles of Karma (Commitment and Detachment), Nishkam Karma and its relevance, Shaping the personality through Trigunas

Suggested Readings:

1. O.P. Tiwari - Asana why and how, Kaivalyadham SMYM Samiti, Lonavala-2012
2. M.L. Gharote - Guidelines for Yogic Practices, Medha Publication, Lonavala
3. Swami Satyananda Saraswati - Asan, Pranayama, Mudra, Bandha, Yoga publcation trust, Munger, 2006.
4. K.N. Udupa- Stress and its management by yoga, Motilal banarsidass publication, 1998
5. R. Nagarathna and Dr. H.R. Nagendra, Yoga and Health, Swami Vivekananda Yoga Prakashana - 2002
6. R. Nagarathna and Dr. H. R. Nagendra, Yoga for Promotion of Positive Health, Swami Vivekananda Yoga Prakashana-2004
7. Swami Satyananda Saraswati - Yogic Management of Common, Yoga Publication Trust, Munger, Bihar - 2002
8. Swami Satyananda Saraswati, Four Chapters on Freedom, Yoga Publication Trust, Munger, Bihar, 2001
9. P.V. Karambelkar, Pātañjala Yogasūtra, Kaivalyadham SMYM Samiti, Lonavla, 2011
10. Vijnananand Saraswati - Yog Vijyan, Yoga niketan trust, Rishikesh,1998.

Departmental elective
Course Code - SIAS YOGA 2101 E 2103
Fundamentals of Yoga Therapy

3 hrs per week **Total Credits: 4**

General objective of the paper:

- To provide knowledge about Human anatomy and physiology with connection of Yogic practice
- To enhance the understanding of different body systems and impact of Yogic practices on them

Outcome of the paper:

- Students will be aware about human anatomy and physiology
- How Yogic practices are impacts human system they will be explain it on scientific ground

C. **Fundamentals of Yoga Therapy**

UNIT I

Introduction to Human Anatomy and Physiology, Basic Anatomical and Physiological terms; Cell: Structure & Functions, Different cell organelles and their functions; Tissues and their types, Organization of human system. Impact of Yogic practices on them.

UNIT II

Gross anatomy of digestive system, functional anatomy of Mouth, Oral cavity, Pharynx, Esophagus, Stomach, Small intestine, Large intestine and Anal canal; Physiology of digestion, assimilation & peristalsis, Gastric and digestive juices involved during digestion, associated glands involved in digestive system; Gross anatomy of the respiratory passages, functional of Nasal cavity, Pharynx, Larynx, Trachea, Bronchus, Lungs and Alveoli; The process of Respiration, Lungs volumes & capacities, Mechanics of breathing and exchange of gas in alveoli. Impact of Yogic practices on them.

UNIT III

Functional anatomy of the Heart, arteries, veins and capillaries; The organization of systematic and pulmonary circulation, the cardiac cycle; Blood: Composition and Functions, Blood groups and their importance; Cardiac output and Venous return; Blood pressure and Regulation of blood pressure. Impact of Yogic practices on them.

Unit IV

An introduction to Histology – nerve – structure and properties of neurons – nerve – action potential – generation propagation – factors influencing classification of

neurons and nerve fibers, neuralgia cells, receptors and reflex arcs. Anatomical structure of important endocrine glands (Pituitary, thyroid, parathyroid, pancreas, adrenal and gonads). Impact of Yogic practices on them with health and Yoga Therapy through different Yogic texts (Hathapradeepika, Gherandasamhita, Hatharatnavali and Patanjal Yoga Sutra)

Suggested Readings:

1. Shirley Teles, A Glimpses of Human Body, Swami Vivekanand Yoga Prakashan, Bangalore
2. M.M. Gore, Anatomy and Physiology of Yogic Practices, Motilal Banarsidass, New Delhi-2007.
3. Ross and Wilson, Human Anatomy and Physiology in Health and Illness, Churchill Livingstone, 2010
4. Inderveer Singh, Anatomy and Physiology for Nurses, Jaypee Brothers Publishers, 2008
5. Sri Krishna, Notes on Structure and Functions of Human Body and Effects of Yogic practices on it (Kaivalydhama S.M.Y.M Samiti, Lonavala, 1988)
6. Chatterjee, C.C., Human Physiology (Vol. I & II), Medical Allied Agency, Calcutta, 1992.

Core Course
Course Code - SIAS YOGA 2103 C 2002
Research and Publication Ethics
2 hrs per week **Total Credits:2**

General objective of the paper:

- To offer awareness about research etics

Outcome of the paper:

- Researchers having knowledge about research ethics

D. Research and Publication Ethics

Unit –I

Introduction to philosophy: definition, nature and scope, concept, branches; Ethics: definition, moral philosophy, nature of moral judgment and reactions. Ethics with respect to science and research, intellectual honesty and research integrity, scientific misconducts: falsification, fabrication, and plagiarism, redundant publications, duplicate and overlapping publications, salami slicing, selective reporting and misrepresentation of data

Unit –II

Definition, introduction, and importance, best practices/standard settings, initiatives and guidelines: COPE, WAME etc. conflicts of interest, publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types, violation of publication ethics, authorship, and contributor ship, identification of publication misconduct, complaints, and appeals, predatory publishers and journals

Practice

Unit –III

Open access publications and initiatives: SHERPA/RoMEO online resources to check publisher copyrights and self-archiving policies, software tool to identify predatory publications developed by SPPO, journal finder/journal suggestion tools viz GANE, Elsevier journal finder, Springer journal etc.

Unit –IV

Group discussion – subject specific ethical issues, FFP, authorship, conflict of interest, complaint and appeals: example and fraud from India and abroad. B. Software tools – Use of plagiarism software like turnitin, urkund, and other open source software tools. Database – Indexing databases, citation databases: web of science, scopus, etc. Research matrix, impact factor of journal as per journal citation report, impact factor of journal as per journal citation report, SNIP, SJAR, IPP, Citescore, matrices, h-index, g-index, i10-index, almatrices

Suggested readings:

1. Philosophy of science, (2006), Bird, A., Routledge, ISBN 9781138705579.

2. A short history of ethics: A history of moral philosophy from the homeric age to the twentieth century (1967), MacIntyre, A., London, ISBN: 9780268161286.
3. Ethics in competitive research, do not get scooped; do not get plagiarized (2018), Chaddhah, P., ISBN-10: 9387480860
4. On being a scientist, a guide to responsible conduct in research (2009), National Academy of Science, National Academy of Engineering and Institute of Medicine, ISBN-10: 0309119707
5. Ethics in science education, research and governance (2019), Muralidhar K., Ghosh A., Singhvi A., Indian National Science Academy, ISBN: 9788193948217

CENTRAL UNIVERSITY OF HARYANA
MAHENDERGARH

(Established vide Central Universities Act 2009)

NAAC Accredited 'A' Grade University

SCHEME, SYLLABUS AND COURSES OF READING

Offered by the Department of Yoga for M. Sc. in YOGA Sciences

SEMESTERS: I-IV

(Proposed w.e.f. the Academic Session: 2019-2021)

Semester – I	**Examination: December, 2019**
Semester – II	**Examination: May, 2020**
Semester – III	**Examination: December, 2020**
Semester – IV	**Examination: May, 2021**

(Approved in the Meeting of BOS Held on 03 November, 2020)



School of Inter displinary and applied Sciences

Credit Matrix for M.Sc. Yoga
w.e.f. 2019-2020

Semesters	Core Course (CC)	Discipline Centric Elective Courses (DCEC)	Interdisciplinary/ Generic Elective Course (GEC)	Total
I	26	-	-	26
II	21	-	4	25
III	21	-	4	25
IV	11	5+5	-	21
Total	79	10	8	97

Instructions for the Students:

Course Type

Core Course (CC): There are core courses in every semester. These courses are to be compulsorily studied by a student as core courses to complete the requirement of this discipline of study.

Discipline Centric Elective Courses (DCEC): These are Elective courses and can be chosen from a pool of papers in all Semesters. These will be supportive to gain in depth understanding in concerned field of Yoga and are mandatory as per course curriculum.

Generic Elective Course (GEC): Generic Elective Course is to be taken from an unrelated discipline available in the School. It is interdisciplinary/open elective as per course curriculum available/offered by other departments included in the School and the GEC Course offered by the Department of Yoga is meant for the students of other disciplines.

Introduction:

Yoga is an ancient Indian scientific system and is evolved by Vedic Rishis for holistic growth of body, mind and spirit. It has potential for prevention of physiological and psychosomatic disorders and promotion of inclusive health. The eclectic approach of Yoga brings harmony in the individual and social life. It brings suitable changes in the behavioral pattern and attitude thereby helps to improve the inter-personal relationship at home and also in the society. Therapeutic benefits of Yoga have also been revealed by many scientific

researches carried out all over the world. Today, Yoga has become very popular and has gained essential, indispensable and even imperative space in the lives of individual dignitaries.

Objectives of the Course:

1) The course will provide deeper insight into the curriculum of Yogic Sciences along with the therapeutic applications of Yoga and alternative therapies.
2) At the Master level it is also intended that students should get familiar with the original texts.
3) Promoting Positive Health in the Students through Yoga and enabling and imparting skill in them to practice and apply Yogic practices for Health to general public and teach Yoga for total personality development and spiritual evolution.
4) Invoking and inculcating inquisitive, scientific temper in the students regarding the Traditional Indian Sciences specially Yoga, Spirituality and Ayurveda.
5) A research attitude and orientation will also be inculcated into the students so that they further become efficient to undertake advance, theoretical and applied researches in the field of Yoga and Alternative Therapies.

Structure of Program:

Semester - I

Course	Title of the Paper	L	T	P	C
SIAS YOGA 1101 C 4105	Fundamentals and Foundation of Yoga	4	1	0	05
SIAS YOGA 1102 C 4105	Principles, Practices and Essentials of Haṭha-Yoga	4	1	0	05
SIAS YOGA 1103 C 00126	Yoga Practical - 1	0	0	12	06
SIAS YOGA 1104 C 4105	Yogic Practices and Human Anatomy and Physiology -1	4	1	0	05
SIAS YOGA 1105 C 4105	Eminent Ancient and Medieval Philosophers and Yogis of India	4	1	0	05
Total					26

Semester –II

Course	Title of the Paper	L	T	P	C
SIAS YOGA 1206 C 4105	Pātañjala-Yogasūtra	4	1	0	05
SIAS YOGA 1207 C 4105	Yogic Practices and Human Anatomy and Physiology -2	4	1	0	05
SIAS YOGA 1208 C 00126	Yoga Practical – 2	0	0	12	06
SIAS YOGA 1209 C 4105	Principle Upaniṣads, Gītā and Yogavāsiṣṭha	4	1	0	05
SIAS YOGA 1101 GEC 3104	Fundamentals of Yoga (for the students other than Yoga)	3	1	0	04
Total					25

Semester – III

Course	Title of the Paper	L	T	P	C
SIAS YOGA 1310 C 4105	Indian Philosophy	4	1	0	05
SIAS YOGA 1311 C 4105	Holistic Health and Yoga Therapy	4	1	0	05
SIAS YOGA 1312 C 00126	Yoga Practical - 3	0	0	12	06
SIAS YOGA 1313 C 4105	Teaching methods in Yoga	4	1	0	05
SIAS YOGA 1102 GEC 3104	Yoga and Holistic Health (for the students other than Yoga)	3	1	0	04
Total					25

Semester - IV

Course	Title of the Paper	L	T	P	C
SIAS YOGA 1414 C 4105	Research Methodology and Statistics in Yoga	4	1	0	05
SIAS YOGA 1415 C 00126	Yoga Practical -4 and Naturopathy	0	0	12	06
-	DCEC-1	4	1	0	05
-	DCEC-2	4	1	0	05
Total					21

Courses for students of M.Sc. (Yoga) only (DCEC):

Course	Title of the Paper	L	T	P	C
SIAS YOGA 1401 DCEC 4105	Applied Psychology and Yoga	4	1	0	05
SIAS YOGA 1402 DCEC 4105	Principles of Naturopathy and Natural Dietics	4	1	0	05
SIAS YOGA 1403 DCEC 4105	Āyurvedic Svasthavṛtta and Diet	4	1	0	05
SIAS YOGA 1404 DCEC 4105	Project¸Seminar¸Workshop on Yoga	4	1	0	05

Scheme of Examination:

Seventy five percent (75%) attendances in theory and practical classes are necessary for a candidate to appear in the Internal Assessment and End-Semester examination.

The evaluation of each theory paper is based on the following scheme:

(a) Internal Assessment : 30 Marks
(b) End Semester Examination : 70 Marks

Scheme of Evaluation:

A. Internal Assessment:

a. Theory:

(i) Evaluation of assignment, presentation etc. : 05 Marks
(ii) Class Test (Two 10 marks each) : 20 Marks
(iii) Attendance : 05 Marks

The marks of attendance shall be awarded as follows:

(i) 75% and bellow : 00 Mark
(ii) 75% and up to 80% : 01 Mark
(iii) 80% and up to 85% : 02 Marks
(iv) 85% and up to 90% : 03 Marks
(v) 90% and up to 95% : 04 Marks
(vi) 95% : 05 Marks

b. Practical:

The Internal Evaluation of practical shall be awarded as follows:

(i) Evaluation of assignment, presentation etc : 05 Marks
(ii) Performance in Yogic practices and Viva-voce (Two 10 marks each) : 20 Marks
(iii) Attendance in Practical Classes : 05 Marks

The marks of attendance shall be awarded as follows:

(i) 75% and bellow : 00 Mark
(ii) 75% and up to 80% : 01 Mark
(iii) 80% and up to 85% : 02 Marks
(iv) 85% and up to 90% : 03 Marks
(v) 90% and up to 95% : 04 Marks
(vi) 95% : 05 Marks

c. End Semester Examination for Practical Performance:

It will consist of 70 marks as follows:

(i) Performance in Yogic practices and Practical notebook : 50 Marks
(ii) Viva-voce : 20 Marks

d. Evaluation of Projects:

It will be based on periodic assessment of the progress of the Project and End Semester Examination as follow:

(i) First periodic assessment of the progress after 08 weeks : 20 Marks
(ii) Second periodic assessment of after 04 weeks : 20 Marks

End Semester Examination will consist of:

(a) Evaluation of submitted project : 50 Marks
(b) Viva-Voce regarding the project : 10 Marks

e. Evaluation of Seminars/ Workshops:

(i) Documentation of the Seminar/Workshop : 20 Marks

(ii) First presentation of the Seminar/Workshop : 20 Marks

End semester examination will consist of:

(a) Presentation of the Seminar/Workshop : 50 Marks

(b) Defense of the Presentation : 10 Marks

प्रथम सत्र - First Semester

SIAS YOGA 1101 C 4105 - योग के आधारभूत मौलिक तत्त्व -Fundamentals of Yoga

Objective of the Paper:

- To equip the students basics of Yoga
- Students will familiarize themselves with Yogic terminology

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Know the difference between Hath Yoga and Raj Yoga
- How many types of Yoga is there in our ancient literature

Unit-I परिचय - Introduction

1. योग का अर्थ एवं परिभाषाएँ, योग का स्वरूप, योग का उद्देश्य - Meaning, Definitions, Form and Objectives of Yoga
2. योग की उत्पत्ति, योग का इतिहास और विकास - Origin, Development and Historical Background of Yoga.
3. योग से संबन्धित भ्रामक धारणायें एवं उनके समाधान - Misconceptions about Yoga and their Solutions.
4. नाड़ी और प्राण की अवधारणायें, कुण्डलिनी शक्ति एवं षट्चक्र का परिचय - Conceptions of Nāḍī and Prāṇa, Introduction to Kuṇḍalinī and Ṣaṭcakra.

Unit-II विभिन्न ग्रन्थों एवं परम्पराओं में योग - Yoga in Different Texts and Traditions

1. वेदों, उपनिषदों व गीता में योग का स्वरूप - Form of Yoga in Vedas, Upaniṣads and Gītā.
2. न्याय, वैशेषिक, सांख्य, मीमांसा, वेदान्त बौद्ध और जैन दर्शनों में योग का स्वरूप - Form of Yoga in Nyāya, Vaiśeṣika, Sāṉkhya, Mīmāṃsā and Vedānta Schools of Indian Philosophy.
3. आयुर्वेद, योगवाशिष्ठ एवं तंत्र में योग का स्वरूप - Form of Yoga in Āyurveda, Yoga-Vāsiṣṭha and Tantras.

Unit-III योग के विभिन्न प्रकार – 1.(संक्षिप्त परिचय) - **Different Types of Yoga** -1. (Brief Introduction)

हठयोग - Haṭha-yoga, राजयोग - Rāja-yoga, मन्त्रयोग - Mantra-yoga, लययोग - Laya-yoga कर्मयोग - Karma-yoga, ज्ञानयोग - Jñāna–yoga, भक्तियोग - Bhakti-yoga

Unit-IV योगाभ्यास की अनिवार्यताएँ - Essentials for Yoga Practice:

1. योगाभ्यास के नियम एवम् अनुशासन - Rules and Disciplines in Yogic Practices
2. योगाभ्यास का स्थान एवं समय - Place and Timing of Yogic Practices
3. योगाभ्यासी की भोजन सूची एवं सारिणी - List and Schedule of Diet of Yoga Practitioner
4. योगाभ्यास के मार्ग में बाधायें - Obstacles in the Path of Yoga Practice
5. योगाभ्यास का अनुक्रम - Sequence of Yogic Practices

<u>आवश्यक पठनीय - Essential Readings:</u>

1. स्वामी विज्ञानानन्द सरस्वती, योग-विज्ञान, योग निकेतन ट्रस्ट, ऋषिकेश - 1998
2. राजकुमारी पाण्डेय, भारतीय योगपरम्परा के विविध आयाम, राधा प्रकाशन, नई दिल्ली - 2008
3. स्वामी विवेकानन्द, ज्ञान-भक्ति-कर्म-योग और राजयोग, अद्वैत आश्रम, कलकत्ता - 2000
4. कामाख्या कुमार, योग-महाविज्ञान, Standard Publisher, New Delhi
5. कल्याण (योगाङ्क), गीता प्रेस गोरखपुर - 2002
6. कल्याण (योग तत्त्वांक), गीता प्रेस गोरखपुर - 1991
7. डॉ॰ ईश्वर भारद्वाज, औपनिषदिक अध्यात्म विज्ञान, सत्यम् पब्लिकेशन्स, उत्तम नगर, नई दिल्ली

सन्दर्भ ग्रन्थ - Suggested Readings:

1. योग-विज्ञानम्, आचार्य बालकृष्ण, पतञ्जलि योग-पीठ, हरिद्वार
2. वेदों में योग विद्या, स्वामी दिव्यानन्द
3. भारतीय दर्शन, आचार्य बलदेव उपाध्याय
4. भारत के महान् योगी, विश्वनाथ मुखर्जी
5. सन्त-चरित, स्वामी शिवानन्द
6. The Yoga Tradition, Motilal Banarsidass
7. K.S. Joshi - Yoga in Daily Life, Orient Paper Back Publication, New Delhi - 1985.
8. S.P. Singh - History of Yoga - PHISPC, Center for Studies of Civilization, Delhi, Ist Edn. - 2010
9. S. P. Singh and Yogi Mukesh - Foundation of Yoga, Standard Publishers, New Delhi - 2010

SIAS YOGA 1102 C 4105 - हठयोग के सिद्धान्त, अभ्यास एवम् अनिवार्यताएँ - Principles, Practices and Essentials of Haṭhayoga (हठयोगप्रदीपिका व घेरण्डसंहिता पर आधृत – Based on Haṭhayogapradīpikā and Gheraṇḍasaṃhitā)

Objective of the Paper:

- To equip the students basics of Hath-Yoga
- Students will familiarize themselves with Hatha-Yogic texts

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Know the the sequences of Hath-Yogic practices
- Differenciate between Chaturanga Yoga and Saptanga Yoga

Unit-I परिचय - Introduction:

1. हठयोग की परिभाषा एवम् उद्देश्य - Haṭhayoga, its definition and objectives
2. हठयोग की उत्पत्ति एवं परम्परा - Origin and Tradition of Haṭhayoga
3. हठाभ्यास-हेतु उचित स्थान, वातावरण, ऋतु एवं काल का महत्त्व - Importance of proper Place, Environment, Season and Time for Haṭha practice
4. हठाभ्यास-हेतु साधक व बाधक तत्त्व - Aids and Obstructions to Haṭha practice
5. हठाभ्यास-हेतु निषिद्ध एवं संस्तुत आहार -Prohibited and Recommended Food for Haṭha practice.

Unit-II अधोलिखित का अर्थ, उद्देश्य, विधि, लाभ एवं सावधानी - Meaning, Objectives, Techniques, Benefits and Cautions of the following:

1. षट्कर्म - Ṣaṭkarmas

Unit-III अधोलिखित का अर्थ, उद्देश्य, विधि, लाभ एवं सावधानी - Meaning, Objectives, Techniques, Benefits and Cautions of the following:

1. आसन - Āsanas 2. प्राणायाम - Prāṇāyāma, 3. मुद्रा - Mudrā व 4. बन्ध - Bandha

Unit-IV आध्यात्मिक ऊर्जा - Spiritual Energy:

1. प्रत्याहार - Pratyāhāra, 2. ध्यान - Dhyāna, 3. समाधि - Samādhi, 4. नादानुसन्धान - Nādānusandhāna, 5.चक्र - Cakras, 6. नाड़ी - Nāḍi, 7. पञ्चकोश - Pañcakośa, 8. कुण्डलिनी शक्ति - Kuṇḍalinī Śakti, कुण्डलिनी शक्ति के जागरण की विधि - Technique of awakening Kuṇḍalinī Śakti

आवश्यक पठनीय - Essential Readings:

1) घेरण्ड-सहिंता, स्वामी निरञ्जनानन्द, योग भारती, मुंगेर, बिहार - 1997
2) हठ-योग-प्रदीपिका, स्वामी दिगम्बर जी व रघुनाथ शास्त्री, कैवल्यधाम, लोनावला, पूना - 2006
3) घेरण्ड-संहिता, स्वामी दिगम्बर जी व एम.एल. घरोटे, कैवल्यधाम, लोनावला, पूना - 1978
4) हठ-योग-प्रदीपिका, स्वामी मुक्तिबोधानन्द सरस्वती, योग पब्लिकेशन्स ट्रस्ट, मुंगेर, बिहार - 2000
5) स्वामी सत्यानन्द सरस्वती, आसन-प्राणायाम-मुद्रा-बन्ध, योग पब्लिकेशन्स ट्रस्ट, मुंगेर, बिहार - 2006
6) स्वामी कुवलयानन्द व एस.ए. शुक्ल, गोरक्ष-षट्कर्म, कैवल्यधाम, लोनावला, पूना - 2006

सन्दर्भ ग्रंथ - Suggested Readings:

1. B.K.S. Iyengar - Light on Yoga, Harper Collins Publisher, New Delhi - 2012
2. B.K.S. Iyengar - Light on Pranayama, Harper Collins Publisher, New Delhi - 2012
3. M.L.Gharote - Hatha Ratnavali, Kaivalyadham SMYM Samiti, Lonavala - 2009
4. M.L.Gharote - Siddhasiddhant Paddhati, Kaivalyadham SMYM Samiti, Lonavala - 2005

SIAS YOGA 1103 C 00126 - यौगिक अभ्यास – 1, Yoga Practical -1

यौगिक क्रियाओं का क्रमिक अभ्यास - Sequence of Yoga Practices

Objective of the Paper:

- To learn how to practice different Yogic practices
- What are the different Yogic techniques and how to perform them?

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Do Yogasana practices with effective manners
- Do different Yogic Shatkarmas like Jal Neti, Sutra Neti etc.

1. **षट्कर्म - Ṣaṭkarmas:** गजकरणी (कुञ्जल), जलनेति, सूत्रनेति, रबरनेति, अग्निसार, वातक्रम-कपालभाति - Gajakaraṇ,, (Kuñjala), Jalaneti, Sūtraneti, Rabarneti, Agnisāra, Vātakrama-Kapālabhāti
2. **सूक्ष्म-व्यायाम - Subtle Exercise:** स्वामी धीरेन्द्र ब्रह्मचारी कृत 'सूक्ष्म व्यायाम' से प्रथम बीस क्रियाएँ - First twenty exercises from the Book - 'Sūkṣma Vyāyāma' of Swami Dhirendra Brahmachari.
3. **सूर्य-नमस्कार (संबद्ध मन्त्रोच्चारण-पूर्वक) - Sūrya-Namaskāra** (Along recitation of concerned mantras)
4. **आसन - Āsanas:** उत्तानपादासन, भुजंगासन, शलभासन, नौकासन, विपरीत-नौकासन या नाभ्यासन, मकरासन, धनुरासन, सिद्धासन, स्वस्तिकासन, पद्मासन, उत्थित-पद्मासन, वक्रासन, अर्धमत्स्येन्द्रासन, गोमुखासन, वज्रासन, सुप्तवज्रासन, कूर्मासन, उत्तानकूर्मासन, शांकासन (गुरुप्रणामासन), दण्डासन, सिंहासन, भद्रासन,

मार्जार्यासन, व्याघ्रासन, कागासन, ताड़ासन, कटिचक्रासन, पार्श्वचक्रासन, त्रिकोणासन, कोणासन, ऊर्ध्वहस्तोत्तानासन, उत्कटासन, पादहस्तासन, नटराजासन व शवासन - Uttānapādāsana, Bhujan̲gāsana, Śalabhāsana, Naukāsana, Vipar,,ta-Naukāsana or Nābhyāsana, Makarāsana, Dhanurāsana, Siddhāsana, Svastikāsana, Padmāsana, Utthita-Padmāsana, Vakrāsana, Ardhamatsyendrāsana, Gomukhāsana, Vajrāsana, Supta-Vajrāsana, Kurmāsana, Uttāna-Kurmāsana, Śaśān̲kāsna (Gurupraṇāmāsana), Danḍāsana, Sin̲hāsana, Bhadrāsana, Mārjāryāsana, Vyāghrāsana, Kāgāsana, Tāḍāsana, Kaṭicakrāsana, Pārśva-cakrāsana, Trikoṇāsana, Koṇāsana, Ūrdhvahastottānāsana, Utkaṭāsana, Pādahastāsana, Naṭarājāsana and Śavāsana

5. **प्राणायाम - Prāṇāyāma:** नाड़ीशोधन, अनुलोम-विलोम, सूर्यभेदी, उज्जायी व शीत्कारी - Nāḍīśodhana, Anuloma-Viloma, Sūryabhedī, Ujjāyī, and Śītkārī
6. **मुद्रा व बन्ध - Mudrā and Bandha**: उड्डियानबन्ध, मूलबन्ध, जालन्धरबन्ध, विपरीतकरणी, तड़ागी, काकी व शाम्भवी - Uḍḍiyānabandha, Mūlabandha, Jālandharabandha, Viparītakaraṇī, Taḍāgī, Kāki and Śāmbhavī
7. **ध्यान - Meditation:** ओंङ्कारध्यान व प्रेक्षाध्यान - On̲kāradhyāna and Prekṣādhyāna

आवश्यक पठनीय - Essential Readings:

1. स्वामी धीरेन्द्र ब्रह्मचारी, सूक्ष्म व्यायाम, मोरारजी देसाई नेशनल ईन्स्टिट्यूट ऑव योग, निकट गोल डाकखाना, नई दिल्ली
2. O.P. Tiwari - Asana why and how, Kaivalyadham SMYM Samiti, Lonavala - 2012.
3. M.L. Gharote - Guidelines for Yogic Practices, Medha Publication, Lonavala.
4. स्वामी सत्यानन्द सरस्वती, आसन-प्राणायाम-मुद्रा-बन्ध, योग पब्लिकेशन्स ट्रस्ट, मुंगेर, बिहार - 2006
5. पं. श्रीराम शर्मा, प्रज्ञा अभियान का योग व्यायाम, ब्रह्मवर्चस् शोध संस्थान, शान्तिकुञ्ज, हरिद्वार - 1998.

सन्दर्भ ग्रंथ - Suggested Readings:

1. B.K.S. Iyengar - Light on Yoga, Harper Collins Publisher, New Delhi, 2012.
2. B.K.S. Iyengar - Light on Pranayama, Harper Collins Publisher, New Delhi, 2012.
3. Swami Kuvlayanand - Asana, Kaivalyadham SMYM Samiti, Lonavala, 1993.

SIAS YOGA 1104 C 4105 - योगाभ्यास एवं मानवीय अवयव-संघटन व शारीर संरचना - 1, Human Anatomy, Physiology and Yogic Practices - 1

Objective of the Paper:

- To know about human body systems
- How Yogic practices do impact our body systems?

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Anatomy and physiology of different parts of the body
- Explain the impact of Yogic practices on body systems

UNIT-I कोशिका, ऊतक, शरीर व मन का परिचय - Introduction to Cell, Tissue, Body and Mind

1. शरीर की परिभाषा, शरीर का षडंगत्व, पुरुष के आयुर्वेदोक्त चार भेद - चेतना-पुरुष, धातु-पुरुष, पंचविंशति-पुरुष, षड्धातु-पुरुष - Human Body, Its six types of organism, Four Types of Puruṣa according to Āyurveda - Catena-Puruṣa, Dhatu-Puruṣa, Pañcaviṅśati-Puruṣa, Ṣaḍdhātu- Puruṣa
2. **मानवीय कोशिका - Human Cell** संरचना व इसके विभिन्न अवयवों के कार्य - Structure and Functions
3. ऊतक की संरचना, प्रकार तथा कार्य – Structure, Types and Functions of Tissue
4. मन की परिभाषा, मन की उत्पत्ति, मन का स्थान, मन का निग्रह, मन के कर्म के संदर्भ में ध्यान समन्वय - Definition of Mind, Origin of Mind, Place of Mind, Keeping the Mind in Check, Meditational Sequence with regards to Functions of Mind

UNIT II अस्थि पेशीय तन्त्र एवं योग – Musculoskeletal system and Yoga

1. अस्थि की परिभाषा, अस्थि के भेद, अस्थि की संख्या, अस्थि की संरचना, अस्थि के कार्य - Definition of Bone, Types of Bones, Number of Bones, Structure of Bones, Function of Bones
2. तरुणास्थि/उपास्थि का स्थान, तरुणास्थि/उपास्थि के भेद और कार्य - Place of Cartilage, Types and Functions of Cartilage

3. सन्धि-स्थल, प्रकार, घुटने व कशेरुका सन्धि-स्थल की संरचना - Joints, their Types, Structure of the Joints of Knee and Vertebra
4. अस्थि-तंत्र पर योगाभ्यास का प्रभाव - Impact of Yoga on Skeletal System
5. मांस-धातु की संरचना, पेशी का परिचय, पेशियों की संख्या व भेद - Structure of Flesh, Introduction of Muscles, Number and Types of Muscles
6. पेशी की संरचना, पेशियों के कार्य - Structure of Muscle, Functions of Muscles
7. शरीर की प्रधान पेशियों का संक्षिप्त परिचय यथा फ्रन्टेलिस, आक्सीपीटोफ्रंटालिस, टैम्पोरोपेरन्टालिस, स्टरनोक्लीडोमैस्टायड, लैटिसमस-डोरसाई, ट्रपीजियस, रैक्टस-फेमोरिस, रैक्टस-एबडोमिनिस, डैल्टायड, बाइसैप्स-ब्राची, ट्राईसैप्स-ब्राची, ट्राईसैप्स-सुराए, ग्लूटियस-मैक्सीमस, रेक्टस-फेमोरिस, सारटोरियस, गैस्ट्रोक्नीमियस - Short Introduction of Main Muscles of Body, for example - Frontalis, Occipitofrontalis, Sternocleidomastoid, Latissimus-dorsi, Trapezius, Rectus-femoris, Rectus-abdominis, Deltoid, Biceps-brachii, Triceps-brachii, Triceps-surae, Gluteus-maximus, Rectus-femoris, Sartorius, Gastrocnemius
8. योगाभ्यास का पेशी-तन्त्र पर प्रभाव - Impact of Yogic Exercises on Muscle system

UNIT III श्वसन तन्त्र एवं योग - Respiratory System and Yoga

1. श्वसन की परिभाषा, श्वसन के भेद, श्वसन तन्त्र की संरचना, श्वसन की क्रिया - बाह्य व आन्तरिक - Definition of Respiration, Types of Respiration, Structure of Respiratory System, Inner and Outer Function of Respiration
2. गैसों का परिवहन, श्वसन-क्रिया की नियंत्रण प्रक्रियायें - Movement of Gases, Regulatory Functions of Respiration
3. श्वसन क्षमताएं व आयतनों की संक्षिप्त जानकारी - Capacity of Respiration and Short Information of Expansion
4. श्वसन तन्त्र पर योगाभ्यास का प्रभाव - Impact of Yogic Exercises on Respiratory System

UNIT IV अन्तःस्त्रावी-तन्त्र, नाड़ी-तन्त्र एवं योग - Endocrinal System, Nervous System and Yoga

1. अन्तःस्त्रावी व बहिस्त्रावी ग्रन्थियों का परिचय - Introduction to Endocrine and Exocrine Glands
2. एन्जाइमस व हार्मोन में अन्तर, पीयूष ग्रन्थि, पिनियल ग्रन्थि, परिचुल्लिका ग्रन्थी, चुल्लिका ग्रन्थि, बाल्य-ग्रन्थि (थाइमॉस) आदि ग्रन्थियों का परिचय - Difference between Enzyme and Harmon,

Introduction to different Glands like - Pituitary Gland, Pineal Gland, Para-thyroid Gland, Thyroid Gland, Thymus etc.

3. अग्नाशय तथा एड्रीनल ग्रन्थि, डिम्ब व अण्डकोष ग्रन्थियों की स्थिति, हार्मोन व उनके कार्य - Pancreas and Adrenal Glands, Position of Ovaries and Testes, Harmon and their Functions
4. योगाभ्यास का अन्तःस्रावी व बहिःस्रावी ग्रन्थियों पर प्रभाव - Impact of Yogic Exercises on Endocrine and Exocrine System of Glands
5. नाड़ी-तन्त्र – सामान्य परिचय, विभिन्न भाग, संरचना एवं कार्य - Nervous System, General Information, Different Parts, Its Structure and Function

आवश्यक पठनीय - Essential Readings:

1. Shirley Teles, A Glimpses of Human Body, Swami Vivekanand Yoga Prakashan, Bangalore - 2014
2. M.M. Gore, Anatomy and Physiology of Yogic Practices, Motilal Banarsidass, New Delhi -2007
3. Ross and Wilson, Human Anatomy and Physiology in Health and Illness, Churchill Livingstone - 2010
4. पं. श्रीराम शर्मा, प्रज्ञा अभियान का योग व्यायाम, ब्रह्मवर्चस् शोध संस्थान, शान्तिकुञ्ज, हरिद्वार - 1998

सन्दर्भ ग्रंथ - Suggested Readings:

1. Inderveer Singh, Anatomy and Physiology for Nurses, Jaypee Brothers Publishers - 2008
2. राकेश दीक्षित, शरीर-रचना एवं क्रिया-विज्ञान, भाषा भवन, मथुरा - 2005
3. डॉ. भास्कर गोविन्द घाणेकर, सुश्रुत (शरीर स्थान) - 2018
4. डॉ. मुकुन्द स्वरूप वर्मा, शरीर रचना विज्ञान - 2013
5. डॉ. प्रियव्रत शर्मा, शरीर क्रिया विज्ञान - 1954
6. वैद्य रणजीत राय देसाई, आयुर्वेदीय क्रिया शरीर - 2009

SIAS YOGA 1105 C 4105 प्राचीन एवं मध्यकालीन प्रसिद्ध भारतीय दार्शनिक व योगी - Eminent Ancient and Medieval Philosophers and Yogis of India

Objective of the Paper:

- To know about our great Indian Yogis

- To learn about the teachings of Yogies of India

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Recognise our great Yogis and their contribution towards society
- Familiar with our great ancient Indian heritage and culture

UNIT-I संक्षिप्त जीवन-वृत्त तथा दर्शन व योग के प्रति योगदान - Short Life Sketch and their Contribution to Philosophy and Yoga

1. महर्षि मनु - Maharṣi Manu, 2. महर्षि याज्ञवल्क्य - Maharṣi Yājñavalakya, 3. महर्षि अष्टावक्र - Maharṣi Aṣṭāvakra, 4. विदेह राजा जनक - Videha Rājā Janaka, 5. ऋषिका मैत्रेयी - Ṛṣikā Maitrey, 6. ऋषिका गार्गी - Ṛṣikā Gārgī

UNIT-II संक्षिप्त जीवन-वृत्त तथा दर्शन व योग के प्रति योगदान - Short Life Sketch and their Contribution to Philosophy and Yoga

1. महर्षि वाल्मीकि - Maharṣi Vālmīki, 2. महर्षि वेदव्यास - Maharṣi Vedavyāsa, 3. महर्षि वसिष्ठ - Maharṣi Vasiṣṭha, 4. महर्षि विश्वामित्र - Maharṣi Viśvāmitra

UNIT- III संक्षिप्त जीवन-वृत्त तथा दर्शन व योग के प्रति योगदान - Short Life Sketch and their Contribution to Philosophy and Yoga

1. मुनि अक्षपाद गौतम - Muni Akṣapāda Gautama, 2. मुनि कणाद - Muni Kaṇāda, 3. मुनि कपिल - Muni Kapila, 4. पतञ्जलि - Muni Patañjali मुनि जैमिनि - Muni Jaimini, 2. मुनि बादरायण - Muni Bādarāyaṇa,

UNIT-IV संक्षिप्त जीवन-वृत्त तथा दर्शन व योग के प्रति योगदान - Short Life Sketch and their Contribution to Philosophy and Yoga

1. 1. आदि शंकराचार्य - Ādi Śaṉkarācārya, 2. योगी मत्स्येन्द्रनाथ - Yogi Matsyendranātha, 3.योगी गोरक्षनाथ - Yogi Gorakshanātha, 4. सन्त ज्ञानेश्वर - Santa Jñāneśwara , 5. मुनि गौतम बुद्ध - Muni Gautama Buddha, 6. मुनि महावीर जिन - Muni Mahavira Jina

आवश्यक पठनीय - Essential Readings:

1) विश्वनाथ मुखर्जी, भारत के महान् योगी, विश्वविद्यालय प्रकाशन, नई दिल्ली - 2005

2) विश्वनाथ मुखर्जी, भारत की महान् साधिकायें, विश्वविद्यालय प्रकाशन, नई दिल्ली - 2005

3) कल्याण (भक्त अङ्क), गीता प्रेस गोरखपुर

4) कल्याण (सन्त अङ्क), गीता प्रेस गोरखपुर

5) पं. श्रीराम शर्मा, प्रज्ञा अभियान का योग व्यायाम, ब्रह्मवर्चस् शोध संस्थान, शान्तिकुञ्ज, हरिद्वार - 1998.

सन्दर्भ ग्रंथ- Suggested Readings:

1. कल्याण (योग-तत्त्वांक व योगाङ्क), गीता प्रेस गोरखपुर, क्रमशः1991व 2002

2. राकेश दीक्षित, शरीर-रचना एवं क्रिया-विज्ञान, भाषा भवन, मथुरा - 2005

3. डॉ. भास्कर गोविन्द घाणेकर, सुश्रुत (शरीर स्थान)

4. डॉ. मुकुन्द स्वरूप वर्मा, शरीर रचना विज्ञान

द्वितीय सत्र -Second Semester

SIAS YOGA 1206 C 4105 - पातञ्जल योगसूत्र - Pātañjala Yogasūtra

Objective of the Paper:

- To provide teachings of Patanjal Yoga Sutra
- How does one can control their mental fluctuations?

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Know mental fluctuations and methods of control them.
- Use the teachings of Patanjali in daily life.

Unit-I पातञ्जल योगसूत्र का परिचयचित्त , की भूमियाँ, चित्तवृत्तियाँ, अभ्यास और वैराग्य रूपी संसाधन, योगअंतराय-, चित्तप्रसादन - Introduction of Patañjali's Yogasūtra, Cittabhūmis, Cittavṛttis, Abhyāsa & Vairāgya as the tools, Yoga-Antarāyas, Citta-Prasādana

Unit-II क्रियायोग- और उसके प्रकार, ईश्वर का स्वरूप, पंच क्लेश, चतुर्व्यूहवाद, कर्म सिद्धान्त - Kriyā-Yoga and its Kinds, Concept of Īśvara, Pañca-kleśas, Caturvyūhavāda, Karma Theory
अष्टाङ्गयोग, यम ,नियम-वितर्क और महाव्रत की अवधारणा ,आसन, प्राणायाम, प्रत्याहार और उनकी सिद्धियाँ - Eight Steps of Yoga, Yamas & Niyamas, Concept of Vitarka and Mahāvratas, Āsanas, Prāṇāyāma, Pratyāhāra and their Siddhis

Unit-III धारणा, ध्यान एवं समाधि का परिचय और संयम का स्वरूप, समाधि के प्रकारसम्प्रज्ञात -, असम्प्रज्ञात, ऋतम्भरा प्रज्ञा, विवेकख्याति, धर्ममेघ समाधि - ṇIntroduction of DhāraāDhyān ,aNature of ,and Samādhi SaṁyamaKinds of Samādhi , -Samprajñāt aAsampra ,jñāta, Ṛtambharā PrajñāVivek ,a ,khyāti DharamameghaSamādhi

Unit-IV अष्ट-सिद्धियाँ, पुरुष एवं प्रकृति की अवधारणापुरुष और प्रकृति का , संयोग, सिद्धि के पांच साधन, समाधि जनित सिद्धि का महत्त्व कैवल्य की अवधारणा ,- AṣṭaSiddhi-s, Concept of Puruṣa and Prakṛti and Conjunction of both, Five means of Siddhi, Importance of Siddhis achieved through Samādhi, Concept of Kaivalya

आवश्यक पठनीय -Essential Readings:

1. स्वामी ओमानन्द तीर्थ ,पातंजल योग-प्रदीप,गीता प्रेसगोरखपुर , - 2013
2. हरिकृष्ण गोयन्दका गोरखपुर ,गीता प्रेस ,पातंजल योगदर्शन ,-2007
3. Swami Satyananda Saraswati, Four Chapters on Freedom, Yoga Publication Trust, Munger, Bihar - 2001
4. P.V. Karambelkar, Pātañjala Yogasūtra, Kaivalyadham SMYM Samiti, Lonavla -2011
5. श्रीराम शर्मा आचार्यदर्शन-दर्शन और योग-सांख्य ,, अखण्ड1998 - मथुरा ,ज्योति-
6. आचार्य उदयवीर शास्त्रीनई ,विजयकुमार गोविन्दराम हासानन्द ,विद्योदयभाष्यम् ,योगदर्शनम् , सड़क दिल्ली , 1990 -

सन्दर्भ ग्रंथ -Suggested Readings:

1. श्रीराम शर्मा आचार्य, साधना पद्धतियों का ज्ञान और विज्ञान, अखण्ड1998 - मथुरा ,ज्योति-
2. Maharṣi Vyasa, Vyāsa-Bhāṣhya (Yogasūtra), Chaukhambha Sanskrit Sansthan, Varanasi -2016

SIAS YOGA 1207 C 4105

मानव-शरीर-रचना एवं क्रिया-विज्ञान तथा योगाभ्यास - 2

Human Anatomy, Physiology and Yogic Practices - 2

Objective of the Paper:

- To know about human body systems
- How Yogic practices do impact our body systems?

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Anatomy and physiology of different parts of the body
- Explain the impact of Yogic practices on body systems

Unit-I रक्त-परिसंचरण-तन्त्र एवं रक्त की संरचना - Blood Circulatory System and Formation of Blood

1. श्वेत रक्त-कण व लाल रक्त-कण की संरचना तथा कार्य, रक्त के कार्य - Formation and Function of White Blood Cell and Red Blood Cell ,Functions of Blood
2. धमनी व शिरा की संरचना व उनमें अन्तर - Formation of Vein and Nerve and Difference between them
3. हृदय की बाह्य एवं आन्तरिक संरचना, हृदय चक्र - Outer and Inner Formation of Heart, Cardiac Cycle
4. रक्तदाब, रक्त का संवहन -Blood Pressure, Blood Circulation
5. रक्त परिसंचरण तन्त्र पर योगाभ्यास का प्रभाव - Impact of Yogic Exercises on Blood Circulatory System
6. रक्तदाब व हृदय गति की नियन्त्रण प्रक्रिया - Mechanism for the Control of Blood-Pressure and Heart Beat

Unit-II पाचन-तन्त्र - Digestive System

1. पाचन तन्त्र की परिभाषा, पाचन तन्त्र की संरचना व क्रियायें - Definition of Digestive System, Formation and Functions of Digestive System
2. प्रोटीन, वसा तथा कार्बोहाईड्रेटस का पाचन - Digestion of Protein, Fats and Carbohydrates
3. यकृत की संरचना और कार्य - Formation and Functions of Liver
4. अग्नाशय की संरचना और कार्य - Formation and Functions of Pancreas
5. पाचन-तन्त्र पर योगाभ्यास का प्रभाव - Impact of Yogic Exercises on Digestive System

Unit-III उत्सर्जन प्रक्रिया एवं योगाभ्यास - Excretory System and Yogic Practices

1. उत्सर्जन-तन्त्र का परिचय, उत्सर्जन तन्त्र की संरचना - Introduction of Excretory System, Formation of Excretory System
2. वृक्क की संरचना तथा कार्य, वृक्काणु (नेफ्रान) की संरचना -Formation and Functions of Kidney, Formation of Nephron
3. मूत्र उत्पत्ति की प्रक्रिया, मूत्र का उत्सर्जन, मूत्र की मात्रा व संघटक, मूत्र द्वारा उत्सर्जित असामान्य पदार्थ - System of origin of Urine, Excretion of Urine, Quantity and ingredients of Urine, Abnormal Ingredients excreted by Urine
4. उत्सर्जन तन्त्र पर योगाभ्यास का प्रभाव - Impact of Yogic Exercises on Excretory System

Unit-IV तन्त्रिका तन्त्र एवं योगाभ्यास - Nervous System and Yogic Practices

.1 तन्त्रिका तन्त्र के विभाग, तन्त्रिकाओं के प्रकार (जानकारी संक्षिप्त), तन्त्रिका कोशिका की संरचना -Divisions of Nervous System, Brief Information regarding types of Nerves, Formation of all of Vein

.2 मस्तिष्क के तीन विभाग, बृहद्मस्तिष्क की संरचना और कार्य-, लघु -मस्तिष्क ,मस्तिष्क की संरचना और कार्य-वृन्त की संरचना और कार्य - Three Divisions of Mind, Formation and Functions of Cerebrum, Formation and Functions of Cerebellum, Formation and Functions of Brainstem

.3 धमनियों के भेद, मस्तिष्कीय धमनियाँ, सौषुम्निक धमनियाँ, (धमनियाँ-ग्रीवा) नाड़ी संस्थान एवं तन्त्रिका तन्त्र पर योगाभ्यास का प्रभाव -Divisions of Veins, Veins of Mind, Carotid Veins, Impact of Yogic Exercises on Nervous and Vein System

4. ज्ञानेन्द्रियों की संरचना और कार्य, ज्ञानेन्द्रियों पर योगाभ्यास का प्रभाव -Formation and Functions of Sensual Organs, Impact of Yogic Exercises on Sensual Organs

आवश्यक पठनीय - Essential Readings:

1. Shirley Teles, A Glimpses of Human Body, Swami Vivekanand Yoga Prakashan, Bangalore - 2014
2. M.M. Gore, Anatomy and Physiology of Yogic Practices, Motilal Banarsidass, New Delhi - 2007
3. Ross and Wilson, Human Anatomy and Physiology in Health and Illness, Churchill Livingstone - 2010
4. पं. श्रीराम शर्मा, प्रज्ञा अभियान का योग व्यायाम, ब्रह्मवर्चस् शोध संस्थान, शान्तिकुञ्ज, हरिद्वार - 1998

सन्दर्भ ग्रंथ - Suggested Readings:

1. Inderveer Singh, Anatomy and Physiology for Nurses, Jaypee Brothers Publishers - 2008
2. राकेश दीक्षित, शरीर-रचना एवं क्रिया-विज्ञान, भाषा भवन, मथुरा - 2005
3. डॉ. भास्कर गोविन्द घाणेकर, सुश्रुत (शरीर स्थान) - 2018
4. डॉ. मुकुन्द स्वरूप वर्मा, शरीर रचना विज्ञान - 2013
5. डॉ. प्रियव्रत शर्मा, शरीर क्रिया विज्ञान - 1954
6. वैद्य रणजीत राय देसाई, आयुर्वेदीय क्रिया शरीर - 2009

SIAS YOGA 1208 C 00126 - योग- अभ्यास-प्रायोगिक-2, Yoga-Practical -2

योगाभ्यास का अनुक्रम -Sequence of Yogic Practices

Objective of the Paper:

- To learn how to practice different Yogic practices
- What are the different Yogic techniques and how to perform them?

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Do Yogasana practices with effective manners
- Do different Yogic Shatkarmas like Jal Neti, Sutra Neti etc.
- Perform all the Sukshama and sthul vyayama

टिप्पणी - प्रथम सत्र के पाठ्यक्रम में आई सभी षट्कर्म क्रियायें, सूक्ष्म व्यायाम, आसन, प्राणायाम, मुद्रा, बन्ध व ध्यान द्वितीय सत्र में भी सम्मिलित रहेंगे - Ṣaṭkarmas (Kriyās), Subtle Exercises, Āsanas, Prāṇāyāma, Mudrās, Bandhas and Meditation practiced in the first semester shall also be included in the syllabus of the second semester

1. **षट्कर्म** - व्युत्क्रम,कपालभाति- दण्डधौति (दाएँ व बाएँ ,मध्य) नौलि ,- **Ṣaṭkarmas** - Vyutkrama-Kapālabhāti, Daṇḍadhauti, Naulī (Central, Right and Left)
2. **सूक्ष्मयामव्या-** - स्वामी धीरेन्द्र ब्रह्मचारी कृत 'सूक्ष्म व्यायाम' से सभी 1)से 48क्रियाएँ (- **Sūkṣma Vyāyāma** (Subtle Exercises) of Svāmī Dhīrendra Brahmacārī 1)to 48(
3. **सूर्यनमस्कार-** (संबद्ध मन्त्रोच्चारणपूर्वक-) - **Sūrya-Namaskāra** (Along recitation of concerned mantras)
4. **आसन - ध्यानात्मक व विश्राम-दायक आसन** - सिंहासन, मुक्तासन, भद्रासन, स्वस्तिक आसन, मकरासन - **Āsanas - Meditative and Relaxative Āsanas** - Siṁhāsana, Muktāsana, Bhadrāsana, Svastikāsana, Makarāsana - **सांस्कृतिक आसन - खड़े होकर किए जाने वाले आसन** - उत्कटासन, पादहस्तासन, वृक्षासन, गरुड़ासन - **Cultural Āsanas - Standing Āsanas** - Utkaṭāsana, Pādahastāsana, Vṛkṣāsana, Garuḍāsana - **कमर के बल लेट कर किए जाने वाले आसन** - सर्वांगासनचक्रासन ,हलासन ,मत्स्यासन , - **Spine Yoga Asanas** - Sarvāṅgāsana, Matsyāsana, Halāsana, Cakrāsana - **पेट के बल लेटकर किए जाने वाले आसन** - भुजंगासन, विपरीत-नौकासन, एकपाद-धनुरासन - **Prone Yoga Āsanas** - Bhujaṅgāsana, Viparīta-Naukāsana, Ekapāda-Dhanurāsana - **बैठकर किए जाने वाले आसन** - जानुशीर्षासन ,तोलाङ्गुलासन ,आकर्णधनुरासन , बद्धपद्मासन - **Sitting Yoga Āsanas** - Jānuśirṣāsana, Ākarṇadhanurāsana, Tolāṅgulāsana, Baddha-Padmāsana - **उन्नत आसन** - एकपादस्कन्दासन, बकासन, पूर्ण उष्ट्रासन, शीर्षासन - **Advance Āsanas** - Ekpādaskandāsana, Bakāsana, Pūrṇa Uṣṭrāsana, Śīrṣāsana

5. प्राणायाम - भस्त्रिका शीतली व भ्रामरी ,**-** Prāṇāyāma **-** Bhastrikā, Sītalī and Bhrāmarī

6. मुद्रा व बन्ध - अश्विनीमुद्रा, महामुद्रामहावेधमुद्रा व शक्तिचालिनीमुद्रा ,महाबन्ध , - **Mudrās and Bandhas** - Aśvinīmudrā, Mahāmudrā, Mahābandha, Mahāvedhamudrā and Śakticālinīmudrā

.7ध्यान - सोऽहम् साधना, गायत्रीध्यान व-मन्त्र- विपश्यना-ध्यान - Dhyānas **(**Meditation) - So'ham Sādhanā, Gāyatrī-Mantra-Meditation, Vipaśyanā-Meditation

आवश्यक पठनीय -Essential Readings:

1. स्वामी धीरेन्द्र ब्रह्मचारीनई ,निकट गोल डाकखाना ,व योगमोरारजी देसाई नेशनल ईन्स्टिट्यूट ऑ ,सूक्ष्म व्यायाम , - दिल्ली 1966
2. स्वामी सत्यानन्द सरस्वती2006 - बिहार ,मुंगेर ,योग पब्लिकेशन्स ट्रस्ट ,बन्ध-मुद्रा-प्राणायाम-आसन ,
3. O.P. Tiwari - Asana Why and How, Kaivalyadham SMYM Samiti, Lonavala- 2012
4. M.L. Gharote - Guidelines for Yogic Practices, Medha Publication, Lonavala - 1982
5. पं - हरिद्वार ,शान्तिकुञ्ज ,ब्रह्मवर्चस् शोध संस्थान ,प्रज्ञा अभियान का योग व्यायाम ,श्रीराम शर्मा .1998

सन्दर्भ ग्रंथ- Suggested Readings:

1. B.K.S. Iyengar - Light on Yoga, Harper Collins Publisher, New Delhi- 2012
2. B.K.S. Iyengar - Light on Pranayama, Harper Collins Publisher, New Delhi- 2012
3. Swami Kuvlayanand - Asana, Kaivalyadham SMYM Samiti, Lonavala- 1993
4. Swami Satyananda Saraswati - Asana Pranayama Mudra Bandhas, Yoga Publication Trust, Munger, Bihar - 2006

SIAS YOGA 1209 C 4105 - मुख्य उपनिषद्, श्रीमद्भगवद्गीता और योगवासिष्ठ

Principal Upaniṣads, Gītā and Yogavāsiṣṭha

Objective of the Paper:

- To know about principal Upanishads
- To learn about the teachings of Upanishadas

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Understad about teachings of Upanishadas

- How Upanishads are helpful to human beings

Unit-I **ईशावास्योपनिषद्** - कर्म-निष्ठा, विद्या और अविद्या, ब्रह्म का स्वरूप - **Īśāvāsyopaniṣad**- Karmaniṣṭhā, Vidyā & Avidyā, Nature of Brahman - **केनोपनिषद्** - आत्मा और मन, सत्य की अनुभूति, यक्ष के उपाख्यान का संदेश - **Kenopaniṣad** - Ātmā and the Mind, Realization of Truth, Message of Yakṣa-Episode - **कठोपनिषद्** - योग की परिभाषा, आत्मा का स्वरूप एवं आत्मानुभूति का महत्त्व - **Kaṭhopaniṣad** - Definition of Yoga, Nature of Soul, Importance of Self Realization - **प्रश्नोपनिषद्** - प्राण और रयि की अवधारणा, पंचप्राण - **Praśnopaniṣad** - Concept of Prāṇa & Rayi (Creation), Pañcaprāṇa

Unit-II **मुंडकोपनिषद** - विद्या - परा तथा अपरा, ब्रह्मविद्या की विशेषताएं, तप और गुरुभक्ति, सृष्टि की उत्पत्ति, ध्यान का उद्देश्य - **Muṇḍakopaniṣad** - Vidyā - Parā & Aparā, Characteristics of Brahmavidyā, Tapas & Gurubhakti, Creation, Goal of Meditation - **माण्डूक्योपनिषद्** - चेतना की चार अवस्थाएँ एवं ओंकार से इनका संबन्ध - **Māṇḍukyopaniṣad** - Four States of Consciousness and their relation with Oṁ-kāra; **ऐतरेयोपनिषद्** - आत्मा, ब्रह्माण्ड और ब्रह्म की अवधारणा - **Aitareyopaniṣad** - Concepts of Ātmā, Universe and Brahman

Unit-III **तैत्तिरीयोपनिषद्** - पंचकोश, शिक्षावल्ली, आनंदवल्ली, भृगुवल्ली का संक्षिप्त विवरण - **Taittirīyopaniṣad** - Pañcakośa, Śikṣāvalli; Ānandavalli and Bhṛguvalli in short; **छान्दोग्योपनिषद्** - ओम ध्यान, शाण्डिल्य-विद्या - **Chāndogyopaniṣad** - Om Meditation, Śāṇḍilyavidyā - **बृहदारण्यकोपनिषद्** - याज्ञवल्क्य-मैत्रेयी-संवाद - **Bṛhadāraṇyakopaniṣad** - Dialogue between Yājñavalkya and Maitreyī, **योगवासिष्ठ** - योगवासिष्ठ का सामान्य परिचय, आधि और व्याधि, मुक्ति के चार द्वारपाल, सत्वगुण का विकास, ध्यान के आठ चरण, सप्त भूमियाँ - **Yogavāsiṣṭha** - General Introduction of Yogavāsiṣṭha, Three Methods of Yoga, Ādhi & Vyādhi, Four Gatekeepers of Salvation, Promotion of Sattva Guṇa, Eight Steps of Meditation, Sapta Bhūmis

IV-Unit **श्रीमदभगवद्गीता** - **Bhagavadgītā** - योग की परिभाषाएं - आत्मा का स्वरूप, स्थितप्रज्ञ, सांख्ययोग (अध्याय-2), कर्मयोग (अध्याय-3), ध्यानयोग (अध्याय-6), भक्तों के प्रकार (अध्याय-7), भक्ति की प्रकृति (अध्याय-12), भक्तियोग के साधन और साध्य, त्रिगुण और प्रकृति का स्वरूप, योगी का आहार एवं उसका वर्गीकरण (अध्याय 14 व 17), देवासुर संपद्विभागयोग (अध्याय-16), मोक्ष का उपदेश (अध्याय-18) - Definitions of Yoga, Concepts of Ātmā, Sthitaprajña, Sāṁkhyayoga (Chapter-II), Karmayoga (Chapter-III), Dhyānayoga (Chapter-VI), Types of Bhakta (Chapter-VII), Nature of Bhakti (Chapter-XII), Means and Goal of Bhaktiyoga, the Triguṇas and Concept of Prakṛti, Food prescribed for Yoga Practitioner & Classification of Food (Chapter-XIV & XVII), Daivāsurasampad-vibhāgayoga (Chapter-XVI), Concept of Salvation (Chapter-XVIII)

सन्दर्भ ग्रंथ- Suggested Readings:

1. उपनिषद् अंक, कल्याण, गीता प्रेस गोरखपुर2015 -
2. उपनिषद् प्रकाशसत्यव्रत सिद्धांतालंकार - , विजयकृष्ण लखनपाल, डब्ल्यू 77 - ए, ग्रेटर कैलाश, नई दिल्ली - 1981
3. साधक संजीवनी - स्वामी प्रेमसुख दास जी महाराज, गीता प्रेस गोरखपुर 1990 -
4. उपनिषद् दीपिका डॉ॰ रामनाथ वेदालंकार -
5. श्रीमदभगवद्गीता, शाङ्करभाष्य, गीताप्रेस, गोरखपुर 2015 -
6. गीता रहस्य - बाल गंगाधर तिलक2019 -
7. गीताभाष्य - सत्यव्रत सिद्धांतालंकार, उत्तर प्रदेश 2013 -
8. The Principal Upanishads, S.Radha Krishan, Harpee Collins Publishers, A-75, Sector 37, Noida ,Uttar Pradesh - 201301

SIAS YOGA 1101 GE 3104
योग के मूल तत्त्व -Fundamentals of Yoga

Objective of the Paper:

- To know about Yoga
- To eradicate the misunderstanding about Yogic practices

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Know about meaning and definition of Yoga
- Familiar with an authentic foundation of Yogic practices

Unit-I योग का अर्थ, परिभाषाएँ, योग का लक्ष्य व उद्देश्य, योग का इतिहास, वर्तमान समय में योग की प्रासंगिकता, योग पद्धतियाँ - मंत्र योग, ज्ञानयोग, भक्तियोग, कर्मयोग, हठयोग एवं राजयोग - Meaning of Yoga, Definitions, Aim and objectives of Yoga, History of Yoga, Relevance of Yoga in modern times, Mantra-Yoga, Jñānayoga, Bhakti-Yoga, Karma-Yoga, Haṭha-Yoga and Rāja-Yoga विभिन्न शास्त्रों में योग का स्वरूप - वेद, उपनिषद्, गीता, जैनमत, बौद्धमत, सांख्य, न्याय, वैशेषिक, मीमांसा तथा वेन्दात- **Form of Yoga in different Texts**- Veda, Upaniṣads, Gītā, Jainism, Buddhism, Sāṁkhya, Nyāya, Vaiśeṣikas, Mīmāṁsā and Vedānta

Unit-II यौगिक ग्रन्थों का सामान्य परिचय - पातंजल योगसूत्र, श्रीमद् भगवद्तागी-, रामायण, महाभारत, नारद् भक्तिसूत्र-, शिवसंहिता- एवं हठरत्नावली - **General Introduction to Yogic Texts** - Patanjali Yoga Sūtra, Śrīmadbhagavadgītā, Rāmāyaṇa, Mahābhārata, Nāradabhaktisūtra, Śivasaṁhitā and Haṭharatnāvalī

Unit-III प्रसिद्ध आधुनिक योगियों का संक्षिप्त परिचय एवं योग- सम्बन्धी योगदान- महर्षि दयान्द सरस्वती, स्वामी विवेकानन्द, श्री अरविन्द, महर्षि रमण, महर्षि शिवानन्द, टी कृष्णमाचार्य, पंडित श्रीराम शर्मा, महर्षि महेश योगी व स्वामी राम (हिमालय) - **Short Introduction and Contribution of Prominent Modern Yogis Regarding Yoga** - Maharṣi Dayānanda Sarasvatī, Swami Vivekananda, Shri Aurobindo, Maharṣi Ramaṇa, Maharṣi Śivānanda, T. Kṛṣṇāmacārya, Pt. Śrīrām Śarmā, Maharṣi Maheśa Yogi and Svāmī Rām (Himālaya)

Unit-IV भारत के प्रमुख योग संस्थानों का संक्षिप्त परिचय - कैवल्यधाम, लोनावला; बिहार योग भारती, मुंगेर; मोरारजी देसाई राष्ट्रीय योग संस्थान, नई दिल्ली; स्वामी विवेकानन्द योग अनुसन्धान संस्थानबंगलुरू ,; पतञ्जलि योगपीठ, हरिद्वार; गुरुकुल कांगड़ी विश्वविद्यालयहरिद्वार , और देव संस्कृति विश्वविद्यालय , - रहरिद्वा **Short Introduction of The Chief Yoga Schools in India** - Kaivalyadhāma, Lonavla; Bihar Yoga Bhāratī, Munger; Morarji Desai National Institute of Yoga, New Delhi; Swami Vivekananda Yoga Research Institute, Bengaluru; Patañjali Yogapeetha, Haridwar; Gurukul Kangri Vishwavidyalaya, Haridwar and Dev Sanskriti Vishwavidyalaya, Haridwar

Essential Readings:

1. Vijnananand Saraswati - Yog Vijyan, Yoga Niketan Trust, Rishikesh - 1998
2. Rajkumari Pandey-Bhartiya Yoga Parampara ke Vividh Ayam, Radha Publication, New Delhi - 2008
3. Swami Vivekanand - Jnan, Bhakti, Karma Yoga & Rajyoga, Advait Ashram, Culcutta - 2000
4. Kamakhya Kumar - Yoga Mahavigyan, Standard Publisher, NewDelhi - 2011
5. Kalyan (Yogank) - Gita Press Gorakhpur - 2002
6. Kalyan (Bhakt Ank) - Gita Press Gorakhpur, Kalyan (Sant Ank) - Gita Press, Gorakhpur - 1928

Suggested Readings:

1. K.S. Joshi - Yoga in Daily Life, Orient Paperback Publication, New Delhi - 1985
2. S.P. Sing - History of Yoga - PHISPC, Center for Studies of Civilization Ist - 2010

एम.एस-सी. योग- M.Sc. Yoga Third Semester

SIAS YOGA 1310 C 4105 - भारतीय दर्शन – Indian Philosophy

Objective of the Paper:

- To provide knowledge about Theistic Philosophy and Anti-Theistic Philosophy
- To enhance the understanding about philosophical terminology

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- They will be recognize the different schools of philosophy
- They will be familiar Shad-darshanas

Unit-I – परिचय - Introduction

5. दर्शन का अर्थ एवं परिभाषा - Meaning and definition of Philosophy
6. भारतीय-दर्शन का परिचय और उसकी उपयोगिता - Introduction of Indian Philosophy and its relevance .
7. षड्दर्शन की सामान्य अवधारणा - Basic concepts of Shad-darshanas
8. ज्ञान-मीमांसा तत्व-मीमांसा आचार-मीमांसा तथा मुक्ति, सांख्य-योग और वेदान्त-दर्शन के विशेष सन्दर्भ में - Epistemology, Metaphysics, Ethics and Liberation with special emphasis to Samkhya, Yoga and Vedanta Darshana

Unit-II - आस्तिक दर्शनों का परिचय - Introduction of Theistic Philosophy

4. योग-दर्शन का सामान्य परिचय - General introduction of Yoga Philosophy
5. योग-दर्शन- चित्त-वृत्ति, प्रमाण, चित्त-प्रसादन, क्लेश - Yoga Philosophy-Chitta, Vritti, Evidence, Mind-appeasement, Tribulation
6. सांख्य-दर्शन का सामान्य परिचय - General introduction of Sankhya Philosophy
7. वेदान्त-दर्शन का सामान्य परिचय - General introduction of Vedant Philosophy

Unit-III - आस्तिक दर्शनों का परिचय - Introduction of Anti-Theistic Philosophy

1. न्याय-दर्शन का सामान्य परिचय - General introduction of Nyay Philosophy
2. वैशेषिक-दर्शन का सामान्य परिचय - General introduction of Vaisheshika Philosophy
3. मीमांसा-दर्शन का सामान्य परिचय – General introduction of Mimansa Philosophy

Unit-IV - नास्तिक दर्शनों का परिचय - Introduction of Theistic Philosophy

1. चार्वाक-दर्शन का सामान्य परिचय - General introduction of the Carkvak Philosophy
2. बौद्ध-दर्शन का सामान्य परिचय - General introduction of the Buddhist Philosophy
3. जैन-दर्शन का सामान्य परिचय - General introduction of The Jain Philosophy

आवश्यक पठनीय - Essential Readings:

1. हरेन्द्र प्रसाद सिन्हा, भारतीय दर्शन की रुपरेखा, मोतीलाल बनारसी दास, नई दिल्ली - 2006
2. आचार्य बलदेव उपाध्याय, भारतीय दर्शन, चौखम्बा पब्लिशर्स, वाराणसी - 2000
3. स्वामी विवेकानन्द, वेदान्त, रामकृष्ण मठ नागपुर - 2000
4. राहुल सांकृत्यायन, बौद्ध दर्शन, किताब महल, नई दिल्ली - 2018
5. पंडित श्रीराम शर्मा आचार्य जी, दर्शन, युग निर्माण योजना, मथुरा - 2004
6. पंडित श्रीराम शर्मा आचार्य जी, वैशेषिक दर्शन, युग निर्माण योजना, मथुरा - 2004
7. आचार्य उदयवीर शास्त्री, सांख्य दर्शनम्, सुबोध पब्लिकेशन, नई दिल्ली - 2017

सन्दर्भ ग्रन्थ - Suggested Readings:

1. खेमराज श्रीकृष्णदास, सांख्य दर्शनम्, खेमराज श्रीकृष्णदास, मुम्बई - 2015
2. शशिप्रभा कुमार, वैशेषिक दर्शन में पदार्थ निरूपण, डी के प्रिंटवर्ड - 2013
3. जयदेव वेदालंकार, भारतीय दर्शन शास्त्र का इतिहास (न्याय-वैशेषिक), नई भारतीय पुस्तक निगम - 2006
4. महेन्द्र कुमार जैन, जैन दर्शन, श्री गणेश वर्णी जैन शोध संस्थान, वाराणसी - 2009
5. M. Hiriyanna - Outline of Indian Philosophy, Motilal Banarasi Das -1993
6. C.D. Sharma - A critical survey of Indian Philosophy, Motilal Banarsidass -2016.
7. Dutta and Chaterjee - Indian Philosophy - Rupa & Co; 2010.
8. S.N Das Gupta - History of Indian Philosophy (1-5 Vol), Motilal Banarasi Das -1975.
9. S. Radhakrishan - Indian Philosophy, Oxford - 2008

SIAS YOGA 1311 C 4105 - समग्र स्वास्थ्य और योग चिकित्सा – Holistic Health and Yoga Therapy

Objective of the Paper:

- To know about Yoga therapy
- To eradicate the misunderstanding about Yoga therapy

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Dimentions of holistic health
- Principles of Yoga therapy

- Familiar with an authentic foundation of Yogic therapy

Unit-I परिचय - Introduction:

1. स्वास्थ्य की परिभाषा और महत्व - Definition & Importance of Health
2. स्वास्थ्य के आयाम: शारीरिक, मानसिक, सामाजिक और आध्यात्मिक - Dimensions of Health: Physical, Mental, Social and Spiritual
3. त्रिगुणों की अवधारणा-स्वास्थ्य और स्वास्थ्य-लाभ में उनकी भूमिका - Concepts of Trigunas and their role in Health and Healing
4. पञ्च-महाभूत व षट-चक्र की अवधारणा-स्वास्थ्य और स्वास्थ्य-लाभ में उनकी भूमिका - Concepts of Pancha-mahabhutas and Shat-chakra, their role in Health and Healing
5. पञ्च-प्राण व पञ्च-कोष की अवधारणा-स्वास्थ्य और स्वास्थ्य-लाभ में उनकी भूमिका - Concepts of Pancha-prana and Pancha-koshas, their role in Health and Healing

Unit-II - निवारक स्वास्थ्य देखभाल में योग की भूमिका - Role of Yoga in preventive health care

1. जीवन के एक तरीके के रूप में योग - Yoga as a way of life
2. मानसिक और भावनात्मक स्वास्थ्य और योग - Mental and Emotional Health and Yoga
3. स्वस्थ रहने के योगिक सिद्धांत (आहार , विहार, आचार और विचार)-Yogic Principles of Healthy Living (Ahara, Vihara, Achara and Vichara)
4. स्वस्थ जीवन के लिए योगिक सकारात्मक दृष्टिकोण (मैत्री, करुणा, मुदिता और उपेक्षा) की भूमिका - Role of Yogic Positive Attitudes (Maitri, Karuna, Mudita and Upeksha) for Healthy Living

Unit-III - योग चिकित्सा का परिचय – Introduction of Yoga Therapy

1. योग चिकित्सा का अर्थ और परिभाषा – Meaning and definition of Yoga Therapy
2. योग चिकित्सा का इतिहास – History of Yoga Therapy
3. योग चिकित्सा के सिद्धान्त – Principles of Yoga Therapy
4. योग चिकित्सा की सीमाएं – Limitations of Yoga Therapy

Unit-IV - योग चिकित्सा के एकीकृत दृष्टिकोण - Integrated Approach of Yoga therapy

1. ख़राब-स्वास्थ्य के संभावित कारण - Potential causes of Ill-health
2. आधि और व्याधि की अवधारणा - Concepts of Aadhi and Vyadhi
3. आरामतलब जीवन शैली विकारों का योगिक प्रबन्धन (कब्ज, मोटापा, मधुमेह, गठिया, उच्च रक्तचाप) - Yogic management of sedentary lifestyle disorders (Constipation, Obesity, Diabetes, Arthritis, Hypertension)
4. मानसिक विकारों का योग प्रबन्धन (तनाव, अनिद्रा, अवसाद, दुश्चिन्ता) - Yogic management of mental disorders (Stress, Insomnia, Depression, Anxiety)

आवश्यक पठनीय - Essential Readings:

1. पंडित श्रीराम शर्मा आचार्य जी, चिकित्सा उपचार के विविध आयाम, अखण्ड ज्योति संस्थान, मथुरा – 1995
2. सुरेश लाल बर्णवाल, योग और मानसिक स्वास्थ्य, न्यू भारती बुक कॉर्पोरेशन, दिल्ली - 2002
3. स्वामी रामदेव, योग साधना एवं योग चिकित्सा रहस्य, दिव्य प्रकाशन- 2004
4. अरुण कुमार साव और डॉ अखिलेश्वर साव, योग चिकित्सा (सिद्धांत व व्यव्हार), चौखम्भा ओरिएन्टलिआ - 2019
5. कामाख्या कुमार, योग चिकित्सा संदर्शिका, श्री वेदमाता गायत्री ट्रस्ट, हरिद्वार - 2014
6. मनोरमा नीखरा, मानसिक समस्याएं योग एवं प्राणचिकित्सा, देव संस्कृति विश्वविद्यालय शान्तिकुञ्ज, हरिद्वार - 2017
7. एम.एम. गोरे, शरीर विज्ञान और योगाभ्यास, मोतीलाल बनारसीदास, नई दिल्ली – 2007
8. K.N. Udupa- Stress and its management by yoga, Motilal banarsidass publication, 1998
9. R. Nagarathna and Dr. H.R. Nagendra, Yoga and Health, Swami Vivekananda Yoga Prakashana - 2002
10. R. Nagarathna and Dr. H. R. Nagendra, Yoga for Promotion of Positive Health, Swami Vivekananda Yoga Prakashana-2004
11. Swami Satyananda Saraswati - Yogic Management of Common, Yoga Publication Trust, Munger, Bihar - 2002

सन्दर्भ ग्रंथ – Suggested Readings:

1. Sat Bir Singh Khalsa Principles and Practice of Yoga in Health Care, Sage Publishing- 2016
2. Ganesh Shankar-Classical And Modern Approaches to Yoga, Pratibha Prakashan, New Delhi
3. R.S. Bhogal -Yoga & Mental Health & Beyond, Kaivalyadham S.M.Y.S. samiti, Lonavala, 2015
4. K.S. Joshi-Speaking Of Yoga & Nature Cure Therapy, Sterling Publishers Private Ltd

SIAS YOGA 1312 C 00126 - यौगिक अभ्यास-3, Yoga Practical -3

Objective of the Paper:

- To learn how to practice different Yogic practices
- What are the different Yogic techniques and how to perform them?

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Do advance Yogasana practices with effective manners
- Do different Yogic Shatkarmas like Jal Neti, Sutra Neti, Kapalbhati and Nauli.

- Familiar with Kumbhaka practices

टिप्पणी – प्रथम सत्र और द्वितीय सत्र के पाठ्यक्रम में आई सभी क्रियायें, सूक्ष्म व्यायाम, आसन, प्राणायाम, मुद्रा, बन्ध व ध्यान तृतीय सत्र में भी सम्मिलित रहेंगे-Ṣaṭkarmas (Kriyās), subtle Exercises, Postures, Prāṇāyāma, Mudrās, Bandhas and Meditation practiced in the first semester and second semester shall also be included in the syllabus of the third semester.

यौगिक क्रियाओं का क्रमिक अभ्यास - Sequence of Yoga Practices

8. **षट्कर्म - Ṣaṭkarmas:** गजकरणी (कुञ्जल), जलनेति, सूत्रनेति, वस्त्रधौति, अग्निसार, वातक्रम, व्युत्क्रम और शीतक्रम-कपालभाति **-** Gajakaraṇī (Kuñjala), Jalaneti, Sūtraneti, Vastradhauti, Agnisāra, Vātakrama, Vyutkram and Shitkram-Kapālabhāti
9. **सूक्ष्म-व्यायाम - Subtle Exercise:** स्वामी धीरेन्द्र ब्रह्मचारी कृत 'सूक्ष्म व्यायाम' से सभी अड़तालीस क्रियाएँ और स्थूल व्यायाम – All forty-eight exercises and Sthool Vyayam from the Book - 'Sūkṣma Vyāyāma' of Swami Dhirendra Brahmachari
10. **सूर्य-नमस्कार (संबद्ध मन्त्रोच्चारण-पूर्वक) - Sūrya-Namaskāra** (Along recitation of concerned mantras)
11. **आसन - Āsanas: ध्यानात्मक व विश्राम-दायक आसन-** पदमासन, सिद्धासन, वज्रासन, सिंहासन, मुक्तासन, भद्रासन, स्वास्तिकासन, अदवासना, मकरासन, जयेष्टिकासना, आनन्दमदिरासना, **Meditative and Relaxative Postures-** Padmāsana, Siddhāsana, Vjrāsana, Siṁhāsana, Muktāsana, Bhadrāsana, Svastikāsana, Makarāsana, Jyestikāsana, Ananda-Madirasana **सांस्कृतिक आसन- खड़े होकर किए जाने वाले आसन -** तिर्यक-कटि-चक्रासन, मेरु-प्रतिष्ठासन, समकोणासन, द्विकोणासन, उत्थिता लोलसाना, डोलसाना, शीर्ष-अंगुष्ठ-योगासन, उत्थित-जनु-शीर्षासन, मूर्धासन, उत्कटासन, पादहस्तासन, वृक्षासन, गरुड़ासन-**Cultural Postures- Asana performed in standing position-** Tiryaka Kati Chakrāsana, Meru Prishthāsana, Samakonāsana, Dwikonāsana, Utthita Lolāsana, Dolāsana, Sirshā-Angustha-Yogasana, Utthita-Janu-Sirshāsana, Moordhāsana, Utkaṭāsana, Pādahastāsana, Vṛkṣāsana, Garuḍāsana**. कमर के बल लेट कर किए जाने वाले-** हस्तपाद-अंगुष्ठासन, मेरु-आकर्षणासन, सर्वांगासन ,मत्स्यासन ,हलासन ,चक्रासन- **Lying in Supine-Position-** Hasta-Pada-Angushthasana, Meru-Akarshansana, Sarvāṅgāsana, Matsyāsana, Halāsana, Cakrāsana. **पेट के बल लेटकर किए जाने वाले-** गुप्त-पद्मासन, सर्पासन, उत्तान-प्रतिष्ठासन,

अर्ध-पद्म-पश्चिमोत्तानासन, भुजंगासन, विपरीत-नौकासन, एकपाद धनुरासन- **Lying in Prone Position-** Gupta-Padmāsana, Sarpāsana, Utthān-Pristhāsana, Ardha-Padma-Paschimottānāsana, Bhujaṅgāsana, Viparīta-Naukāsana, Eka-Pāda Dhanurāsana**. बैठकर किए जाने वाले-** अर्ध-पद्म-पश्चिमोत्तानासन, जानुशीर्षासन ,आकर्णधनुरासन ,तोलाङ्गुलासन ,बद्धपद्मासन- **Sitting Postures** – Ardh-Padm-Paschimottānāsana Jānuśirṣāsana, Ākarṇadhanurāsana, Tolāṅgulāsana, Baddha-padmāsana**. उन्नत आसन –** पूर्ण-शलभासन, पूर्ण-धनुरासन, कन्धरासन, एकपादस्कंदासन, बकासन, पूर्ण उष्ट्रासन, शीर्षासन- **Advance Postures-** Poorna-Shalabhasana, Poorna-Dhanurasana, Kandharasana, Ekpādaskandāsana, Bakāsana, Purṇa Uṣṭrāsana, Śīrṣāsana.

12. **प्राणायाम - Prāṇāyāma:** नाड़ीशोधन, अनुलोम-विलोम, सूर्यभेदी, उज्जायी व शीत्कारी, भस्त्रिका ,शीतली व भ्रामरी - Nāḍīśodhana, Anuloma-Viloma, Sūryabhedī, Ujjāyī, and Śītkārī, Bhastrikā, Sītalī and Bhrāmarī
13. **मुद्रा व बन्ध - Mudrā and Bandha**: अश्विनीमुद्रा, महामुद्रा ,महाबन्ध ,महावेधमुद्रा, उड्डियानबन्ध, मूलबन्ध, जालन्धरबन्ध, विपरीतकरणी, तड़ागी, काकी व शाम्भवी - Aśvinimudrā, Mahāmudrā, Mahābandha, Mahāvedhamudrā, Uḍḍiyānabandha, Mūlabandha, Jālandharabandha, Viparītakaraṇī, Taḍāgī, Kākī and Śāmbhavī

14. **ध्यान - Meditation:** योग निद्रा और सविता की ध्यान धारणा - Yoga Nidrā, Savitā Ki Dhyān Dhārana

आवश्यक पठनीय - Essential Readings:

1. स्वामी धीरेन्द्र ब्रह्मचारी, सूक्ष्म व्यायाम, मोरारजी देसाई नेशनल ईन्स्टिट्यूट ऑव योग, नई दिल्ली
2. स्वामी सत्यानन्द सरस्वती, आसन-प्राणायाम-मुद्रा-बन्ध, योग पब्लिकेशन्स ट्रस्ट, मुंगेर, बिहार-2006
3. पं. श्रीराम शर्मा, प्रज्ञा अभियान का योग व्यायाम, ब्रह्मवर्चस् शोध संस्थान, शान्तिकुञ्ज, हरिद्वार-1998
4. O.P. Tiwari - Asana why and how, Kaivalyadham SMYM Samiti, Lonavala-2012
5. M.L. Gharote - Guidelines for Yogic Practices, Medha Publication, Lonavala
6. Swami Satyananda Saraswati - Asan, Pranayama, Mudra, Bandha, Yoga publcation trust, Munger, 2006.

सन्दर्भ ग्रंथ - Suggested Readings:

1. B.K.S. Iyengar - Light on Yoga, Harper Collins Publisher, New Delhi-2012
2. B.K.S. Iyengar - Light on Pranayama, Harper Collins Publisher, New Delhi-2012
3. Swami Kuvlayanand - Asana, Kaivalyadham SMYM Samiti, Lonavala-1993

SIAS YOGA 1313 C 4105 - योग में शिक्षण विधियाँ - Teaching Methods in Yoga

Objective of the Paper:

- To know about Yoga teachings
- Students will equip with teaching tools

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Know meaning and definition of education
- Diliver an effective lecture cum demonstration

Familiar with an authentic foundation of Yogic therapy

Unit-I - शिक्षण और अधिगम - Teaching and Learning

5. शिक्षा का अर्थ और परिभाषा, Meaning and definition of education
6. शिक्षण के सिद्धान्त और उसके आयाम, Principles of teaching and its dimensions
7. अधिगम के सिद्धान्त और उसके आयाम, Principles of learning and its dimensions
8. अधिगम और शिक्षण में सम्बन्ध, Relationship between learning and teachings
9. शिक्षण को प्रभावित करने वाले कारक, Factors influencing teaching methods

Unit-II - योग में शिक्षण विधियाँ – Teaching Methods in Yoga

9. योग शिक्षक की भूमिका और गुण – Role and characteristics of Yoga teacher
10. योग के विशेष संदर्भ के साथ शिक्षण विधियाँ - Teaching methods with special reference to Yoga
11. योग शिक्षण को प्रभावित करने वाले कारक - Factors influencing Yoga teaching
12. योग शिक्षण के आवश्यक तत्व - Essential elements of Yoga teaching
13. एक व्यक्ति, छोटे समूह और बड़े समूह को योग सिखाने के तरीके - Methods of teaching Yoga to an individual, small group and large group
14. योग में व्याख्यान सह प्रदर्शन: इसका अर्थ, महत्व और इसकी प्रस्तुति का तरीका - Lecture cum demonstration in Yoga: Its meaning, importance and method of its Presentation

Unit-III - पाठ योजना– Lesson plan

15. पाठ योजना: इसका अर्थ और आवश्यकता - Lesson plan: Its meaning and need
16. योग में पाठ योजना तैयार करना - Preparation of lesson plan in Yoga
17. विशिष्ट योग साधनाओं में पाठों की प्रस्तुति - Presentation of lessons in specific Yogic practices

Unit-IV – शिक्षण सहायता प्रणाली - Teaching Support System

5. शिक्षण सहायता प्रणाली: पारंपरिक, आधुनिक और आईसीटी आधारित - Teaching Support System: Traditional, Modern and ICT based
6. शिक्षण में पॉवर पॉइंट प्रेजेंटेशन का परिचय और आवश्यकता – Introduction of Power Point Presentation in teachings and its need
7. शिक्षण में पॉवर पॉइंट प्रेजेंटेशन के लाभ – Benefits of Power Point Presentation in teachings

आवश्यक पठनीय - Essential Readings:

1. M L Gharote Shri S K Ganguly, Teaching method for yogic Practice, Kaivalyadhama, Pune – 2001
2. S. K. Mangal, Uma Mangal, Essentials of Educational Technology, PHI Learning Pvt. Ltd., 2009
3. एस.एस.चहल, स्वास्थ्य, शारीरिक एवं योग शिक्षा, भारत बुक हाउस, 2018

सन्दर्भ ग्रंथ - Suggested Readings:

1. Mark Stephens, Teaching Yoga: Essential Foundations and Techniques, North Atlantic Books - 2010
2. Yoga Training Manual for School Children, Morarji Desai National Institute of Yoga, New Delhi- 2010
3. Swami Kuvalyananda Scientific Survey Yogic Poses Extract from the book Asana, Kaivalyadhama - 2006
4. Aruna Goel, Yoga Education: Philosophy and Practice, Deep & Deep Publication - 2007

SIAS YOGA 1102 GE 3104 - योग और समग्र स्वास्थ्य (योग के अलावा अन्य छात्रों के लिए) - Yoga and Holistic Health (for the students other than Yoga)

Objective of the Paper:

- To know aobut holistic health
- Students will equip with preventive care tools of Yoga

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Familiar with Pancha Prana, Panch kosha and Panch Mahabhutas
- Know the ways of healthy livings

Unit-I परिचय - Introduction:

1. स्वास्थ्य की परिभाषा और महत्व - Definition & Importance of Health
2. स्वास्थ्य के आयाम: शारीरिक, मानसिक, सामाजिक और आध्यात्मिक - Dimensions of Health: Physical, Mental, Social and Spiritual
3. त्रिगुणों की अवधारणा-स्वास्थ्य और स्वास्थ्य-लाभ में उनकी भूमिका - Concepts of Trigunas and their role in Health and Healing
4. पञ्च-महाभूत व षट-चक्र की अवधारणा-स्वास्थ्य और स्वास्थ्य-लाभ में उनकी भूमिका - Concepts of Pancha-mahabhutas and Shat-chakra, their role in Health and Healing
5. पञ्च-प्राण व पञ्च-कोष की अवधारणा-स्वास्थ्य और स्वास्थ्य-लाभ में उनकी भूमिका - Concepts of Pancha-prana and Pancha-koshas, their role in Health and Healing

Unit-II - निवारक स्वास्थ्य देखभाल में योग की भूमिका - Role of Yoga in preventive health care

1. जीवन के एक तरीके के रूप में योग - Yoga as a way of life
2. मानसिक और भावनात्मक स्वास्थ्य और योग - Mental and Emotional Health and Yoga
3. स्वस्थ रहने के योगिक सिद्धांत (आहार , विहार, आचार और विचार)-Yogic Principles of Healthy Living (Ahara, Vihara, Achara and Vichara)
4. स्वस्थ जीवन के लिए योगिक सकारात्मक दृष्टिकोण (मैत्री, करुणा, मुदिता और उपेक्षा) की भूमिका - Role of Yogic Positive Attitudes (Maitri, Karuna, Mudita and Upeksha) for Healthy Living

Unit-III - समग्र स्वास्थ्य हेतु यौगिक अवधारणा – Yogic concept of holistic health

1. त्रिदोषों की अवधारणा - Concept of Tridosha
2. स्वस्थ वृत्त और ऋतुचर्या - Swastha Vritta and Seasonal regimen
3. दिनचर्या और रात्रिचर्या - Day and Night regimen
4. समग्र स्वस्थ्य में इनकी भूमिका - Role of Yogic concept in holistic health

Unit-IV - समग्र स्वास्थ्य और आहार - Holistic health and Diet

1. आहार और पोषण की अवधारणा - Concept of Diet and Nutrition
2. स्थूल पोषक तत्त्व और उनकी आवश्यकता - Macronutrients and their utility
3. सूक्ष्म पोषक तत्त्व और उनकी आवश्यकता - Micronutrients and their utility
4. आहार का समग्र स्वास्थ्य पर प्रभाव - Impact of Diet on holistic health

आवश्यक पठनीय - Essential Readings:

1. पंडित श्रीराम शर्मा आचार्य जी, चिकित्सा उपचार के विविध आयाम, अखण्ड ज्योति संस्थान, मथुरा – 1995
2. सुरेश लाल बर्णवाल, योग और मानसिक स्वास्थ्य, न्यू भारती बुक कॉर्पोरेशन, दिल्ली - 2002
3. स्वामी रामदेव, योग साधना एवं योग चिकित्सा रहस्य, दिव्य प्रकाशन- 2004

4. अरुण कुमार साव और डॉ अखिलेश्वर साव, योग चिकित्सा (सिद्धांत व व्यव्हार), चौखम्भा ओरिएन्टलिआ - 2019
5. कामाख्या कुमार, योग चिकित्सा संदर्शिका, श्री वेदमाता गायत्री ट्रस्ट, हरिद्वार - 2014
6. मनोरमा नीखरा, मानसिक समस्याएं योग एवं प्राणचिकित्सा, देव संस्कृति विश्वविद्यालय शान्तिकुञ्ज, हरिद्वार - 2017
7. एम.एम. गोरे, शरीर विज्ञान और योगाभ्यास, मोतीलाल बनारसीदास, नई दिल्ली – 2007
8. K.N. Udupa- Stress and its management by yoga, Motilal banarsidass publication, 1998
9. R. Nagarathna and Dr. H.R. Nagendra, Yoga and Health, Swami Vivekananda Yoga Prakashana - 2002
10. R. Nagarathna and Dr. H. R. Nagendra, Yoga for Promotion of Positive Health, Swami Vivekananda Yoga Prakashana-2004
11. Swami Satyananda Saraswati - Yogic Management of Common, Yoga Publication Trust, Munger, Bihar - 2002

सन्दर्भ ग्रंथ – Suggested Readings:

1. Sat Bir Singh Khalsa Principles and Practice of Yoga in Health Care, Sage Publishing-2016
2. Ganesh Shankar-Classical And Modern Approaches to Yoga, Pratibha Prakashan, New Delhi
3. R.S. Bhogal -Yoga & Mental Health & Beyond, Kaivalyadham S.M.Y.S. samiti, Lonavala, 2015
4. K.S. Joshi-Speaking Of Yoga & Nature Cure Therapy, Sterling Publishers Private Ltd

एम.एस-सी. योग- M.Sc. Yoga Fourth Semester

SIAS YOGA 1414 C 4105 - योग में अनुसंधान पद्धति और सांख्यिकी - Research Methodology and Statistics in Yoga

Objective of the Paper:

- To understand the methods of research
- To know type of research and research design

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Organize, manage and present data

- Analyze statistical data graphically using frequency distributions and cummulative frequency distributions

Unit-I अनुसन्धान परिचय - Introduction of Research

1. अनुसन्धान का अर्थ, परिभाषा, प्रकृति और प्रकार - Meaning, definition, nature and types of research
2. अनुसन्धान का संक्षिप्त इतिहास और विकास - Brief history and development of research
3. योग में अनुसन्धान की आवश्यकता और महत्व - Require and importance of research in Yoga
4. शोध समस्या- इसके अर्थ और विशेषताएं - Research problem- its meaning and characteristics
5. परिकल्पना - अर्थ, प्रकृति और प्रकार - Hypothesis - meaning, nature and types

Unit-II - अनुसन्धान के चर, प्रतिदर्श और प्रतिदर्श चयन – Research Variables, Sample and Sampling

1. चर का अर्थ और स्वरूप - Meaning and Nature of Variable
2. चर के प्रकार और चर को प्रभावित करने वाले कारक - Types of Variables and factors affecting the variables
3. प्रतिदर्श, प्रतिदर्श आकार और इसकी गणना - Sample, sample size and its calculation
4. प्रतिदर्श आकार गणना की आवश्यकता और प्रतिदर्श आकार को प्रभावित करने वाले कारक - Need of sample size calculation and factors affecting sample size
5. प्रतिदर्श चयन का अर्थ , प्रकृति और प्रकार - Meaning, Nature and Types of sampling

Unit-III - अनुसन्धान के तरीके और रूपरेखा – Research Design and methods

1. अनुसन्धान के लक्षण - Characteristics of research
2. अनुसन्धान के तरीके और उनके प्रकार (अवलोकन / प्रतिभागी अवलोकन, सर्वेक्षण, साक्षात्कार, केन्द्रित समूह, प्रयोग, माध्यमिक तथ्य विश्लेषण / अभिलेखीय अध्ययन, मिश्रित तरीके (उपरोक्त में से कुछ का संयोजन)) - Research methods and their types (Observation / Participant Observation, Surveys, Interviews, Focus Groups, Experiments, Secondary Data Analysis / Archival Study, Mixed Methods (combination of some of the above))
3. अनुसंधान रूपरेखा के लक्षण - Characteristics of research design
4. अनुसंधान रूपरेखा के प्रकार (गुणात्मक अनुसंधान रूपरेखा, मात्रात्मक अनुसंधान रूपरेखा और उनके विभाजन) - Types of Research Design (Qualitative research design, Quantitative research design and their divisions)
5. शोध प्रतिवेदन लेखन की विधि तथा शैली - Method and style of writing research report
6. शोध प्रतिवेदन लेखन - Research Report Writing

Unit-IV - सांख्यिकी और उसके अनुप्रयोग - Statistics and its application

1. अनुसंधान तथ्यों का लेखाचित्र निरूपण और पैरामीट्रिक / गैर पैरामीट्रिक परीक्षण (सहसंयोजक का

विश्लेषण, विचरण का विश्लेषण, टी-परीक्षण, काई-वर्ग) - Graphical representation of Research data and Parametric/Non-parametric tests (Analysis of covariance, Analysis of variance, t-test, Chi-square)

2. केंद्रीय प्रवृत्ति की माप : माध्य, माध्यिका और बहुलक- Measures of Central Tendency: Mean, Median and Mode
3. परिवर्तनशीलता की माप - औसत विचलन, चतुर्थक विचलन, मानक विचलन, श्रेणी और भिन्नता - Measures of Variability – Average Deviation Quartile deviation, Standard deviation, Range and Variance
4. सांख्यिकी में एक्सेल का प्रयोग – Use of Excel in statistics
5. कुछ उपयोगी सांख्यिकीय उपकरण (सामाजिक विज्ञान के लिए सांख्यिकीय पैकेज (SPSS), सांख्यिकीय कम्प्यूटिंगके लिए आर फाउंडेशन (R) , द मैथवर्क्स (MATLAB) – Some useful statistical tools (Statistical Package For The Social Sciences (SPSS), R Foundation for Statistical Computing(R), The Mathworks (MATLAB))

आवश्यक पठनीय - Essential Readings:

1. एस एम शुक्ल, सांख्यिकी के मूल तत्व, साहित्य भवन प्रकाशन, आगरा – 2019
2. एस.पी.सिंह, सांख्यकी: सिद्धान्त एवं व्यवहार, एस. चंद प्रकाशन, दिल्ली – 1978
3. Bell, J. Doing Your Research Project: A Guide for First-time Researchers in Education and Social Science, Viva Books, New Delhi- 1997
4. Bulmer, M.C., Sociological Research Methods: An Introduction, Macmillan, Hong Kong - 1984
5. Festinger L. and Katz, D. (ed.), Research Methods in the Behavioral Sciences, Amerind Publishing, New Delhi - 1977

सन्दर्भ ग्रंथ – Suggested Readings:

1. Holloway, I, Basic Concepts of Qualitative Research, Blackwell Science, London -1997

Jain, G., Research Methodology: Methods and Techniques, Mangal Deep, Jaipur – 1998

SIAS YOGA 1415 C 00126- यौगिक अभ्यास-4 और प्राकृतिक चिकित्सा, Yoga Practical -4 and Naturopathy

Objective of the Paper:

- To learn how to practice different Yogic practices
- What are the different naturopathy techniques?

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Do Yogasana practices with effective manners
- Familiar with Naturophathy practices

टिप्पणी – प्रथम सत्र, द्वितीय सत्र और तृतीय सत्र के पाठ्यक्रम में आई सभी क्रियायें, सूक्ष्म व्यायाम, आसन, प्राणायाम, मुद्रा, बन्ध व ध्यान चतुर्थ सत्र में भी सम्मिलित रहेंगे-Ṣaṭkarmas (Kriyās), subtle Exercises, Postures, Prāṇāyāma, Mudrās, Bandhas and Meditation practiced in the first semester, second semester and third semester shall also be included in the syllabus of the fourth semester.

यौगिक क्रियाओं का क्रमिक अभ्यास - Sequence of Yoga Practices

15. **षट्कर्म - Ṣaṭkarmas:** गजकरणी (कुञ्जल), जलनेति, सूत्रनेति, वस्त्रधौति, अग्निसार, वातक्रम, व्युत्क्रम और शीतक्रम-कपालभाति **-** Gajakaraṇī (Kuñjala), Jalaneti, Sūtraneti, Vastradhauti, Agnisāra, Vātakrama, Vyutkram and Shitkram-Kapālabhāti
16. **सूक्ष्म-व्यायाम - Subtle Exercise:** स्वामी धीरेन्द्र ब्रह्मचारी कृत 'सूक्ष्म व्यायाम' से सभी अड़तालीस क्रियाएँ और स्थूल व्यायाम – All forty-eight exercises and Sthool Vyayam from the Book - 'Sūkṣma Vyāyāma' of Swami Dhirendra Brahmachari
17. **सूर्य-नमस्कार (संबद्ध मन्त्रोच्चारण-पूर्वक) - Sūrya-Namaskāra** (Along recitation of concerned mantras)
18. **आसन - Āsanas:** अर्धबद्धपद्मोत्तानासन, अर्धचंद्रासन, अर्धपद्महलासना, अर्धपद्मपद्मोत्तानासन, अष्टांगनमस्कार, अष्टावक्रासन, बकध्यानासन, बकासन, भूनमनासन, भूमिपाद मस्तकासन, ब्रह्मचर्यासना, धनुराकर्षणासना, डोलासन, द्रुतउत्कटासन, द्रुतहलासना, द्वयहस्तभुजंगासन, द्वयजानुनमन, द्वयपादकंधारसाना, द्वयपादशीर्षासन, द्विकोणासन, गर्भपिण्डासन, गत्यात्मकमेरुवक्रासन, गोरक्षासन, हनुमानासन, ज्येष्ठिकासन, कंधरासन, कपिलासन, कश्यपासन, लोलासन, मत्स्यक्रीड़ासन, मयूरासन, मेरुदण्डासन, मेरुपृष्ठासन, नटराजासन, निरालाम्ब-पश्चिमोत्तानासन, निरालाम्बा-शीर्षासन, उर्ध्वपद्मासन, पादप्रसार-पश्चिमोत्तानासन, पदाधीरासन, पद्ममयूरासन, पद्मपार्वतासन, सैथिल्यासन, समकोणासन, सन्तुलनासना, शीर्षअंगुष्ठयोगासन, शीर्षपादभूमिसर्पासन, स्कन्धचक्र, स्तम्भन-आसन, तोलांगुलासन, उत्थितहस्त-मेरुदण्डासन, वशिष्ठासन, वातायन आसन, विश्वामित्रासन, वृश्चिकासन Ardha-Baddha-Padmottanasana, Ardha-Chandrasana, Ardha-Padma-Halasana, Ardha-Padma-Padmottanasana, Ashtanga-Namaskara, Astavakrasana, Baka-Dhyanasana, Bakasana, Bhu-Namanasana, Bhumi-Pada-Mastakasana, Brahmacharyasana, Dhanurakarshanasana, Dolasana, Druta-Utkatasana, Druta-Halasana, Dwi-Hasta-

Bhujangasana, Dwi-Janu-Naman, Dwi-Pada-Kandharasana, Dwi-Pada-Sirasana, Dwikonasana, Garbha-Pindasana, Gatyatmak-Meru-Vakrasana, Gorakshasana, Hanumanasana, Jyestikasana, Kandharasana, Kapali-Asana, Kashyapasana, Lolasana, Matsya-Kridasana, Mayurasana, Merudandasana, Meru Prishthasana, Natarajasana, Niralamba-Paschimottanasana, Niralamba Sirshasana, Oordhwa Padmasana, Pada-Prasar-Paschimottanasana, Padadhirasana, Padma-Mayurasana Padma-Parvatasana, Saithalyasana, Samakonasana, Santolanasana, Sirsha-Angustha-Yogasana, Sirshapada-Bhumi Sparshasana, Skandha Chakra, Stambhan Asana, Tolangulasana, Utthita-Hasta-Merudandasana, Vashishthasana, Vatayanasana, Vishwamitrasana, Vrischikasana.

19. **प्राणायाम - Prāṇāyāma:** बाह्यवृत्ति, अभ्यान्तरवृत्ति , स्तम्भवृत्ति प्राणायाम - Bahyavritti, Abhyantarvritti, Stambhavritti Pranayama
20. **मुद्रा व बन्ध - Mudrā and Bandha**: अश्विनीमुद्रा, महामुद्रा ,महाबन्ध ,महावेधमुद्रा, उड्डियानबन्ध, मूलबन्ध, जालन्धरबन्ध, विपरीतकरणी, तड़ागी, काकी व शाम्भवी - Aśvinimudrā, Mahāmudrā, Mahābandha, Mahāvedhamudrā, Uḍḍiyānabandha, Mūlabandha, Jālandharabandha, Viparītakaraṇī, Taḍāgī, Kākī and Śāmbhavī
21. **ध्यान - Meditation:** चक्रीय ध्यान, भावातीत ध्यान - Cyclic Meditation, Transcendental Meditation
22. **प्राकृतिक चिकित्सा- Naturopathy**
    - (i) आहार चिकित्सा -- Diet Therapy
    - (ii) उपवास चिकित्सा - Fasting Therapy
    - (iii) अभ्यंग चिकित्सा - Masso Therapy
    - (iv) वायु चिकित्सा - Air Therapy
    - (v) सूर्य चिकित्सा – Sun Therapy
    - (vi) जल चिकित्सा – Hydortherapy
    - (vii) मृदा चिकित्सा - Mud Therapy

आवश्यक पठनीय - Essential Readings:

1. स्वामी धीरेन्द्र ब्रह्मचारी, सूक्ष्म व्यायाम, मोरारजी देसाई नेशनल ईन्स्टिट्यूट ऑव योग, नई दिल्ली
2. स्वामी सत्यानन्द सरस्वती, आसन-प्राणायाम-मुद्रा-बन्ध, योग पब्लिकेशन्स ट्रस्ट, मुंगेर, बिहार-2006
3. पं. श्रीराम शर्मा, प्रज्ञा अभियान का योग व्यायाम, ब्रह्मवर्चस् शोध संस्थान, शान्तिकुञ्ज, हरिद्वार-1998
4. नागेंद्र कुमार नीरज, मेरा आहार मेरा स्वास्थ्य, पॉपुलर बुक डिपो, नई दिल्ली – 2012
5. नागेंद्र कुमार नीरज, जल चिकित्सा, पॉपुलर बुक डिपो, नई दिल्ली – 2018
6. पी.डी. मिश्रा, प्राकृतिक चिकित्सा: सिद्धान्त एवं व्यवहार, उत्तर प्रदेश हिन्दी संस्थान - 2012

7. गणेश नारायण चौहान, भोजन के द्वारा चिकित्सा -1,पॉपुलर बुक डिपो, नई दिल्ली – 2012
8. राकेश जिन्दल, प्राकृतिक आयुर्विज्ञान, आयोग्य सेवा प्रकाशन - 2019
9. O.P. Tiwari - Asana why and how, Kaivalyadham SMYM Samiti, Lonavala-2012
10. M.L. Gharote - Guidelines for Yogic Practices, Medha Publication, Lonavala
11. Swami Satyananda Saraswati - Asan, Pranayama, Mudra, Bandha, Yoga publcation trust, Munger, 2006.
12. Stewart Mitchell, Naturopathy, Vermillion; New Ed edition, London -2001
13. Krishan Kumar Suman, Naturopathy Modern Way of Life, Lotus Press, Delhi - 2010

सन्दर्भ ग्रंथ - Suggested Readings:

1. B.K.S. Iyengar - Light on Yoga, Harper Collins Publisher, New Delhi-2012
2. B.K.S. Iyengar - Light on Pranayama, Harper Collins Publisher, New Delhi-2012
3. Swami Kuvlayanand - Asana, Kaivalyadham SMYM Samiti, Lonavala-1993

SIAS YOGA 1401 DCEC 4105 - व्यावहारिक मनोविज्ञान और योग – Applied Psychology and Yoga

Objective of the Paper:

- To know about Psychology and their application
- To understand the role of mind in human behavior

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- To know their mind and emotions
- Handle stressful situations and manage their emotions

Unit-I सामान्य मनोविज्ञान का परिचय - Introduction of General Psychology

1. मनोविज्ञान की उत्पत्ति और परिभाषा – Etymology and definition of Psychology
2. मनोविज्ञान का इतिहास – History of Psychology
3. मनोविज्ञान का स्वरूप एवं कार्यक्षेत्र की सीमाएं – Nature and scope of Psychology
4. मनोविज्ञान अध्ययन के लाभ – Benefits of Psychology-education

Unit-II - व्यावहारिक मनोविज्ञान - Applied Psychology

1. व्यावहारिक मनोविज्ञान का इतिहास- History of Applied Psychology

2. मानसिक स्वास्थ्य एवं चिकित्सा - Mental health and Therapy
3. व्यावहारिक मनोविज्ञान की शाखाएँ - Branches of Applied Psychology
4. मानसिक उलझनों और निराशाओं के कारण और परिणाम - Causes and Consequences of Mental Conflicts and Frustrations
5. सामान्य मानसिक विकारों का परिचय (अनिद्रा, अवसाद, तनाव, चिंता विकार) - Introduction to Common mental disorders (Insomnia, Depression, Stress, Anxiety disorders)

Unit-III - विचार के प्रमुख संकाय - Major schools of thought

1. मनोविज्ञान का जैविक आधार - Biological base of Psychology
2. मनोविज्ञान का व्यवहारिक दृष्टिकोण और व्यक्तित्व - Behavioral approach of Psychology and Personality
3. मनोविज्ञान का संज्ञानात्मक दृष्टिकोण (संवेदन, धारणा, ध्यान, स्मृति, सीखना) – Cognitive approach of Psychology (Sensation, Perception, Attention, Memory, Learning)
4. मनोविज्ञान का सामाजिक दृष्टिकोण – Social approach of Psychology

Unit-IV - मानसिक स्वास्थ्य और योग - Mental Health and Yoga

1. मानसिक स्वास्थ्य की आधुनिक और पारम्परिक परिभाषा - Modern and traditional definition of mental health
2. पातञ्जल-योग-सूत्र में मानसिक स्वास्थ्य - Mental health in Patanjal-Yoga-Sutra
3. श्रीमदभगवतगीता में मानसिक स्वास्थ्य - Mental health in Shrimadbhagavadgītā
4. मानसिक स्वास्थ्य हेतु योगिक अभ्यास - Yogic practice for mental health

आवश्यक पठनीय - Essential Readings:

1. शान्ति प्रकाश अत्रेय, योग मनोविज्ञान, दि इंटरनेशनल स्टैंडरड पब्लिकेशन, वाराणसी – 1961
2. सुरेश लाल बर्णवाल, योग और मानसिक स्वास्थ्य, न्यू भारती बुक कॉर्पोरेशन, दिल्ली - 2002
3. अरुण कुमार सिंह, आधुनिक सामान्य मनोविज्ञान, मोतीलाल बनारसीदास, नई दिल्ली - 2017
4. मोहम्मद सुलेमान, संगठनात्मक मनोविज्ञान, मोतीलाल बनारसीदास, नई दिल्ली - 2016
5. मोहम्मद सुलेमान, सामान्य मनोविज्ञान: मूल क्रियाएँ एवं संज्ञानात्मक प्रक्रियाएँ, मोतीलाल बनारसीदास, नई दिल्ली – 2015
6. कमलाकर मिश्र, मैत्रीभावना : मानसिक स्वास्थ्य एवं सुखी जीवन का चामत्कारिक योग, काशी योग एवं मूल्य शिक्षा संस्था, वाराणसी, 2009.
7. सुभाष विद्यालंकार, योग एवं मानसिक स्वास्थ्य, ज्ञान भारती पब्लिकेशन-2019
8. Jadunath Sinha, Indian Psychology, Motilal Banarsidass Publication, 2008.
9. Kamakhya Kumar, Yoga Psychology : Handbook of Yogic Psychotherapy, D.K. Print world, New Delhi, 2013.

सन्दर्भ ग्रंथ – Suggested Readings:

1. Psychology (5th Edi.): Carole Wade & Carol Tavris, Logman / Addison-Wesley Educational Publications Inc. Us.-1998.
2. Nicholas Procter - Mental Health: A Person-centred Approach, Cambridge University Press; 2 edition, 2017
3. David R. Hamilton,How Your Mind Can Heal Your Body, Hay House UK (September 11, 2018)

SIAS YOGA 1402 DCEC 4105 - प्राकृतिक चिकित्सा और प्राकृतिक आहार विज्ञान के सिद्धांत - Principles of Naturopathy and Natural Dietetics

Objective of the Paper:

- To know how does Naturopathy workes
- To provide knowledge about theraputic effect of Naturopathy

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Know about hydrotherapy
- Know about mud therapy

Unit-I - प्राकृतिक चिकित्सा का सामान्य परिचय – General Introduction of Naturopathy

1. प्राकृतिक चिकित्सा का अर्थ और परिभाषा - Meaning and definition of Naturopathy
2. प्राकृतिक चिकित्सा का संक्षिप्त इतिहास - Brief history of Naturopathy
3. प्राकृतिक चिकित्सा का महत्व - Importance of Naturopathy
4. प्राकृतिक चिकित्सा के मूल सिद्धान्त - Basic principles of Naturopathy
5. रोग का मूल कारण, रोगों की जीर्ण और तीव्र अवस्था - Root cause of disease, Chronic and acute states of diseases
6. विजातीय विषाक्तता का सिद्धान्त, उभार का सिद्धान्त - Principle of foreign poisoning matter, Aggregative principles

Unit-II - जल चिकित्सा – Hydrotherapy

1. जल चिकित्सा और पानी के गुणों का महत्व - Importance of water therapy and properties of water
2. जल चिकित्सा के सिद्धांत और पानी के उपयोग के तरीके - पानी का सेवन - Principles of Water therapy and techniques of water use - Water-intake
3. मानव शरीर पर विभिन्न तापमान के पानी का प्रभाव - Effects of water of different temperature on

human body

4. विभिन्न प्रकार के स्नान - प्राकृतिक स्नान, सरल और घर्षण स्नान, मेरुदण्ड स्नान, मेहन स्नान, भाप स्नान, कटि स्नान, गर्म पानी से पैर स्नान - Different type of bath - Natural bath, Simple and Frictional bath, Spinal bath, Mehan bath, Steam bath, Trunk bath, hotfoot bath
5. विभिन्न प्रकार की पट्टी - पूरे शरीर का गीला आवरण, छाती, पेट, गर्दन, हाथ और पैर की पट्टी - Different type of Wraps – Wet wrap of whole body, bandage of chest, stomach, neck, hand and foot
6. स्पंजी और एनीमा - Sponging and Enema

Unit-III - विभिन्न तत्वों से चिकित्सा – Therapy from different elements

1. मिट्टी चिकित्सा - मिट्टी के प्रकार और विशेषताएं, शरीर पर मिट्टी के प्रभाव - Mud Therapy - Mud types and characteristics, effects of mud on body
2. मिट्टी की पट्टी और मिट्टी स्नान - Mud packs and Mud-bath
3. सूर्य-किरणों का महत्व, मानव शरीर पर सूर्य-किरणों की क्रिया-प्रतिक्रियाएँ - Importance of Sun-rays, action-reactions of Sun-rays on human body
4. सूर्य स्नान और विभिन्न रंगों के उपयोग - Sun-bath and uses of various colours
5. वायु का महत्व, वायु का स्वास्थ्य पर प्रभाव, वायु-स्नान - Importance of Air, health effects of Air, Air-bath

Unit-IV – – Aakash and Diet Therapy

1. आहार चिकित्सा परिचय, विधि एवं लाभ- Introduction of diet therapy, method and benefits
2. उपवास - इसके सिद्धांत और शारीरिक प्रभाव - Fasting - Its principles and physiological effects
3. उपवास के नियम और उपवास के प्रकार – Rules of fasting and types of fasting
4. स्वास्थ्य और रोगों पर उपवास का प्रभाव – Impact of fasting on health and diseases
5. उपवास के विभिन्न तरीके - जल, रस, फल, एक आहार – Different modes of fasting - Water, Juice, Fruit, One Diet
6. विभिन्न प्रकार के आहार - आदर्श आहार, प्राकृतिक आहार, उपचार के लिए उचित आहार – Different types of diet - Ideal diet, Natural diet, Proper diet for treatment
7. आदर्श आहार और संतुलित आहार में अंतर – Difference between ideal diet and balanced diet

आवश्यक पठनीय - Essential Readings:

1. Henry Lindlahr, Nature Cure Philosophy and Practice Based on the Unity of Disease and Cure, Nabu Press, Charleston, South Carolina -2014
2. नागेंद्र कुमार नीरज, मेरा आहार मेरा स्वास्थ्य, पॉपुलर बुक डिपो, नई दिल्ली – 2012
3. नागेंद्र कुमार नीरज, जल चिकित्सा, पॉपुलर बुक डिपो, नई दिल्ली – 2018
4. पी.डी. मिश्रा, प्राकृतिक चिकित्सा: सिद्धान्त एवं व्यवहार, उत्तर प्रदेश हिन्दी संस्थान - 2012
5. गणेश नारायण चौहान, भोजन के द्वारा चिकित्सा -1,पॉपुलर बुक डिपो, नई दिल्ली – 2012
6. राकेश जिन्दल, प्राकृतिक आयुर्विज्ञान, आयोग्य सेवा प्रकाशन - 2019

सन्दर्भ ग्रंथ - Suggested Readings:

5. Edwin D Babbitt, Human culture and cure, in 6 parts, College of Fine Forces; 2nd edition-1887
6. John Harvey Kellogg, Art of Massage, Tech Services, Inc, United States - 1997
7. Rudolph M. Ballentine, Diet and Nutrition: A Holistic Approach, Himalayan Institute Press, Honesdale - 2005

SIAS YOGA 1403 DCEC 4105 – आयुर्वेदिक्, स्वस्थवृत्त और आहार - Āyurvedic Svasthavṛtta and Diet

Objective of the Paper:

- To understand the concept of Svasthavṛtta
- To know about Ahar and Mitahar

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Know Ayurvedic concept of heath
- Use the teachings of daily regimen and night regimen in his/her life

Unit-I – आयुर्वेद का परिचय- Introduction of Āyurveda

1. आयुर्वेद का अर्थ एवं परिभाषा - Meaning and definition of Āyurveda
2. आयुर्वेद का इतिहास -History of Āyurveda
3. आयुर्वेद का उद्देश्य - Purpose of Āyurveda
4. आयुर्वेदिक् चिकित्सा के लाभ - Benefits of Āyurvedic therapy
5. आयु की अवधारणा - Concept of Āyu

Unit-II - स्वस्थवृत्त का परिचय - Introduction of Svasthavṛtta

1. स्वस्थवृत्त का सामान्य परिचय - General introduction of Svasthavṛtta
2. त्रिदोषों की अवधारणा - Concept of Tridosha
3. स्वस्थवृत्त और ऋतुचर्या - Svasthavṛtta and Seasonal regimen
4. दिनचर्या और रात्रिचर्या - Day and Night regimen
5. स्वास्थ्य में स्वस्थवृत्त की भूमिका - Role of Svasthavṛtta in health

Unit-III - समग्र स्वास्थ्य और आहार - Holistic health and Diet

1. आहार और पोषण की अवधारणा - Concept of Diet and Nutrition

2. स्थूल पोषक तत्त्व और उनकी आवश्यकता - Macronutrients and their utility
3. सूक्ष्म पोषक तत्त्व और उनकी आवश्यकता - Micronutrients and their utility
4. पोषक तत्वों के स्रोत - Sources of nutrients
5. आहार का स्वास्थ्य पर प्रभाव - Impact of Diet on health

Unit- IV - यौगिक आहार - Yogic Diet

1. मिताहार की अवधारणा - Concept of Mitahara
2. पारंपरिक योग ग्रंथों के अनुसार यौगिक आहार का वर्गीकरण - Classification in Yogic diet according to traditional Yoga texts
3. शरीर की प्रकृति के अनुसार आहार - Diet according to the body constitution
4. योग साधना में योग आहार का महत्व और स्वस्थ जीवन में इसकी भूमिका - Importance of Yogic Diet in Yog Sadhana and its role in healthy living

आवश्यक पठनीय - Essential Readings:

1. ब्रह्मानंद त्रिपाठी, श्रीमद्भगवत् अष्टांगहृदयम्, चौखम्बा पब्लिशर्स, वाराणसी – 2015
2. शैलजा श्रीवास्तव, अष्टांग हृदयम (सूत्रस्थान) एवम आयुर्वेद के मूलभूत सिद्धान्त, चौखम्बा ओरिएंटल पब्लिशर्स, वाराणसी – 2017
3. विनोद वर्मा, पतंजलि और आयुर्वेदिक योग, राजकमल प्रकाशन – 2000
4. नागेंद्र कुमार नीरज, मेरा आहार मेरा स्वास्थ्य, पॉपुलर बुक डिपो, नई दिल्ली – 2012
5. सर्वेश कुमार अग्रवाल, स्वस्थवृत्त विज्ञान, चौखम्बा ओरिएंटल पब्लिशर्स, वाराणसी – 2018
6. अनीता सिंह, सम्पूर्ण आहार एवम पोषण विज्ञान, स्टार पब्लिकेशन, आगरा -2016
7. Nagendra Kumar Neeraj, Miracles of Naturopathy, Popular Book Depot – 2004

सन्दर्भ ग्रन्थ - Suggested Readings:

1. पंडित श्रीराम शर्मा आचार्य जी, जीवेम शरदः शतम, युग निर्माण योजना, मथुरा - 2004
2. David Frawley, Yoga and Ayurveda: Self-Healing and Self-Realization, Motilal Banarsidass New Delhi- 2013
3. Sunetra Roday, Food Science and Nutrition, Oxford University Press, 2018

SIAS YOGA 1404 DCEC 4105 योग पर परियोजना, संगोष्ठी, कार्यशाला Project, Seminar, Workshop on Yoga

Objective of the Paper:

- To provide practical knowledge of Yoga research
- To familiar with working environment of research

Outcome of the Paper: Upon successful completion of this course, students will be able to:

- Write a project for research
- Present their research papers in seminars

प्रत्येक छात्र को निम्नलिखित काम सौंपा जाएगा और दिए गए समय में पूरा करना होगा - Every student will be assigned the following work and has to be completed in the given time

1. योग से जुड़ी एक परियोजना-A Project related to Yoga
2. पावर प्रेजेंटेशन के माध्यम से एक सेमिनार - A seminar through Power Presentation
3. योग के किसी भी विषय पर कार्यशाला - Workshop on any Aspect of Yoga

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Annexure-XVI

CENTRAL UNIVERSITY OF HARYANA

Department of Tourism & Hotel Management

Ph. D. (Tourism & Hotel Management) Course Work

(w.e.f. 2020-21)

SBMS THM 03 01 01 C 2002: Research Publication and Ethics
SBMS THM 03 01 02 C 6006: Research Methodology in Tourism & Hotel Management
SBMS THM 03 01 03 C 6006: Interdisciplinary Approaches in Tourism & Hotel Management

Course Scheme of Ph.D. (Tourism & Hotel Management)

Sr. No	Course Work	Code	Credits
1	Research Publication and Ethics	SBMS THM 03 01 01 C 2002	2
2	Research Methodology in Tourism & Hotel Management	SBMS THM 03 01 02 C 6006	6
3	Interdisciplinary Approaches in Tourism & Hotel Management	SBMS THM 03 01 03 C 6006	6

RESEARCH PUBLICATION AND ETHICS

SBMS THM 03 01 01 C 2002

Credit: 2

Unit 1: Philosophy and Ethics

- Introduction to Philosophy: definition, nature and scope, concept and branches
- Ethics: definition, moral philosophy, nature of moral judgments and reactions

Unit 2: Scientific Conduct

- Ethics with respect to science and research
- Intellectual honesty and research integrity
- Scientific misconducts: Falsification, Fabrication, and Plagiarism(FFP)
- Redundant publications: duplicate and overlapping publications, salami slicing
- Selective reporting and misrepresentation of data

Unit 3: Publication Ethics

- Publication Ethics: Definition, introduction and importance
- Best practices/standards setting initiatives and guidelines: COPE, WAME, etc.
- Conflicts of interest
- Publication misconduct: Definition, concept, problems that lead to unethical behavior and vice versa, types
- Violation of publication ethics, authorship and contributor ship
- Identification of publication misconduct, complaints and appeals
- Predatory publishers and journals

PRACTICE

Open Access Publishing

- Open access publications and initiatives
- SHERPA/RoMEO online resource to check publisher copyright &self-archiving policies.
- Software tool to identify predatory publications developed by SPPU
- Journal finder/journal suggestion tools viz.JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

Publication Misconduct

A. Group Discussions

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

B. Software Tools

Use of plagiarism software like Turnitin, Urkund and other open source software tools

Databases and Research Metrics

A. Databases

- Indexing databases
- Citation databases: Web of Science, Scopus, etc.

B.Research Metrics

- Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite
- Score
- Metrics: h-index,g index,il0 index, altmetrics

Suggested Readings:

1. Alderson, Priscilla and Viginia Morrow. *The Ethics of Research with Children and Young People: A Practical Handbook*. 2nd ed. Sage Publications, 2011.
2. Altinay L &Paraskevas A, *Planning &Research in Hospitality and Tourism* (Butterworth- Heinemann), 2008.
3. Barbara H. Stanley, Joan E. Sieber, Gary B. Melton, *Research Ethics: A Psychological Approach*, University of Nebraska Press, Lincoln, NE, 1996
4. Brotherton, B., *Researching Hospitality and Tourism: A Student Guide* (Sage Publications), 2008
5. Comstock, Gary. Research Ethics: *A Philosophical Guide to the Responsible Conduct of Research.* New York: Cambridge University Press, 2013.
6. Danis, Marion, Emily Largent, Christine Grady, and David Wendler. *Research Ethics Consultation: A Casebook*. New York: Oxford University Press, 2012.
7. Kitchener, K.: *Foundations of Ethical Practice, Research, and Teaching in Psychology*, Lawrence Erlbaum Associates, Mahwah, NJ, 2000.
8. Kodish, Eric. *Ethics and Research with Children: A Case-Based Approach*. New York: Oxford University Press, 2005.
9. Oliver, P. *The Student's Guide to Research Ethics*, Open University Press, Philadelphia, 2003
10. Ross, Lainie Friedman. *Children in Medical Research: Access versus Protection*. New York: Oxford University Press, 2008.
11. Shamoo, A &Resnik, D. *Responsible Conduct of Research*, Oxford University Press, New York, 2003
12. Smith, S., *Practical Tourism Research* (CABI), 2010
13. Todorovich, M., Kurtz, P. & Hook, S. *The Ethics of Teaching and Scientific Research* Prometheus Books, Buffalo, NY, 1977
14. Wendler, David S. *The Ethics of Pediatric Research*. New York: Oxford University Press, 2010.

RESEARCH METHODOLOGY INTOURISM & HOTEL MANAGEMENT

SBMS THM 03 01 02 C 6006

Credits: 6

UNIT 1: Tourism & Hospitality Research: Research- meaning and definition; objectives and importance of research; types of research and process of research. Research problem and formulation of hypothesis in Tourism & Hospitality; process of problem identification and defining the research problem. Concept and types of hypothesis; formulating suitable hypothesis and testing of hypothesis; research design in Tourism & Hospitality; classification of research designs and selecting appropriate design

UNIT II: Sampling Design: Sample V/s Population; importance of sampling; different methods of sampling; sampling decisions; concept of sampling errors; sources and collection of data; attitude measurement and scaling techniques; types of data and their suitability; survey method of data collection; questionnaire and its construction; interview method of data collection and observation method.

UNITIII: Data Presentation and Analysis: Editing, coding and tabulation of data; preliminary descriptive analysis; measures of central tendency and dispersion; correlation and regression analysis. Analysis and interpretation in Tourism & Hospitality research; hypothesis testing, Chi-square test, T-test and ANOVA; major techniques of multivariate analysis – Factor Analysis, Cluster analysis, Discriminate analysis, MDS techniques and Conjoint analysis.

UNITIV: Research Report Writing (Thesis writing): Components of research report – prefatory items, introduction, review of literature, methodology, presentation of statistics- tables, graphs etc., findings, appendices, bibliography, etc.

Suggested Readings:

1. Anderson, Sweeney and Williams. *Statistic for Business and Economics*, Thomson Learning, 2016.
2. Churchill, Gilbert A: *Basic Marketing Research*, Dryden Press, Boston,2011.
3. Cooper, D. R. & Schindler, P. S., *Business Research Methods*. New York: McGraw-Hill, 2008.
4. Dogan Gursoy, *Handbook of Scales in Tourism and Hospitality Research*,cabi.org,2015
5. Hein, L.W. *Quantitative Approach to Managerial Decisions*, Prentice Hall, New Jersy.
6. Hsu, Cathy H.C. and William C Gartner, eds. *The Routledge Handbook of Tourism Research*, 2012.
7. Huck, S. W., Beavers, A.S. & Esquivel, S., Sample. In N. J. Salkind (Ed.), *Encyclopedia of Research Design*, Thousand Oaks, CA: Sage, 2010.
8. John W. Creswell, J. David Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, SAGE Publications, 2017
9. Jerome Frieman, Donald A. Saucier, Stuart S. Miller,*Principles & Methods of Statistical Analysis*, SAGE Publications, 2017
10. Levin, Richard I and David S Rubin: *Statistics for Management*, Prentice Hall, Delhi.
11. O'Leary, Z., *The Essential Guide to Doing Your Research Project*. New Delhi: Sage, 2017
12. Saunders, M. N. K., Lewis, P., & Thornhill, A., *Research Methods for Business Students (6th ed.)*. Harlow, England: Pearson Education, 2012.

COURSE III: INTERDISCIPLINARY APPROACHES IN TOURISM &HOTEL MANAGEMENT

SBMS THM 03 01 03 C 6006

Credits: 6

PART I

UNIT1: Emerging Trends in Tourism
- Understanding the New Trends in Tourism
- New forms of Tourism- Eco, Responsible, Heritage and E-tourism
- Contemporary Issues in development of Tourism

UNIT 2: Sustainable Tourism Development
- Sustainable Tourism Development: background and concept, dimensions of sustainability
- Benefit and issues of sustainable tourism
- Sustainable Tourism Planning; Principles of STP and Sustainable Designing

UNIT 3: Marketing in Hospitality & Tourism
- Marketing of Products and Services in Hospitality & Tourism
- Contemporary Trends in Marketing, Challenges and Opportunities
- Branding & Case Studies of Incredible India, ITDC, Oberoi Group of Hotels, Taj Group of Hotels, ITC Hotels, and Haryana Tourism Development Corporation

PART II
(Any ONE UNIT from the following)

UNIT 1: Emerging Trends in Hospitality
- Understanding the New Trends in Hospitality
- New Forms of Hotels and Accommodation
- Contemporary Issues in Hospitality Operations

UNIT 2: Operations & Management in Hotels
- Front Office Operations : Role, Scope & Challenges
- Housekeeping Operations : Tasks, Functions &Challenges
- Food Production and Food & Beverage Services: Role, Scope & Challenges

UNIT 3: Economics and Tourism
- Relation between Economic Development and Tourism
- Multiplier Effect and Leakages
- Role of UNWTO, WTTC, IATA, MOT of India in Promotion of Destinations

UNIT 4: Sociological Impacts of Tourism
- Impact of Tourism on Society
- Guest Host Relationship Models
- Socio-cultural Impact Assessments

UNIT 5: Health and Medical Tourism
- Introduction of Health and Medical Tourism and its Future
- International Hospital Accreditation Systems and their Requirements
- Contemporary Issues in Indian Medical Tourism

UNIT 6: ICT Application in Hospitality & Tourism

- Computer Applications: Introduction, Application of MS and Hospitality/Tourism related Software
- Internet Applications in Hospitality & Tourism

Suggested Readings:

1. A. Pizam, *International Encyclopedia of Hospitality Management, ed. Elsevier, 2005*
2. Bhatia, A. K., *Tourism development: Principles, Practices and Philosophies*, Sterling Publishers, New Delhi.2002
3. Chaudhary, M.,*Tourism Marketing*, Oxford Publication 2010
4. Dhiman, M.C., *Opportunities and Challenges for Tourism and Hospitality in the BRIC Nations*, IGI Global, USA, 2016.
5. Dhiman, M.C., Chauhan, V., *International Travel Agency and Tour Operation Management*, IGI Global, USA, 2019.
6. Dixit, S., *Tourism Management*, APH Publishing, 2013
7. Kumar, S; Dhiman, M.C.; Dahiya, A., in "International Tourism and Hospitality in the Digital Age", *IGI Global*, USA, 2015.
8. McIntosh, Robert, W. Goldner, Charles, *Tourism: Principles, Practices and Philosophies*, John Wiley and Sons Inc. New York, 1990 (9th edition)
9. Mill, Robert Christie and Alastair M. Morrison, *The Tourism System* 1988
10. Negi, J.M.S., *Tourism and Travel- Concepts and principles*, Gitanjali Publishing House, New Delhi, 1990
11. Nyheim, P., McFadden, F., Connolly, D., *Technology Strategies for the Hospitality Industry*, Pearson-Prentice Hall, New Jersey, 2005.
12. Roy C Wood,*Key Concepts in Hospitality Management*, SAGE, 2013
13. Sarngadharan. M., *Health Tourism in India*, Indiana, New Delhi, 2009.
14. V. R. Collins, *The Tourism Society's Dictionary for Tourism Industry*, ed. CABI, 2008

CENTRAL UNIVERSITY OF HARYANA
SCHOOL OF BASIC SCIENCES
DEPARTMENT OF CHEMISTRY

Ph.D. (Chemistry) Course Work Syllabus

(Total Credits: 14)

Sl. No.	Course code	Course type	Course title	Credits
1	SBS CH 030101 C 5026	Core	Research Methodology and Computer Applications for Chemistry	6
2	SBS CH 030102 C 2002	Core	Research and Publication Ethics	2
Any one of the following				
3	SBS CH 030104 E 5026	Elective	Medicinal Chemistry	6
4	SBS CH 030105 E 5026	Elective	Spectroscopic Techniques for Chemists	6
5	SBS CH 030106 E 5026	Elective	Chemistry of toxicity and detoxification	6
Total Credits				**14**

CORE COURSE

Course Name - Research Methodology

Course Code - SBS CH 030101 C 5026

Credits: 6

Course Objective and Learning Outcomes:

Guiding philosophy of knowledge creation and dissemination will be discussed in this course. Features of various approaches to research, data collection, analysis and inference will be taught. Principles of formulating research problems, designing experiments and documentation will form a major part of the course. Specific objectives and techniques of chemical sciences research will also be presented. At the end of the course the students are expected to identify, design and plan research problems, prepare research proposals and contemplate publications and reports when presented with data.

UNIT I: METHODS AND TYPES OF RESEARCH

Research methods vs Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Research proposals-design and components.

UNIT II: LITERATURE REVIEW

Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Literature review – Primary and secondary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis.

UNIT-III: SCIENTIFIC SOFTWARES IN RESEARCH DESIGN AND METHODS AS APPLIED

Data Analysis using Tools like MS Excel, ChemDraw and MATLAB

Digital Methods and Web Search: Internal basics, Internet protocols, pre-requisites, search engines – google scholar, chemspider, scifinder, scopus, reaxys, research gate; using advanced search techniques, web resources, e-journals, e-books, journal access, subscribing TOC alerts, hot articles, citation index – h-index and i-index; Impact factor

Experiment design- monitoring- laboratory safety- Laboratory notebook keeping- data collection-coding of samples and experiments- storage of samples- Hypothesis-testing - Generalization and Interpretation.

UNIT-IV: REPORTING, DOCUMENTATION AND PRESENTATION



Scientific Document; Organization and writing of research papers, short communications, review articles, monographs, peer reviewing, ethics in publishing, predatory journals and publishers, technical and survey reports, authored book and edited books and dissertation.
Writing of Thesis: Format of a thesis: Review of literature, formulation, writing methods, results, preparation of tables, figures, writing discussion, summary and conclusion, synopsis, references citing and listing, bibliography, acknowledgement, avoiding plagiarism, Oral presentations-visual aids

Suggested Readings:

1. A. Fink, Conducting Research Literature Reviews: From the Internet to Paper, Sage Publications, 2009.
2. M. Graziano, A.M. Anthony and M. L. Raulin, Research Methods: A Process of Inquiry, Allyn and Bacon., 2009.
3. W. M. K. Trochim, Research Methods: the concise knowledge base, Atomic Dog Publishing, 2005.
4. P. D. Leedy and J. E. Ormrod, Practical Research: Planning and Design, Prentice Hall, 2004.
5. B. L. Garg, R. Karadia, F. Agarwal and U. K. Agarwal, An introduction to Research Methodology, RBSA Publishers, 2002.
6. R. A. Day, How to Write and Publish a Scientific Paper, Cambridge University Press, 1992.
7. C. R. Kothari, Research Methodology: Methods and Techniques, New Age International, 1990.
8. S. M. Coley and C. A. Scheinberg, Proposal Writing, Sage Publications, 1990.



CORE COURSE
Course Name: Research and Publication Ethics
Course Code: CPE-RPE
Credits: 2

Course Objective and Learning Outcomes:

This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands-on-session are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (citations, h-index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

THEORY

RPE 01: PHILOSOPHY AND ETHICS (3 HRS.)

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgement and reactions

RPE 02: SCIENTIFIC CONDUCT (5 HRS.)

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

RPE 03: PUBLICATION ETHICS (7 HRS.)

1. Publication ethics: definition, introduction and importance
2. Best practices / standards setting initiatives and guidance: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types
5. Violation of publication ethics, authorship and contributorship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals



PRACTICE

RPE 04: OPEN ACCESS PUBLISHING (4 HRS.)

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving polices
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

RPE 05: PUBLICATION MISCONDUCT (4 HRS.)

A. Group Discussion (2 hrs.)

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

B. Software tools (2 hrs.)

1. Use of plagiarism software like Turnitin, Urkund and other open source software tools

RPE 06: DATABASES AND RESEARCH METRICS (7 HRS.)

A. Databases (4 hrs,)

1. Indexing databases Research Metrics
2. Citation databases: Web of Science, Scopus, etc.

B. Research Metrics (3 hrs.)

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IIP, Cite Score
2. Metrics: h index, g index, i10 index, almetrics

Suggested Readings:

1. Bird, A. (2006). *Philosophy of Science*. Routledge
2. MacIntyre, Alasdair (1967) *A Short History of Ethics*. London
3. P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN:978-9387480865
4. National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2009). On Being a Scientist: A Guide to Responsible Conduct in Research: Third Edition. National Academics Press.



5. Resnik, D. B. (2011). What is ethics in research and why is it important. National Institute of Environmental Health Sciences, 1-10. Retrived from https://www.neihs.nih.gov/research/resources/bioethics/whatis/index.cfm
6. Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489 (7415), 179-179. https://doi.org/10.1038/489179a
7. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN: 978-81-939482-1-7. http://www.insaindia.res.in/pdf/Ethics_Book.pdf



ELECTIVE COURSE

ELECTIVE COURSE

Course Name - Medicinal Chemistry
Course Code: SBS CH 030104 E 5026
Credits: 6

Course Objective and Learning Outcomes:

This course will provide a basic understanding and fundamentals of Medicinal Chemistry. At the end of this course, students will learn about the various stages involved in drug discovery & development process and challenges encounter during the course of development of new drug which finally comes into the market, various biological drug targets, drug-target binding, mode of actions of anticancer, antibiotics, psychoactive drugs and its chemical synthesis.

UNIT I: DRUG DESIGN

Introduction, Development of new drugs, Concept of lead compounds and lead modifications, structure-activity relationship (SAR), factors affecting bioactivity, resonance, inductive effect, isosterism, bio-isosterism. Theories of drug activity: occupancy theory, rate theory, induced fit theory. Quantitative structure activity relationship, Concepts of drugs receptor, Elementary treatment of drug receptor interactions, Physico-chemical parameters: lipophilicity, partition coefficient, electronic ionization constants, steric factors.

UNIT II: ANTICANCER AGENTS

Introduction, cancer chemotherapy, role of alkylating agents and antimetabolites in treatment of cancer. Synthesis of 6-mercapto purine, melphalan, mechlorethamine, cyclophosphamide and uracil, Recent development in cancer chemotherapy.

UNIT III: ANTI-INFECTIVE DRUGS

Introduction and general mode of action of antibiotic and antibacterial-, antiviral-, antifungal- and antiprotozoan drugs. Cell wall biosynthesis, inhibitors, ®-lactam rings, antibiotics inhibiting protein synthesis. Synthesis of penicillin G, amoxycillin, cephalosporin, ciprofloxacin, furazolidone, dapsone, gluconazole, chloroquine, primaquin, Introductory idea of tetracycline and streptomycin.

UNIT IV: CARDIOVASCULAR DRUGS

Introduction and general mode of action. Synthesis of ditiazem, verapamil, methyldopa and atenolol.



Suggested Readings:

1. G. L. Patrick, An Introduction to Medicinal Chemistry, 5th ed., Oxford University Press, 2013.
2. D. Sriram and P. Yogeshwari, Medicinal Chemistry, 2nd ed., Pearson, 2012.
3. R. B. Silverman, The Organic Chemistry of Drug Design and Drug Action, Academic Press, 2009.
4. Ed Robert F. Dorge. Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry, 2008.
5. Ed. M. E Wolff, Burger's Medicinal Chemistry and Drug Discovery, Vol. 1, John Wiley, 2007.
6. S. S. Pandeya and J. R. Dmmock, An Introduction to Drug Design, New Age International, 2004.

ELECTIVE COURSE

Course Name - Spectroscopic Techniques for Chemists

Course Code: SBS CH 030105 E 5026

Credits: 6

Course Objective and Learning Outcomes:

To provide the advance knowledge and understanding of organic spectroscopy. At the end of this course, students will acquire both the theoretical and application aspect of various spectroscopic techniques (UV-Visible, IR, NMR spectroscopy and mass spectrometry) to the solve problems related to structure determination of organic compounds.

UNIT I: ULTRAVIOLET AND VISIBLE SPECTROSCOPY AND MASS SPECTROMETRY

UV-Visible spectroscopy: Various electronic transitions, Beer-Lambert law, visible spectrum & colour, effect of solvent on electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyenes. Fieser-Woodward rules for conjugated dienes and carbonyl compounds, ultraviolet spectra of aromatic and heterocyclic compounds.

Mass spectrometry: Introduction, ion production–EI, CI, FD and FAB, factors affecting fragmentation, ion analysis, ion abundance. Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak, McLafferty rearrangement. Nitrogen rule. High resolution mass spectrometry (HRMS).

UNIT II: INFRARED SPECTROSCOPY

Instrumentation and sample handling. Characteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, phenols and amines. Detailed study of vibrational frequencies of carbonyl compounds (ketones, aldehydes, esters, amides, acids, anhydrides, lactones, lactams and conjugated carbonyl compounds). Effect of hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination bands and Fermi resonance.

UNIT III: NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY

General introduction and definition, theory of NMR, chemical shift, shielding and deshielding mechanism, magnetic anisotropy, chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic) and other nuclei (alcohols, phenols, enols, carboxylic acids, amines, amides & mercapto), spin-spin interaction, Spin systems, Pople notation, complex spin-spin interaction between two, three and four nuclei (first order spectra), virtual coupling. chemical exchange, effect of deuteration, Stereochemistry, hindred rotation, Karplus curve-variation of coupling constant with dihedral angle. Simplification of complex spectra, nuclear magnetic double resonance, contact shift reagents. Fourier transform technique, nuclear Overhauser effect (nOe), COSY.



UNIT IV: CARBON-13 NMR SPECTROSCOPY AND COMBINED APPLICATIONS

***Carbon-13 NMR Spectroscopy*:** General considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonyl carbon), coupling constants and DEPT ^{13}C NMR spectra. General introduction to two-dimensional NMR spectroscopy- HETCOR and NOESY. Resonance of other nuclei-F, P.

***Combined problems*:** Combined problems relating to structure elucidation by UV, IR, NMR Spectroscopy, 2D NMR and Mass Spectrometry.

Suggested Readings:

1. D. L. Pavia, G. M. Lampman, G. S. Kriz and J. R. Vyvyan, Introduction to Spectroscopy, 5th ed. Cengage India, 2015.
2. R. Kakkar, Atomic and Molecule Spectroscopy: Basic Concepts and Applications, Cambridge University Press, 2015.
3. W. Kemp, Organic Spectroscopy, Mac publishers, 3rd Ed., 2011.
4. D. H. Williams, I. Fleming, Spectroscopic Methods in Organic Chemistry, Tata McGraw-Hill, 2010.
5. J. R. Dyer, Application of Spectroscopy of Organic Compounds, Prentice Hall, 2009.
6. R. J. Abraham, J. Fisher and P. Loftus, Introduction to NMR Spectroscopy, Wiley, 2005.
7. J. Mohan, Organic Spectroscopy, Narosa Publishers, New Delhi, 2002.
8. R. M. Silverstein, G. C. Bassler and T. C. TMorrill, Spectrometric Identification of Organic Compounds, John Wiley, 1995.
9. C. N. Banwell and E. M. McCash; Fundamentals of Molecular Spectroscopy, 4th ed. Tata McGraw Hill, 1994.



ELECTIVE COURSE

Course Name - Chemistry of Toxicity and Detoxification
Course Code - SBS CH 030106 E 5026
Credits: 6

Course Objective and Learning Outcomes:

The course is designed to introduce students to the fundamental concepts of toxic and hazardous waste; provide knowledge about the identification of various toxic and hazardous waste and Cancer-Causing Chemicals. Drug Toxicity issues are introduce in terms of various surrounding parameters.

UNIT I: TOXIC PROPERTIES

Chemical Substances including ignitable, corrosive, reactive, incompatible under the following heading:

- Pathway of entry;
- detoxication
- bioactivation.
- Degradation
- Addition or conjugation reactions

Physical properties of toxic and hazardous waste

Chemical pollutant, its oxidation, hydrolysis, biodegradation, groundwater contamination, and overall persistence in the environment related to the following studies:

- Vapour pressure
- Vapour density
- Solubility.

Toxic and hazardous characteristic various organic chemicals

- Acids
- Aldehydes
- Amines
- Dioxins
- Ethers
- Cyanides

UNIT II: CANCER-CAUSING CHEMICALS

Concept of carcinogenesis, Mechanism of chemical carcinogens, Human carcinogens

Common Toxic, and Flammable Gases including*:*

Hydrogen, Carbon mono and dioxide, Nitrogen Oxide

Biochemical aspects of Arsenic, Cadmium, Lead, Mercury, Carbon monoxide

UNIT III: Hazardous Properties

Insecticides, Asbestos, Flyash, Ozone and PAN pesticides,
Chemical and Biological agents including warfare Agents, Management techniques for toxic and hazardous waste. Model assignments and practical validation.

UNIT IV: DRUG TOXICITY

Mechanism to reduce a drug toxicity; Drug-Chemical; Drug-Drug, Drug-Microbe/enzyme interaction.

Suggested Readings:

1. L. C. Batty and K. B. Hallberg, Ecology of Industrial Pollution, Cambridge University press, New Delhi, 2009.
2. Healtth Hazards of Environmental Arsenic Poisoning, Imperial College Press, 2008.
3. T. F. Yen, Chemical Processes for Environmental Engineering, Imperial College Press, 2008.
4. C. Oloman, Material and Energy Balance for Engineers and Environmentalist, Imperial College Press, 2002.
5. C. N. Madu, Environmental Planning and management, Imperial College Press, 2002.
6. P. Patnaik, A Comprehensive Guide to the Hazardous Properties of Chemical Substances (III Ed.) John Wiley & Sons, Inc., Hoboken, New Jersey.
7. H. K. Moffatt and Shuckburgh, Environmental Hazards, Imperial College Press (ISBN 978-981-4313-28-5).



CENTRAL UNIVERSITY OF HARYANA
SCHOOL OF BASIC SCIENCES
DEPARTMENT OF CHEMISTRY

Annexure-XVIII

M.Sc. Chemistry

SEMESTER-I (24-Credits)

Sl. No	Course code	Course title	L	T	P	Hrs/ week	Total Credits
CORE COURSES							
1.	SBS CH 010101 C 4004	Inorganic Chemistry-I	4	0	0	4	4
2.	SBS CH 010102 C 4004	Organic Chemistry-I	4	0	0	4	4
3.	SBS CH 010103 C 4004	Physical Chemistry-I	4	0	0	4	4
4.	SBS CH 010104 C 0042	Inorganic Chemistry Practical-I	0	0	4	4	2
	SBS CH 010105 C 0042	Organic Chemistry Practical-I	0	0	4	4	2
5.	SBS CH 010106 C 0042	Physical Chemistry Practical-I	0	0	4	4	2

DISCIPLINE CENTRIC ELECTIVE COURSES							
Sr. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Hrs /week**	**Total Credits**
1.	SBS CH 010101 DCEC 2002	Household and Applied Chemistry	2	0	0	2	2
2.	SBS CH 010102 DCEC 2002	Reaction Mechanism: Structure and Reactivity	2	0	0	2	2
3.	SBS CH 010103 DCEC 2002	Chemistry of Nutraceuticals	2	0	0	2	2

GENERIC ELECTIVE COURSES							
1.	SBS CH 010101 GEC 4004	Chemistry of Materials	4	0	0	4	4
2.	SBS CH 010102 GEC 4004	Basic Concepts in Chemistry	4	0	0	4	4
3.	SBS CH 010103 GEC 4004	Chemistry for Biologists	4	0	0	4	4



CENTRAL UNIVERSITY OF HARYANA
SCHOOL OF BASIC SCIENCES
DEPARTMENT OF CHEMISTRY

M.Sc. Chemistry

SEMESTER-II (24-Credits)

Sl. No	Course code	Course title	L	T	P	Hrs/ week	Total Credits
CORE COURSES							
1.	SBS CH 010207 C 4004	Inorganic Chemistry-II	4	0	0	4	4
2.	SBS CH 010208 C 4004	Organic Chemistry-II	4	0	0	4	4
3.	SBS CH 010209 C 4004	Physical Chemistry-II	4	0	0	4	4
4.	SBS CH 010210 C 0042	Inorganic Chemistry Practical-II	0	0	4	4	2
	SBS CH 010211 C 0042	Organic Chemistry Practical-II	0	0	4	4	2
5.	SBS CH 010212 C 0042	Physical Chemistry Practical-II	0	0	4	4	2
DISCIPLINE CENTRIC ELECTIVES COURSES							
1.	SBS CH 010204 DCEC 2002	Green and Sustainable Chemistry	2	0	0	2	2
2.	SBS CH 010205 DCEC 2002	Introduction to Nanomaterials	2	0	0	2	2
3.	SBS CH 010206 DCEC 2002	Analytical Techniques in Chemistry	2	0	0	2	2
4.	SBS CH 010207 DCEC 2002	Computational Chemistry	2	0	0	2	2
5.	SBS CH 010208 DCEC 2002	Carbohydrates: Chemistry and Applications	2	0	0	2	2
6.	SBS CH 010209 DCEC 2002	Nanoparticulate Drug-Delivery Systems	2	0	0	2	2

GENERIC ELECTIVE COURSES



1.	SBS CH 010204 GEC 4004	Environmental Chemistry	4	0	0	4	4
2.	SBS CH 010205 GEC 4004	Chemistry in Everyday Life	4	0	0	4	4
3.	SBS CH 010206 GEC 4004	Nuclear and Magnetochemistry	4	0	0	4	4



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SCHOOL OF BASIC SCIENCES
DEPARTMENT OF CHEMISTRY

M.Sc. Chemistry

SEMESTER-III (24-Credits)

Sl. No	Course code	Course title	L	T	P	Hrs/ week	Total Credits
CORE COURSES (COMPULSORY, 2X4 = 8 Credit)							
1.	SBS CH 010313 C 4004	Applications of Spectroscopy	4	0	0	4	4
2.	SBS CH 010314 C 4004	Molecular Spectroscopy	4	0	0	4	4
SPECIALISED ELECTIVES							
1.	SBS CH 010301 SE 4004	Inorganic Chemistry-III	4	0	0	4	4
2.	SBS CH 010302 SE 4004	Inorganic Chemistry-IV	4	0	0	4	4
3.	SBS CH 010303 SE 0084	Inorganic Chemistry Practical-III	0	0	8	4	4
OR							
4.	SBS CH 010304 SE 4004	Organic Chemistry-III	4	0	0	4	4
5.	SBS CH 010305 SE 4004	Organic Chemistry-IV	4	0	0	4	4
6.	SBS CH 010306 SE 0084	Organic Chemistry Practical-III	0	0	8	4	4
OR							
7.	SBS CH 010307 SE 4004	Physical Chemistry-III	4	0	0	4	4
8.	SBS CH 010308 SE 4004	Physical Chemistry-IV	4	0	0	4	4
9.	SBS CH 010309 SE 0084	Physical Chemistry Practical-III	0	0	8	4	4

DISCIPLINE CENTRIC ELECTIVE COURSES

1.	SBS CH 010310 DCEC 4004	Waste Management	4	0	0	2	4
2.	SBS CH 010311 DCEC 4004	Chemistry of Toxic Substances	4	0	0	2	4
3.	SBS CH 010312 DCEC 4004	Environmental Chemistry	4	0	0	2	4
4.	SBS CH 010313 DCEC 2002	Agrochemicals	2	0	0	2	2
5.	SBS CH 010314 DCEC 2002	Industrial Chemistry	2	0	0	2	2
6.	SBS CH 010315 DCEC 2002	Carbon Management	2	0	0	2	2
7.	SBS CH 010316 DCEC 2002	Pharmaceutical Chemistry	2	0	0	2	2
8.	SBS CH 010317 DCEC 2002	Enzymes: Chemistry and Applications	2	0	0	2	2

GENERIC ELECTIVE COURSES

1.	SBS CH 010307 GEC 4004	Green Chemistry	4	0	0	4	4
2.	SBS CH 010308 GEC 4004	Drug Design and Discovery	4	0	0	4	4



CENTRAL UNIVERSITY OF HARYANA
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DEPARTMENT OF CHEMISTRY

M.Sc. Chemistry

SEMESTER-IV (24-Credits)

Sl. No	Course code	Course title	L	T	P	Hrs/ week	Total Credits
CORE COURSES (COMPULSORY, 14 Credit)							
1.	SBS CH 010415 C 00 2814	Research Project	0	0	28	28	14
SPECIALISED ELECTIVES							
1.	SBS CH 010410 SE 4004	Inorganic Chemistry-V	4	0	0	4	4
2.	SBS CH 010411 SE 4004	Inorganic Chemistry-VI	4	0	0	4	4
OR							
3.	SBS CH 010412 SE 4004	Organic Chemistry-V	4	0	0	4	4
4.	SBS CH 010413 SE 4004	Organic Chemistry-VI	4	0	0	4	4
OR							
5.	SBS CH 010414 SE 4004	Physical Chemistry-V	4	0	0	4	4
6.	SBS CH 010415 SE 4004	Physical Chemistry-VI	4	0	0	4	4
DISCIPLINE CENTRIC ELECTIVE COURSES							
1.	SBS CH 010418 DCEC 2002	Adsorption Science and Technology	2	0	0	2	2
2.	SBS CH 010419 DCEC 2002	Asymmetric Catalysis: Fundamentals to Frontiers	2	0	0	2	2
3.	SBS CH 010420 DCEC 2002	Toxicology Lab	0	0	4	2	2
4.	SBS CH 010421 DCEC 2002	Molecules of Life	2	0	0	2	2
5.	SBS CH 010422 DCEC 2002	Molecular Magnetism	2	0	0	2	2
6.	SBS CH 010423 DCEC 2002	Analytical Chemistry	2	0	0	2	2
7.	SBS CH 010424 DCEC 2002	Antibiotic and Anti-inflammatory Agents: Chemistry and Applications	2	0	0	2	2



GENERIC ELECTIVE COURSES

1.	SBS CH 010409 GEC 4004	Materials and Nuclear Chemistry	4	0	0	4	4
2.	SBS CH 010410 GEC 4004	Medicinal Chemistry	4	0	0	4	4

SEMESTER-WISE SYLLABUS

INORGANIC CHEMISTRY COURSES



SEMESTER - I

Course Name - Inorganic Chemistry-I
Course Code - SBS CH 010101 C 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide students with basic understanding of symmetry, coordination chemistry, magnetic properties of coordination complexes, metal carbonyl/nitrosyl and metal clusters. This course will strengthen the fundamentals of inorganic chemistry, especially the coordination chemistry and would help students to appreciate color and magnetism exhibited by inorganic compounds.

UNIT I: SYMMETRY, STRUCTURE AND COORDINATE POLYMERS IN INORGANIC COMPOUNDS

Symmetry elements and symmetry operations, symmetry groups with examples from inorganic compounds, groups of very high symmetry, molecular dissymmetry and optical activity, molecular symmetry of coordination compounds, matrix representations of symmetry operators and their products. Valence bond theory, electroneutrality principle and limitations, Brief introduction of coordination polymers-1D, 2D, 3D coordination polymers and interpenetration.

UNIT II: COORDINATION COMPOUNDS

Crystal field theory, splitting of *d*-orbitals in octahedral, tetragonal, square planar and tetrahedral ligand environments. Structural consequences of splitting of *d*-orbitals, Jahn-Teller theorem, trends in ionic radii, lattice energy and heat of ligation. Structure of spinels. MOT with σ and π-bonding.

Brief review of different types of magnetic behaviors, spin-orbit coupling, quenching of orbital angular moments. Term symbols for metal ions, crystal field theory and its application to explain magnetic properties of coordination compounds.

UNIT III: CHEMISTRY OF NON TRANSITION ELEMENTS

Structures and acidic behaviour of boron halides, Types and nomenclature boron hydrides (boranes), Wade's polyhedral skeleton electron pair theory (PSEPT). W. N. Lipscomb's STYX rules and semi-topological structures of boranes.Preparation, and properties of boron hydrides, carboranes, metalloboranes and metallocarboranes. Preparation, structure and properties of borazines, phosphazenes, phosphorus-oxygen, sulphur-nitrogen compounds, silicates, interhalogens, Chlorofluorocarbons, pseudohalides and noble gas compounds.

UNIT IV: METAL CARBONYLS, NITROSYLS AND CLUSTERS

Molecular orbital of carbonyl, classification of metal carbonyls, bonding in metal carbonyl, valence electron count (EAN rules), preparation and properties of mononuclear and polynuclear carbonyl complexes, bond



lengths and stretching frequencies, carbonylate ions, carbonyl hydride complexes, isolobal fragments, structure and important reactions of transition metal nitrosyl. Bonding, preparation and properties of dinuclear metal cluster (dirhenium complex $[Re_2Cl_8]^{2-}$ ions), trinuclear and hexanuclear metal clusters.

Suggested Readings:

1. B. N. Figgis and M. A. Hitchman, Ligand Field Theory and Its Applications, Wiley-India, 2010.
2. F. A. Cotton and Wilkinson, Advanced Inorganic Chemistry, 6th ed. John Wiley, 2006.
3. J. E. Huheey, E. A. Keiter, R. L. Keiter, O. K. Medhi, Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed. Pearson Education, 2006.
4. N. N. Greenwood and E. A. Earnshaw; Chemistry of elements, 2nd ed. Butterworth- Heinemann, 1997.
5. D. F. Shriver, P.W. Atkins and C.H. Landgord, Inorganic Chemistry, 3rd Edn., Oxford University Press, 1998.
6. J. D. Lee, Concise Inorganic Chemistry, Chapman & Hall Ltd., 1991.
7. R. L. Magnetochemistry, Carlin, Springer Verlog. Heidelberg, New York, Tokyo, 1986.
8. A. Earnshaw, Magnatochemistry, 1st ed. Academic Press, 1968.

SEMESTER-I

Course Name - Inorganic Chemistry Practical-I
Course Code - SBS CH 010104 C 4004

Credits: 2

Course Objective and Learning Outcomes:

To train students with preparation of various inorganic complexes/compounds, water analysis and identification of acidic and basic radicals. Much of the understanding acquired from the theory paper (Inorganic Chemistry I) would be validated with the performed experiments.

At the end of the course students will have first-hand expertise of performing simple inorganic experiments independently.

UNIT 1: WATER AND RADICAL ANALYSIS

(a) Water Analysis (Any Two)

1. Determination of DO, COD and BOD of a waste water sample.
2. Determination of total suspended solids and total dissolved solids.
3. Determination of turbidity of a water sample by nephlometer.

(b) Radical Analysis

Analysis of simple mixtures of acidic and basic radicals.

UNIT 2: PREPARATIONS AND RELATED COMPLEMENTARY WORK AND PHYSICAL STUDIES (ANY FOUR)

1. Reinecke Salt
2. $VO(acac)_2$
3. $Mn(acac)_3$
4. Prussian Blue/Turnbull's Blue
5. $Hg[Co(NCS)_4]$
6. Potassium trioxalatoferate (III) Trihydrate
7. Potassium trioxaltochromate (III)
8. Cis, trans-dichloro bis(ethylenediammine) cobalt(III)chloride.

Suggested Readings:

1. J. Bassett, R. C. Denney, G. H. Jeffery and J. Mendham, Vogel's Textbook of Quantitative Analysis, revised, 5th ed. ELBS, 1989.
2. G. Svehla, Vogel's Textbook of Macro and Semimicro Qualitative Inorganic Analysis, revised, 5th ed. Longman, 1979.
3. Marr and Rocket, Practical Inorganic Chemistry, Van Nostrand Reinhold, 1972.

SEMESTER - II

Course Name - Inorganic Chemistry –II

Course Code - SBS CH 010207 C 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide an understanding of the fundamentals of electronic spectroscopy of coordination compounds and advanced topics such as, reaction mechanism in complexes. Introductory nuclear chemistry and its theory will be discussed as well.

At the end of the course students will be able to appreciate the kinetics and thermodynamics associated with the reactions of inorganic compounds and enjoy the flavor of nuclear chemistry.

UNIT I: REACTION MECHANISMS OF TRANSITION METAL COMPLEXES

Energy profile of a reaction, reactivity of metal complexes, inert and labile complexes, kinetic application of valence bond and crystal field theories, kinetics of octahedral substitution, acid hydrolysis, factors affecting acid hydrolysis, base hydrolysis, conjugate base mechanism, direct and indirect evidences in favour of conjugate mechanism, anation reactions, reactions without metal ligand bond cleavage. Substitution reaction in square planar complexes, *trans* effect, mechanism of the substitution reactions. Redox reactions, mechanism of inner-outer sphere type reactions, cross reactions and Marcus-Hush theory.

UNIT II: ELECTRONIC SPECTROSCOPY OF TRANSITION METAL COMPLEXES

Spectroscopic ground states and the evaluation of energies of various J states of free ions, splitting of S, P, D and F terms under octahedral and tetrahedral electrostatic potential, correlation, Orgel and Tanabe-Sugano diagrams for transition metal complexes (d^1-d^9 states), calculations of Dq, B and β parameters, charge transfer spectra of complexes (both metal to ligand and ligand to metal), spectroscopic method of assignment of absolute configuration in optically active metal chelates and their stereochemical information.

UNIT III: METAL-LIGAND EQUILIBRIA IN SOLUTION

Stepwise and overall formation constants and their interaction, trends in stepwise constants, factors influencing stability of metal complexes dependent on size and charge, metal class, ligand preference, nature of transition metal ions, basic strength, chelate effect, ring size, steric strain, macrocyclic effect, thermodynamic and kinetic stability, determination of formation constants by pH-metry and spectrophotometry.

UNIT IV: RADIOACTIVITY AND NUCLEAR CHEMISTRY

Nuclear binding energy, nuclear emissions, nuclear transformations, kinetics of radioactive decay, bombardment of nuclei, nuclear fission, nuclear fusion, kinetic isotope effects, radiocarbon dating, chemical separation, Szilard–Chalmer's effect, effects of radiation on life, radioactivity in medicines.

Suggested Readings:

1. G. Friedlander, J. W. Kennedy, E. S. Macias; Nuclear and Radiochemistry, 3rd ed. Willey, 2013.
2. J. E. Huheey, E. A. Keiter, R. L. Keiter, O. K. Medhi; Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed. Pearson Education, 2006.
3. F. A. Cotton, G. Wilkinson, C. A. Murillo and M. Bochmann; Advanced Inorganic Chemistry, 6th ed. John Wiley, 1999.
4. D. F. Shriver, P.W. Atkins and C.H. Landgord, Inorganic Chemistry, 3rd Edn., Oxford University Press, 1998.
5. N. N. Greenwood and E. A. Earnshaw: Chemistry of elements, 2nd ed. Butterworth- Heinemann, 1997.
6. B. E. Douglas, D. H. McDaniel, J. J. Alexander; Concepts and Models of Inorganic Chemistry, 3rd ed. John Wiley, 1993.
7. J. D. Lee, Concise Inorganic Chemistry, Chapman & Hall Ltd., 1991.
8. H. J. Arnikar, Essentials of Nuclear Chemistry, Wiley Eastern, 1988.



SEMESTER-II

Course Name - Inorganic Chemistry Practical-II
Course Code - SBS CH 010210 C 0042

Credits: 2

Course Objective and Learning Outcomes:

To train students with quantitative estimation of metal ions (single and mixtures) and identification of mixture of radicals (acid and basic including interfering radicals).

At the end of the course students will have first-hand expertise of performing simple inorganic experiments independently and acquired the skill of carrying out redox and complexometric titrations.

UNIT I: QUANTITATIVE ESTIMATION

Quantitative estimation (involving volumetric-redox and complexometry) of constituents in two and three component mixtures.

UNIT II: SEMIMICRO QUALITATIVE ANALYSIS

Complete systematic analysis of Inorganic mixtures containing six ions including the interfering radicals.

Suggested Readings:

1. Vogel's Textbook of Quantitative Analysis, revised, J. Bassett, R. C. Denney, G. H. Jeffery and J. Mendham, 5th ed. ELBS, 1989.
2. Vogel's Textbook of Macro and Semimicro Qualitative Inorganic Analysis, revised, G. Svehla, 5th ed. Longman, 1979.
3. Practical Inorganic Chemistry, Marr and Rocket, Van Nostrand Reinhold, 1972.

SEMESTER-III

Course Name - Inorganic Chemistry-III (Bioinorganic Chemistry)

Course Code - SBS CH 010301 SE 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide exposure of various biomolecules containing metal ions that comprise many important proteins and enzymes; and important biological processes such as nitrogen fixation and photosynthesis. This course would be highly beneficial for students who had minimal exposure of bioinorganic chemistry at the undergraduate level.

UNIT I: METAL IONS IN BIOLOGY

Essential and trace elements in biological systems. Calcium in biology: Calcium in living cells, transport and regulation, molecular aspects of intramolecular processes. Role in muscle contraction, blood clotting mechanism and biological calcification. Biochemistry of sodium and potassium, membrane structure, mechanism of ion transport across membranes, Na^+/K^+ Pump, biological defense mechanism, ionophores.

UNIT II: NITROGEN FIXATION AND PHOTOSYNTHESIS

Biological nitrogen fixation, introduction of nitrogenase, iron-sulfur clusters, Fe-protein structure, MoFe-protein structure, details of P-cluster and FeMo-cluster, nitrogenase model systems. Chlorophylls, structure of chlorophyll, photosystem I and photosystem II in cleavage of water. Model systems.

UNIT III: METALLOPROTEINS

Structure and function of metalloproteins in electron transport processes– cytochromes and iron-sulphur proteins, synthetic models. Heme proteins and oxygen uptake, myoglobin and hemoglobin basics, structure of the prosthetic group, mechanism for reversible binding of dioxygen and cooperativity of oxygen binding of myoglobin and hemoglobin, structure and function of hemocyanins and hemerythrin.

UNIT IV: ENZYMES IN BIOLOGICAL SYSTEMS

Introduction and historical perspective of enzymes, chemical and biological catalysis, remarkable properties of enzymes like catalytic power, specificity and regulation. Zinc enzymes-carboxypeptidase and carbonic anhydrase. Iron enzymes- catalase, peroxidase and cytochrome P-450. Copper enzymes-superoxide dismutase. Molybednum oxatransferase enzymes-xanthine oxidase. Coenzyme vitamin B_{12}.

Suggested Readings:

1. J. E. Huheey, E. A. Keiter, R. L. Keiter, O. K. Medhi, Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed. Pearson Education, 2006.

2. J. A. Cowan, Inorganic Biochemistry-An Introduction, Wiley-VCH, 1997.
3. S. J. Lippard, J. M. Berg, Principles of Bioinorganic Chemistry, University Science Book, Mill Valley, 1994.
4. I. Bertini, H. B. Gray, S. J. Lippard and J. S. Valentne, Bioinorganic Chemistry, University Science Books, Mill Valley, CA (USA), 1994.
5. E. I. Ochiai, Bioinorganic Chemistry-An Introduction, Allyn and Bacon, Inc., 1977.
6. R. W. Hay, Bioinorganic Chemistry, Ellis Hollwood, 1984.



SEMESTER-III

Course Name - Inorganic Chemistry-IV (Spectroscopy and Photoinorganic Chemistry)

Course Code - SBS CH 010302 SE 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide students exposure with various spectroscopic techniques (IR, Raman, ESR, Mossbauer, NQR) required to characterize inorganic complexes and coordination compounds. An introduction of photoinorganic chemistry involving various photophysical processes would be covered as well.

UNIT I: INFRARED AND RAMAN SPECTROSCOPY

Molecular vibrations, force constants, molecular vibrations and absorption of Infrared radiations. Raman spectroscopy, polarized Raman lines. Use of symmetry considerations to determine the number of lines in IR and Raman Spectra. Structural studies involving IR and Raman Spectroscopy of coordination compounds containing the following molecules/ions and ligands: NH_3, H_2O, OH, SO_4^{2-}, ClO_4^-, COO^-, NO_2, CN^-, SCN^-, NO, O_2, halides, acetylacetone. Hydrogen bonding and infrared spectra, metal ligand and related vibrations. Application of resonance Raman spectroscopy to structural elucidation of the active sites of heme and non-heme oxygen carriers.

UNIT II: ELECTRON SPIN RESONANCE SPECTROSCOPY

Basic principle, selection rules, presentation of spectra, origin and interpretation of Lande's factor(g), factor affecting 'g-value', isotropic and anisotropic hyperfine coupling, super hyperfine coupling, spin-orbit coupling, line shape, zero field splitting, Kramer's degeneracy, quadrupolar interactions, ESR analysis of organic compounds, transition metal complexes of vanadium, chromium, manganese, iron, copper, cobalt and iron.

Application of ESR spectroscopy: structure determination, interpretation of ESR spectra of simple organic radicals like benzene, naphthalene, toluene and xylene radical ions, study of unstable paramagnetic species.

UNIT III: MÖSSEBAUER AND NUCLEAR QUADRUPOLE RESONANCE SPECTROSCOPY



Mössebauer Spectroscopy: Introduction to Mössebauer effect-Basic principles, recoilless emission & absorption of γ-rays. Mössebauer experiment - Instrumentation, scheme of Mössebauer spectrometer, Mössebauer spectrum. Isomer shift, quadrapole splitting and hyperfine interactions, application of Mössebauer effect to the investigations of compounds of iron and tin.

Nuclear Quadrupole Resonance Spectroscopy: Principle, nuclear quadrupole resonance experiment, structural information from NQR spectra, Interpretation of nuclear quadrupole coupling constants.

UNIT IV: PHOTOINORGANIC CHEMISTRY

Interaction of electromagnetic radiation with matter, Grotthus-Draper law, Stark-Einstein law of photochemical equivalence and Lambert-Beer's law, quantum yield, photodissociation, predissociation, photochemical reactions: photoreduction, photooxidation, photodimerization, photochemical substitution, photoisomerization, photosensitized reaction.

Eectronic transition, Frank-Condon principle, selection rules, electronically excited singlet states, life time of electronically excited state, construction of Jablonski diagram, electronic transitions and intensity of absorption bands, photophysical pathways of excited molecular system (radiative and non-radiative), chemiluminescence, phosphorescence and fluorescence.

Suggested Readings:

1. D. L. Pavia, G. M. Lampman, G. S. Kriz and J. R. Vyvyan; Introduction to Spectroscopy, 5th ed. Cengage India, 2015.
2. K. K. Rohatgi and K. K. Mukherjee; Fundamentals of Photochemistry, 3rded. New Age International (P) Ltd., 2014.
3. K. Nakamoto; Infrared and Raman Spectra of Inorganic and Coordination Compounds, Part A and B, 6th ed. Wiley, 2008.
4. J. R. Lakowicz, Principles of Fluorescence Spectroscopy, 3rd ed. Springer, New York, 2006.
5. N. J. Turro, V. Ramamurthy and J. C. Scaiano, Modern Molecular Photochemistry of Organic Molecules, 1st ed. University Science, Books, CA, 2010.
6. C. N. Banwell and E. M. McCash; Fundamentals of Molecular Spectroscopy, 4th ed. Tata McGraw Hill, 1994.
7. I. Ninomiya and T. Naito, Photochemical Synthesis, 1st ed. Academic Press, New York, 1989.



SEMESTER-III

Course Name - Inorganic Chemistry Practical-III
Course Code - SBS CH 010303 SE 0084

Credits: 4

Course Objective and Learning Outcomes:

To provide students exposure of chromatography and gravimetric experiments. Advanced experiments such as growing of single-crystals and their identification using polarizing optical microscope will be carried out. First-hand experience of UV-Visible and FTIR spectroscopic studies will be provided. At the end of this course students will gain skills of characterizing compounds and will be equipped to perform experiments at the research level.

UNIT I: CHROMATOGRAPHY

Separation of binary mixtures in the given solution by paper chromatography, visualizing solution: concentrated ammonia, ascending chromatography.

UNIT II: GRAVIMETRY

To prepare solutions of different metal ions and estimate the metal ions gravimetrically. Three component metal ion analysis (one volumetric and two gravimetric method).

UNIT III: SINGLE-CRYSTALS

Methods of growing single-crystals: (i) Diffusion method; (ii) Hydrothermal and Solvothermal method; (ii) Slow evaporation method. To grow single-crystals of molecular compounds, metal-organic cages and metal-organic higher dimensional compounds. Identification of single-crystals under polarizing optical microscope.

UNIT IV: SPECTROSCOPIC STUDIES

Data plotting, analysis and characterization of coordination compounds using Infrared and UV-Visible Spectroscopy.

Suggested Readings:

1. Vogel's Textbook of Quantitative Analysis, revised, J. Bassett, R. C. Denney, G. H. Jeffery and J. Mendham, 5th ed. ELBS, 1989.
2. Vogel's Textbook of Macro and Semimicro Qualitative Inorganic Analysis, revised, G. Svehla, 5th ed. Longman, 1979.
3. Practical Inorganic Chemistry, Marr and Rocket, Van Nostrand Reinhold, 1972.

SEMESTER-IV

Course Name - Inorganic Chemistry-V (Organometallic Chemistry)
Course Code - SBS CH 010410 SE 4004

Credits: 4

Course Objective and Learning Outcomes:

Detailed study of bonding, structure, synthesis and reactions of various types of organometallic complexes will be done. Metal complexes of carbons at various oxidation levels will be discussed. Synthesis and stability, precautions in handling, characterisation techniques and utility or TM-complexes will be studied. The applications of metal complexes in catalysis will be studied in detail. At the end of the course, students are expected to have clear knowledge about the bonding, structure, stability and reactions of various organometallics and their usefulness.

UNIT I: ALKYLS, ARYLS, CARBENES AND CARBYNES OF TRANSITION METALS

Synthesis, structure and bonding considerations of Zeise's salt; synthesis, stability and decomposition pathways of organocopper in organic synthesis; synthesis and reactivity of alkyl lithium; synthesis and reactivity of organozinc compounds.

Metal carbenes: preparation, reactivity, structure and bonding considerations of Fischer and Schrock carbene complexes, Tebbe's reagent, Grubb's reagent, Petasis reagent, Metal carbines: synthesis, reactivity, structure and bonding considerations of Fischer and Schrock carbyne complexes.

UNIT II: TRANSITION METAL Π-CYCLIC COMPLEXES

Half and bent sandwich compounds, molecular orbitals of metallocenes, structures of cyclopentadienyl compounds, covalent versus ionic bonding, 18 electron rule, synthesis, structure, aromatic behaviour of Ferrocene, reactions such as metallation, Friedel Craft, Mannich reaction, sulphonation, nitrations, halogenations reactions, Synthesis, structure and reactions of other metallocenes (with Cr, Ni and Zr metals).

UNIT III: FLUXIONAL ORGANOMETALLIC COMPOUNDS AND COUPLING REACTIONS

Rates of rearrangement and techniques of study, NMR study of Fluxional behavior, Classification of fluxional organometallic Compounds, Mechanism of fluxionality in compounds of η^1-cyclopentadienyls and η^3–allyls. Stereochemical non rigidity in case of coordination numbers- 4 & 5 (*cis-trans*, atomic inversion, Berry Pseudorotation).

Tsuji-Trost, Mizoroki-Heck, Miyaura-Suzuki, Stille, Negishi, Sonogashira, Kumada, Hiyama, Buchwald-Hartwig amination or coupling reactions.

UNIT IV: CATALYTIC PROCESSES INVOLVING TRANSITION METAL ORGANOMETALLIC COMPOUNDS

Oxidative addition, reductive elimination, insertion-migration reactions, C-H bond activation catalytic mechanism of hydrogenation, hydroformylation, oxidation and isomerization of alkenes, Monsanto acetic acid synthesis, olefin metathesis, Fischer-Tropsch synthesis and Ziegler-Natta polymerization of alkenes, water gas shift reaction, asymmeteric and supported organometallic catalysis.

Suggested Readings:

1. G. L. Miessler and D. A. Tarr, Inorganic Chemistry, 3rd ed. Pearson, 2018.
2. R. H. Crabtree, The Organometallic Chemistry of the Transition Metals, John Wiley, 5th ed. 2009.
3. R. C. Mehrotra and A. Singh, Organometallic Chemistry, New Age International, 2nd ed. 2007.
4. R. B. Jordan, Reaction Mechanism of Inorganic and Organometallic systems; 2nd ed.; Oxford University Press, 3rd ed. 2007
5. J. E. Huheey, E. A. Keiter, R. L. Keiter and O. K. Medhi, Inorganic Chemistry: Principles of Structure and Reactivity, 4th ed. Pearson Education, 2006.



SEMESTER-IV

Course Name - Inorganic Chemistry-VI (Materials and Supramolecular Chemistry)
Course Code - SBS CH 010411 SE 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide exposure of nanomaterials and hybrid materials (covering synthesis, characterization and application) and various aspects of supramolecular chemistry (with basic understanding and applications).

UNIT 1: NANOMATERIALS AND NANOCOMPOSITES

Nanomaterials: An Introduction. Nanomaterials and Nanocomposites. Elementary Consequences of Small Particle Size - Surface of Nanoparticles. Classification of nanomaterials. Gas-Phase Synthesis of Nanoparticles - Physical and Chemical Vapor Synthesis Processes. Radio- and Microwave Plasma Processes. Flame Aerosol Process.

Characterization of Nanomaterials: Global Methods for Characterization, X-Ray and Electron Diffraction, Electron Microscopy, Scanning Transmission Electron Microscopy.

Nanotubes, Nanorods, and Nanoplates. One-Dimensional Crystals, Carbon Nanotubes and Graphene, Nanotubes and Nanorods from Materials other than Carbon, Synthesis.

UNIT 2: HYBRID MATERIALS

Coordination Polymers, Introduction, Classification of Coordination Polymers, Design Strategies of Coordination Polymers-Metal Nodes and Linkers, Secondary Building Unit Concept, Topology and Interpenetration, Synthesis of Coordination Polymers-Solvothermal/Hydrothermal, Sonochemical, Microwave, Mechanochemical. Characterization: X-ray diffraction and Spectroscopic Methods. Applications of Coordination Polymers in Gas Storage, Gas Separation, Catalysis and Drug Delivery. Zeolitic Metal-Organic Frameworks.

UNIT 3: SUPRAMOLECULAR CHEMISTRY AND NATURE OF INTERACTIONS

Definition and Development of Supramolecular Chemistry: Host-Guest Chemistry, Classification of Supramolecular Host-Guest Compounds, Receptors, Coordination and the Lock and Key Analogy, Cooperativity and the Chelate Effect, Preorganisation and Complementarity, Thermodynamic and Kinetic Selectivity, and Discrimination.

Nature of Supramolecular Interactions: Ion–ion, Ion–Dipole, Dipole–Dipole, Hydrogen Bonding, Cation–π, Anion-π, π–π, Van der Waals Forces and Crystal Close Packing, Closed Shell Interactions. Solvation and Hydrophobic Effects. Supramolecular Concepts and Design.

UNIT 4: SUPRAMOLECULAR CHEMISTRY OF LIFE AND MOLECULAR DEVICES



Biological Inspiration for Supramolecular Chemistry- Rhodopsin: A Supramolecular Photonic Device, Porphyrins and TetrapyrroleMacrocycles-The Role of Magnesium Tetrapyrrole Complexes. Uptake and Transport of Oxygen by Hemoglobin.

Cation-Binding Hosts: Supramolecular Cation Coordination Chemistry-The Crown Ethers- Discovery and Scope, The Cryptands, The Calixarenes-cation Complexation by Hybrid Calixarenes. Molecular Devices: Supramolecular Photochemistry-Bipyridyl-Type Light Harvesting Devices. Molecule-Based Electronics-Molecular Wires, Molecular Rectifiers, Molecular Switches.

Suggested Readings:

1. C. Wu, Inorganic Two Dimensional Materials, Royal Society of Chemistry, 2017.
2. S. Kaskel, The Chemistry of Metal-Organic Frameworks, Vol. 1, Wiley-VCH, 2016.
3. D. Vollath, Nanomaterials: An Introduction to Synthesis, Properties and Applications, 2nd Ed., Wiley-VCH, 2013.
4. D. C. Agarwal, Introduction to Nanoscience and Nanomaterials, World Scientific, 2013.
5. J. W. Steed, Supramolecular Chemistry: From Molecules to Nanomaterials, Vol. 8, Set Ed., John Wiley & Sons, 2012.
6. L. R. Macgillivray, Metal-Organic Frameworks: Design and Applications, Wiley, 2010.
7. J. W. Steed and J. L. Atwood, Supramolecular Chemistry, 2nd Ed., Wiley, 2009.
8. J.-M. Lehn, Supramolecular Chemistry: Concepts and Perspectives, Wiley, 2006.



ORGANIC CHEMISTRY COURSES



SEMESTER-I

Course Name - Organic Chemistry-I

Course Code - SBS CH 010102 C 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide the basics in Organic Chemistry at the beginning of the semester. At the end of this course, students will gain the knowledge about the nature of bonding in organic molecules, delocalized chemical bonding, aromaticity, stereochemistry, such as conformation and configuration, RS and EZ notations and mechanistic aspects of aliphatic and aromatic nucleophilic substitution and electrophilic aromatic substitutions and elimination reactions.

UNIT I: NATURE OF BONDING IN ORGANIC MOLECULES

Delocalized chemical bonding-conjugation, cross conjugation, resonance, rules of resonance, effect on reactivity, hyperconjugation, tautomerism; Energy level of π–molecular orbitals, Aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternant hydrocarbons, Hückel's rule, annulenes, anti-aromaticity, homo-aromaticity; bonding in fullerenes. Fundamentals of Supramolecular Chemistry, Bonds weaker than covalent- addition compounds, crown ether complexes and cryptands, inclusion compounds, cyclodextrins, catenanes and rotaxanes.

UNIT II: STEREOCHEMISTRY

***Conformational analysis*:** Simple alkanes, cycloalkanes, decalins, conformational lock, ring strain, effect of conformation on reactivity.

***Chirality*:** Basic principles, molecules with more than one chiral center, threo and erythro isomers, Optical activity in the absence of chiral carbon (biphenyls, allenes and spiranes); Stereochemistry of the compounds containing nitrogen, sulphur and phosphorus.

Methods of resolution, optical purity, enantiotopic and diastereotopic atoms, groups and faces, stereospecific and stereoselective synthesis. Asymmetric synthesis: basic principles, chiral pool, auxiliary, substrate, reagent and catalyst controlled.

UNIT III: ALIPHATIC NUCLEOPHILIC SUBSTITUTION AND ELIMINATION REACTIONS

a) Aliphatic Nucleophilic Substitution Reactions:

The S_N2, S_N1, mixed S_N1 and S_N2 and SET Mechanisms. The neighbouring group mechanism, neighbouring group participation by π and σ bonds. Classical and nonclassical carbocations, phenonium ions, norbornyl system, common carbocation rearrangements. The S_N^i mechanism. Nucleophilic substitution at an allylic, aliphatic trigonal and a vinylic carbon. Reactivity effects of substrate structure, attacking nucleophile, leaving group and reaction medium, phase transfer catalysis and ultrasound, ambidentnuleophile, regioselectivity.



b) Elimination Reactions:

The E2, E1 and E1cB mechanisms. Orientation of the double bond. Reactivity – effects of substrate structures, attacking base, the leaving group and the medium.

UNIT IV: AROMATIC SUBSTITUTION REACTIONS

a) Aromatic Electrophilic Substitution:

The arenium ion mechanism, orientation and reactivity. The *ortho/para* ratio, *ipso* attack, orientation in other ring systems. Diazonium coupling, Vilsmeir reaction, Gattermann-Koch reaction.

b) Aromatic Nucleophilic Substitution:

The S_NAr, diazonium salts and benzyne mechanisms. Reactivity–effect of substrate structure, leaving group and attacking nucleophile. The *von* Richter, Sommelet-Hauser and Smiles rearrangements.

Suggested Readings:

1. R. N. Boyd, R. T. Morrison and S. K. Bhattcharjee, Organic Chemistry, 7th ed., Pearson, 2014.
2. M. B. Smith, March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, 7th ed., WILEY, 2013.
3. J. Clayden, N. Geeves and S. Warren, Organic Chemistry, Oxford University Press, 2012.
4. E. L. Eliel and S. H. Wilen, Stereochemistry of Organic Compounds, Wiley India, 2008.
5. F. A. Carey and R. J. Sundburg, Advanced Organic Chemistry PART A, Springer 2007.
6. P. Y. Bruce, Organic Chemistry, 7th Ed., Pearson, 2007.
7. S. M. Mukherji and S. P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan, 2007.
8. D. Nasipuri, Stereochemistry of Organic Compounds, Second Ed., New Age International, 2005.
9. P. Sykes, A Guide Book to Mechanism in Organic Chemistry, Longman, 1985.



SEMESTER-I

Course Name - Organic Chemistry Practical-I
Course Code - SBS CH 010105 C 0042

Credits: 2

Course Objective and Learning Outcomes:

To acquire experimental skills important for various separation and purification techniques, functional group identification and drying of organic solvents. To get an exposure to industrial oriented chemical processes. At the end of this course, students will learn the various purification methods, chromatographic separation and identification of organic compounds, solvent drying and functional group detection in organic compounds. Students would be familiarized with manufacturing, designing and analysis of the organic compounds at commercial level.

UNIT 1: PURIFICATION AND SEPARATION TECHNIQUES: PRINCIPLE AND APPLICATION

Part A

- Crystallization and recrystallization
- Sublimation
- Distillation: Simple, Steam and Vacuum
- Solvent Extraction
- Chromatography: Paper and Thin-layer

Part B

Chemical Tests: Chemistry and Application

- Extra elements detection (N, S, X = Cl, Br, I)
- Functional group detection (in mono functional compounds)

UNIT 2: SOLVENT DRYING AND REFLUXING

Part A

- Drying of ethanol/ acetone/ diethylether/THF
- Refluxing of water/ ethanol/toluene

Part B

Industrial visit- to relevant Industry and preparation of a short report.

Suggested Readings:

1. K. L. Williamson and K. M., Masters Macroscale and Microscale Organic Experiments, 7th Edition, Cengage Learning, 2017.
2. R. K. Bansal, Laboratory Manual in Organic Chemistry, Wiley, 2006.
3. B. S. Furniss and others, Vogel's Text Book of Practical Organic Chemistry, 5e Paperback, Pearson, 2003.
4. D. Pasto, C. Johnson and M. Miller, Experiments and Techniques in Organic Chemistry, Prentice Hall, Instructor's Edition, 1992.
5. H. T. Clarke revised by B. Haynee, A Hand book of Organic Analysis-Qualitative and Quantitative, Edward Arnold, London, 1975.



6. H. Middleton, Systematic Qualitative Organic Analysis, Edward Arnold, London, 1959.

SEMESTER-II

Corse Name - Organic Chemistry-II

Course Code - SBS CH 010208 C 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide advance knowledge of organic chemistry reactions such as addition reactions, free radical, photochemistry and pericyclic reactions. At the end of this course, students will be trained in solving the problems related to addition reactions, free radical reactions, photochemistry and pericyclic reactions.

UNIT I: ADDITION REACTIONS OF CARBON-CARBON AND CARBON-HETEROATOM MULTIPLE BONDS

a) Polar addition to Carbon-Carbon Multiple Bonds:

Mechanistic and stereochemical aspects of following **electrophilic addition reactions**: hydrohalogenation, hydration, epoxidation, Woodward and Prevost dihydroxylations, halogenation, halocyclizations, oxymercuration, hydrogenation, hydroboration and carbene cyclopropanation. General aspects of addition reactions of alkynes and allenes. Addition of **nucleophiles** to alkenes, Michael reaction, nucleophilic epoxidation and cyclopropanation.

b) Addition to Carbon-Heteroatom Multiple Bonds:

Reactivity of various carbonyl compounds, Mechanistic and stereochemical aspects of following nucleophilic addition reactions to carbonyl compounds**:** hydration, acetalization, imine and enamine formation, Grignard, organozinc and organolithium reagents, Aldol, Knoevenagel, Claisen, Mannich, Benzoin, Perkin and Stobbe reactions, Addition of ylides (Wittig, Julia and Peterson reactions), hydride reductions of various carbonyl compounds, Hydrolysis of acetals, esters, amides and nitriles.

UNIT II: FREE RADICAL REACTIONS AND ORGANIC PHOTOCHEMISTRY

a) Free radicals: Generation of free radicals, structure and stability, persistent radicals, common initiators and uses (peroxides, UV light, AIBN-tin hydride), radical anions and cations (One electron redox reactions), radical chain reactions, radical scavengers, Types of free radical reactions: substitution (halogenation, Sandmeyer reaction), addition (to unsaturated systems, radical cyclization), fragmentation (Hunsdiecker reaction), rearrangement, intramolecular H-abstraction (Hofmann-Loeffler and Barton reactions), oxidation (autooxidation of aldehydes) and dimerization (Pinacol, McMurry, acyloin and Glaser reactions)

b) Organic Photochemistry**:** Fundamentals of organic photochemistry, Photochemical reactions of alkenes: photo-cycloaddition, Paterno-Buchi reaction, di-pi-methane rearrangement) Photochemical reactions of carbonyl compounds: Norrish type I and II reactions, oxa-di-pi methane rearrangement. Modern photoredox catalysis.



UNIT III: PERICYCLIC REACTIONS I- ELECTROCYCLIC AND CYCLOADDITION REACTIONS

Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatriene, allyl and pentadienyl systems. Classification of pericyclic reactions. FMO approach. **Electrocyclic reactions**: conrotatory and disrotatory modes and effect on stereochemistry, 4n, 4n +2, allyl and pentadienyl systems, Nazarov cyclization. **Cycloaddition reactions:** antarafacial and suprafacial additions, 4n and 4n+2 systems, 2+2 addition of ketenes, Detailed treatment of Diels-Alder reactions (types of Diels-Alder reactions, common dienes and dienophiles, endo/exo selectivity, catalysis, synthetic applications, intramolecular and hetero Diels-Alder reactions), **1,3-dipolar cycloadditions**: structure, methods of preparation and synthetic applications of nitrones, nitrile oxides and azides.

UNIT IV: PERICYCLIC REACTIONS II- SIGMATROPIC, ENE AND CHELOTROPIC REACTIONS

Sigmatropic rearrangements: General considerations, suprafacial and antarafacial shifts of H and alkyl groups, 1,3, 1,5, 3,3 and 2,3-sigmatropic rearrangements. Valence tautomerism (divinyl cyclopropane and bullvalene), Detailed treatment of Claisen (Eschenmoser, Johnson, Ireland and aromatic variants), Cope (oxy-Cope and anionic oxy-Cope) rearrangements. Wittig, aza-Wittig and Sommelet-Hauser rearrangements, concerted syn-elminations. **Ene reactions**: General features, carbonyl and oxy-ene reactions, intramolecular ene reactions. **Chelotropic eliminations**: Definition, examples involving nitrogen, sulfur dioxide and carbon monoxide extrusions.

Suggested Readings:

1. S. Kumar, V. Kumar and S. P. Singh, Pericyclic Reactions, A Mechanistic and Problem Solving Approach, Ist Ed., Elsevier, 2015.
2. Michael B. Smith, March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, 7th Ed., WILEY, 2013.
3. J. Clayden, N. Geeves and S. Warren, Organic Chemistry, Oxford University Press, 2012.
4. Morrison, Boyd and Bhattcharjee, Organic Chemistry, 7th Ed., Pearson, 2010.
5. F. A. Carey and R. J. Sundburg, Advanced Organic Chemistry PART A and PART B, Springer 2007.
6. S. Sankararaman, Pericyclic reactions-A Textbook, 1st Ed., Wiley-VCH, Weinheim, 2005.
7. R. Bruckner, Advanced Organic Chemistry: Reaction Mechanism, Harcourt (India) Pvt. Ltd., 2001.
8. P. Sykes, A Guide Book to Mechanism in Organic Chemistry, Longman, 1985.
9. S. M. Mukherji and S. P. Singh, Macmillan Reaction Mechanism in Organic Chemistry, 1984.
10. S. M. Mukherji, Pericyclic Reactions, Macmillan, India, 1980.



SEMESTER-II

Course Name - Organic Chemistry Practical-II
Course Code - SBS CH 010211 C 0042

Credits: 2

Course Objective and Learning Outcomes:

To acquire experimental skills and hands on experience of various separation and purification techniques specifically applicable to binary mixtures, and identification of the given unknown organic compounds. To get hands on experience in synthetic organic chemistry and quantitative analysis.
At the end of this course, students will learn the various purification methods, chromatographic separation and identification of organic components present in the given binary mixtures. Further, they will learn about the various important parameters of organic synthesis preferably in greener approaches. Students would also be able to determine the number of some functional groups present in the given organic samples.

UNIT I: QUALITATIVE ANALYSIS OF THE GIVEN BINARY ORGANIC MIXTURE (*SOLID-SOLID* AND *SOLID-LIQUID* MIXTURES) BY A SYSTEMATIC APPROACH

Chemical separation: using H_2O, $NaHCO_3$, NaOH, HCl, Ether or any other reagent as per required conditions. Systematic identification of the components and preparation of at least one derivative of each.

UNIT II: ORGANIC SYNTHESIS AND QUANTITATIVE ANALYSIS

Preparation of an organic compound involving one-step reaction. (Prepare at least three compounds)
[**Important *Note:*** *Prefer to use* ***greener protocols*** *wherever possible. Submit the recrystallised sample of the synthesized compound after checking its purity by TLC*]

Estimation of alcoholic/phenolic/amino groups in the given organic compound.
Determination of Iodine and Saponification values of an oil sample.

Suggested Readings:

1. K. L. Williamson and K. M., Masters Macroscale and Microscale Organic Experiments, 7th Edition, Cengage learning, 2017.
2. H.A. Shally, Green Chemistry Laboratory Manual for General Chemistry, CRC Press, First Edition, 2015.
3. R. K. Bansal, Laboratory Manual in Organic Chemistry, Wiley, 2006.
4. B. S. Furniss and others, Vogel's Text Book of Practical Organic Chemistry, 5th Edition Paperback, Pearson, 2003.
5. D. Pasto, C. Johnson and M. Miller, Experiments and Techniques in Organic Chemistry, Prentice Hall, Instructor's Edition, 1992.
6. H. T. Clarke revised by B. Haynee, A Hand book of Organic Analysis-Qualitative and Quantitative, Edward Arnold, London, 1975.
7. H. Middleton, Systematic Qualitative Organic Analysis, Edward Arnold, London, 1959.



SEMESTER-III

Course Name - Applications of Spectroscopy

Course Code - SBS CH 010313 C 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide the advance knowledge and understanding of organic spectroscopy. At the end of this course, students will acquire both the theoretical and application aspect of various spectroscopic techniques (UV-Visible, IR, NMR spectroscopy and mass spectrometry) to the solve problems related to structure determination of organic compounds.

UNIT I: ULTRAVIOLET AND VISIBLE SPECTROSCOPY AND MASS SPECTROMETRY

UV-Visible spectroscopy*:* Various electronic transitions, Beer-Lambert law, visible spectrum & colour, effect of solvent on electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyenes. Fieser-Woodward rules for conjugated dienes and carbonyl compounds, ultraviolet spectra of aromatic and heterocyclic compounds.

Mass spectrometry*:* Introduction, ion production–EI, CI, FD and FAB, factors affecting fragmentation, ion analysis, ion abundance. Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak, McLafferty rearrangement. Nitrogen rule. High resolution mass spectrometry (HRMS).

UNIT II: INFRARED SPECTROSCOPY

Instrumentation and sample handling. Characteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, phenols and amines. Detailed study of vibrational frequencies of carbonyl compounds (ketones, aldehydes, esters, amides, acids, anhydrides, lactones, lactams and conjugated carbonyl compounds). Effect of hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination bands and Fermi resonance.

UNIT III: NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY

General introduction and definition, theory of NMR, chemical shift, shielding and deshielding mechanism, magnetic anisotropy, chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic) and other nuclei (alcohols, phenols, enols, carboxylic acids, amines, amides & mercapto), spin-spin interaction, Spin systems, Pople notation, complex spin-spin interaction between two, three and four nuclei (first order spectra), virtual coupling. chemical exchange, effect of deuteration, Stereochemistry, hindred rotation, Karplus curve-variation of coupling constant with dihedral angle.



Simplification of complex spectra, nuclear magnetic double resonance, contact shift reagents. Fourier transform technique, nuclear Overhauser effect (nOe), COSY.

UNIT IV: CARBON-13 NMR SPECTROSCOPY AND COMBINED APPLICATIONS

***Carbon-13 NMR Spectroscopy*:** General considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroarmatic and carbonyl carbon), coupling constants and DEPT ^{13}C NMR spectra. General introduction to two-dimensional NMR spectroscopy- HETCOR and NOESY. Resonance of other nuclei-F, P.

***Combined problems*:** Combined problems relating to structure elucidation by UV, IR, NMR Spectroscopy and Mass Spectrometry.

Suggested Readings:

1. D. L. Pavia, G. M. Lampman, G. S. Kriz and J. R. Vyvyan, Introduction to Spectroscopy, 5th ed. Cengage India, 2015.
2. R. Kakkar, Atomic and Molecule Spectroscopy: Basic Concepts and Applications, Cambridge University Press, 2015.
3. W. Kemp, Organic Spectroscopy, Mac publishers, 3rd Ed., 2011.
4. D. H. Williams, I. Fleming, Spectroscopic Methods in Organic Chemistry, Tata McGraw-Hill, 2010.
5. J. R. Dyer, Application of Spectroscopy of Organic Compounds, Prentice Hall, 2009.
6. R. J. Abraham, J. Fisher and P. Loftus, Introduction to NMR Spectroscopy, Wiley, 2005.
7. J. Mohan, Organic Spectroscopy, Narosa Publishers, New Delhi, 2002.
8. R. M. Silverstein, G. C. Bassler and T. C. TMorrill, Spectrometric Identification of Organic Compounds, John Wiley, 1995.
9. C. N. Banwell and E. M. McCash; Fundamentals of Molecular Spectroscopy, 4th ed. Tata McGraw Hill, 1994.

SEMESTER-III

Course Name - Organic Chemistry-III (Heterocycles and Natural Products)
Course Code - SBS CH 010304 SE 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide the advance knowledge of heterocyclic and natural products chemistry. At the end of this course, students will learn about the synthesis, chemical transformation and reaction mechanism involved in Heterocyclic Chemistry. They will also gain knowledge about different class of natural product (synthesis and reactions) and its application and importance in drug discovery and development process.

UNIT I: HETEROCYCLIC CHEMISTRY-I

Introduction, Nomenclature, spectral characteristics, reactivity and aromaticity, Strain-bond angle and torsional strain and their consequences in small ring heterocycles. Conformation of six-membered heterocycles with reference to molecular geometry, barrier to ring inversion, pyramidal inversion and 1,3-diaxial interaction. Synthesis and reactions of three and four membered heterocycles (aziridines, oxiranes, thiiranes, azetidines, oxetanes and thietanes). Synthesis and reactions of benzofused five membered heterocycles (benzopyrroles, benzofurans and benzothiophenes)

UNIT II: HETEROCYCLIC CHEMISTRY-II

Synthesis and reactions of pyrylium salts and pyrones and their comparison with pyridinium & thiopyririlium salts and pyridones. Chemistry of bicyclic compounds containing one or more heteroatom. Benzofused six membered rings: synthesis and reactions of benzopyrans, quinolones, isoquinolines, acridines, benzotriazoles, quinolinizium and benzopyrylium salts. Seven and large membered heterocycles: azepines, oxepines, thiepines, Chemistry of porphyrins and spiroheterocycles.

UNIT III: NATURAL PRODUCTS-I

Terpenoids and Carotenoids

Classification, nomenclature, occurrence, isolation, general methods of structure determination, isoprene rule. Stereochemistry, Synthesis (chemical/biosynthesis) of the following representative molecules: Citral, α-Terpeneol, Farnesol, Santonin, Phytol and β-carotene.

Steroids

Occurrence, nomenclature, basic skeleton, Diel's hydrocarbon and stereochemistry. Isolation and synthesis/biosynthesis of Cholesterol, Testorosterone, Progesterone, Oestrone.

UNIT IV: NATURAL PRODUCTS-II

Alkaloids

Definition, nomenclature, occurrence, isolation, general methods of structure elucidation, degradation, classification based on nitrogen heterocyclic ring. Stereochemistry, synthesis and biosynthesis of the following: Ephedrine, Nicotine, Atropine and Quinine.

Flavonoids

Introduction, isolation and purification of flavonoids, General methods of structural determination of flavonoids, Biosynthesis of flavonols and related polyphenols. Structure and synthesis of apigenin, luteolin, quercetin and diadzen.

Suggested Readings:

1. B. A. Bohm, Introduction to Flavonoids, Harwood Academic Publishers, 2011.
2. I. L. Finar, Organic Chemistry, Vol. 2, ELBS., 2009
3. Atta-ur-Rahman and Choudhary, Chemistry, Harwood Academic Publishers, 2008.
4. E. S. Coffey, Rodd's Chemistry of Carbon Compounds, Elsevier, 2005
5. J. A. Joule, Heterocyclic Chemistry, ELBS, 2005
6. Mann, Davidson, Hobbs, Banthrope and Harborne, Natural products: Chemistry and Biological Significance, Longman, Essex., 2004.
7. T. Eicher and S. Hauptmann, The Chemistry of Heterocycles, Thieme, 2002.
8. G. R. Newkome and W. W. Paudler, Contemporary Heterocyclic Chemistry, Wiley-Interscience, 1995.
9. T. L. Gilchrist, Heterocyclic Chemistry, Longman Scientific Technical, 1990.
10. R. M. Acheson, An Introduction to Heterocyclic Chemistry, John Wiley, 1980
11. A. R. Katritzky and C. W. Rees, Comprehensive Heterocyclic Chemistry, eds. Pergamon Press, 1970.



SEMESTER - III

Course Name - Organic Chemistry IV (Reagents and Reactions)
Course Code - SBS CH 010305 SE 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide the advance knowledge of organic synthesis in general and classical and modern reagents and methods in synthesis in particular. In-depth knowledge of metal-mediated reactions and common metal-based reagents, oxidation-reduction reactions and reagents and rearrangement reactions will be gained. At the end of the course students are expected to predict reagents and conditions needed for specific conversions.

UNIT I: USE OF METALS IN ORGANIC SYNTHESIS

Alkali metal reagents (LDA, LHMDS, KHMDS); organomagnesium compounds, Reactions with carbonyl compounds; Stereoselectivity of additions to ketones, olefination reactions and reagents (Wittig, Wadsworth, Peterson, Julia and McMurry reactions); Amide coupling reagents (DCC, DIC, EDC, BOP, HOBt, Mukiyama reagent); Mitsunobu reaction; Palladium mediated reaction: Wacker process, Heck reaction, Suzuki coupling, Negishi coupling, Kumada coupling, Sonagashira reaction and Buchwald-Hartwig amination.

UNIT II: OXIDATION REACTIONS

Common oxidizing agents (transition metal oxidant, sulphur based, peroxide and peracid, modern catalytic oxidations) for oxidation of alcohols, ketones and aldehydes; Oxidation of C-C bonds [ozone, $KMnO_4$, $Pb(OAc)_4$, dimethyldioxirane, Ce(IV) and Mn(III)] and saturated carbons; Woodward and Prevost dihydroxylation, hypervalent iodine reagents, DDQ.

UNIT III: REDUCTION REACTIONS

Common reducing agents such as dissolving metal reductions (Birch reduction), various Aluminum and Boron derived hydrides, catalytic/transfer hydrogenations (Homogeneous and Heterogeneous), diimide, Bu_3SnH, low valent Ti species, microbial reductions (NADH models) and Wolf-Kishner reduction.
Asymmetric reduction using Corey's oxazaborolidine (CBS catalyst) and Noyori's hydrogenation.

UNIT IV: REARRANGEMENT REACTIONS

General mechanistic considerations, nature of migration, migratory aptitude and mechanistic study of the following rearrangements: Pinacol-pinacolone, Wagner-Meerwin, Benzil-Benzilic acid, Favorskii, Arndt-Ester synthesis, Demyanov, Beckmann, Hofmann, Curtius, Schmidt, Baeyer-Villiger, Shapiro reaction, Dienone-Phenol, Claisen, Cope, Von-Ritcher, Pummerer, Smiles and Sommelet-Hauser rearrangements.



Suggested Readings:

1. F. A. Carey and R. J. Sundberg, Advanced Organic Chemistry, Part A and Part B: Reaction and Synthesis, 5thed. Springer Verlag, 2012.
2. V. K. Ahluwalia, Oxidation in Organic Synthesis, CRC press, 2012.
3. J. H. Hartwig, Organotransition Metal Chemistry: From Bonding to Catalysis, University Science Books, 1st Ed. 2009.
4. L. Kurti and B. Czako, Strategic Applications of Name Reactions in Organic Synthesis, Elsevier Academic Press 2005.
5. R. H. Crabtree, The Organometallic chemistry of the transition metals, John Wiley, 2005.
6. W. Carruthers and Iain Coldham, Modern Methods of Organic Chemistry, 4th ed. Cambridge University Press, 2004.
7. Warren, S.; Greeves, N.; J. Clayden and P. Wothers, Organic Chemistry, 2nd ed. Oxford University Press, 2001.
8. J. March, Advanced Organic Chemistry, Reactions, Mechanisms and Structure, 4th ed. John-wiley, 1999.
9. S. Warren, Organic Synthesis, Wiley, 1982.
10. H. O. House, W. A. Benjamin, Modern Organic Synthesis, Inc., New York, 1965.



SEMESTER - III

Course Name - Organic Chemistry Practical-III
Course Code - SBS CH 010306 SE 0084

Credits: 4

Course Objective and Learning Outcomes:

To acquire hands on experience in organic synthesis particularly involving multistep reactions and to gain knowledge about quantitative analysis of organic compounds by spectroscopic methods. To get hands on experience in extraction and isolation of natural products.

At the end of this course, students will understand and acquire the knowledge of various important parameters used in multistep organic synthesis preferably in greener approaches. Further, they would be able to characterize the synthesized compounds on the basis of their spectral data. Students would also learn the spectrophotometric methods used for quantitative analysis of organic compounds besides having hands on experience in extraction and isolation of natural products.

UNIT I: MULTI-STEP ORGANIC SYNTHESIS

Prepare at least any two organic compounds by three or more step reaction.

[**Important *Note:*** *Prefer to use* ***greener protocols*** *wherever possible. Monitor the progress of reaction by TLC and submit the recrystallised sample of the synthesized compound after checking its purity by TLC at each step*]

UNIT II: SPECTROSCOPIC IDENTIFICATION OF ORGANIC COMPOUNDS

Establish the chemical structure of the organic compounds with the help of their given UV-vis, IR and PMR spectral data.

UNIT III: EXTRACTION OF NATURAL PRODUCTS

- Caffeine from tea leaves
- β-Carotene from carrot
- Nicotine from tobacco
- Lactose from milk
- Casein from milk
- Limonene from citrus rind
- Piperine from black pepper
- Lycopene from tomatoes

UNIT IV: QUANTITATIVE ANALYSIS

UV-vis spectrophotometric estimations of the followings:

- Carbohydrates



- Ascorbic acid
- Amino acids
- Proteins
- Cholesterol
- Urea
- Aspirin

Suggested Readings:

1. K. L. Williamson and K. M., Masters Macroscale and Microscale Organic Experiments, 7th Edition, Cengage learning, 2017.
2. H.A. Shally, Green Chemistry Laboratory Manual for General Chemistry, CRC Press, First Edition, 2015.
3. D. L. Pavia, G. M. Lampman, G. S. Kriz and J. R. Vyvyan, Introduction to Spectroscopy, 5th ed. Cengage India, 2015.
4. R. M. Silverstein, G. C. Bassler and T. C. TMorrill, Spectrometric Identification of Organic Compounds, 8th Edition, Wiley India, 2015.
5. William Kemp, Organic Spectroscopy, Mac publishers, 3rd Edition, 2011.
6. R. K. Bansal, Laboratory Manual in Organic Chemistry, Wiley, 2006.
7. Jag Mohan, Organic Spectroscopy, CRC Press, 2nd Edition, 2004.
8. B. S. Furniss and others, Vogel's Text Book of Practical Organic Chemistry, 5e Paperback, Pearson, 2003.
9. D. Pasto, C. Johnson and M. Miller, Experiments and Techniques in Organic Chemistry, Prentice Hall, Instructor's Edition, 1992.
10. H. T. Clarke revised by B. Haynee, A Hand book of Organic Analysis-Qualitative and Quantitative, Edward Arnold, London, 1975.
11. H. Middleton, Systematic Qualitative Organic Analysis, Edward Arnold, London, 1959.



SEMESTER-IV

Course Name - Organic Chemistry-V (Organic Synthesis)

Course Code - SBS CH 010412 SE 4004

Credits: 4

Course Objective and Learning Outcomes:

To gain an in-depth understanding of various functional group transformations, classical and modern techniques in synthetic chemistry, synthetic planning and targeted synthesis of complex molecules. Detailed information and analysis of common synthetic techniques and methods will be gained. Using this knowledge, exercises on the planning of synthesis of complex scaffolds and targets will be carried out. Breakdown of complex molecules into simple building blocks for synthesis will be learned. A few case studies of total synthesis to understand the actual application of synthetic methods in real life problem solving will also be learned. Students are expected to design retrosynthesis and forward synthesis of complex targets at the end of the course.

UNIT I: FUNCTIONAL GROUP TRANSFORMATIONS USING MISCELLANEOUS REAGENTS

Use of $SOCl_2$, $(COCl)_2$, PBr_3, BBr_3,PPh_3-CX_4, LiBr, NaI, NBS, PPh_3-X_2, Lawesson's reagent, CH_2N_2, $TMSCHN_2$, Achmatowicz reaction, Barbier-Weiland degradation, Chugaev elimination, Finkelstein reaction, Eschenmoser-Tanabe, Ohira-Bestmann reagent.

UNIT II: CLASSICAL AND MODERN METHODS IN SYNTHESIS

Strategies and tactics in total synthesis, overall yield, ideal synthesis, multicomponent reactions (Strecker, Mannich, Passerini and Ugi reactions), cascade and domino reactions, multiple C-C bond forming reactions, CH-activation, asymmetric organocatalysis (proline, NHCs), click chemistry, protecting group free synthesis, green chemistry, biotransfromations, Artificial enzymes in organic synthesis, Reusable reagents, biomimetic synthesis (polyene cyclizations), modern carbonyl chemistry (boron-aldol, modern olefinations).

UNIT III: RETROSYNTHESIS AND DISCONNECTION APPROACH

Concept of retrosynthesis, disconnection approach, introduction to synthons and synthetic equivalents, linear and convergent synthesis, types of transforms, functional group inter-conversions, classification of



disconnections, chemoselectivity, control of stereochemistry, reversal of polarity (umploung), common building blocks, the importance of the order of events in organic synthesis, applications of alkynes, aliphatic nitro compounds, bifunctional compounds, Protecting groups, representative examples for O, N, COOH and carbonyl protection/deprotections.

UNIT IV: CASE STUDIES- TOTAL SYNTHESIS

Detailed case study of the following classical and modern total syntheses: Periplanone B (W. C. Still), Cubane (Pettit), Quinine (G. Stork).

Suggested Readings:

1. S. Warren, Designing Organic Synthesis, Wiley, 2011.
2. F. A. Carey and R. J. Sandburg, Advanced Organic Chemistry Part B, Plenum Press, 2009.
3. T. Hudlický and J. W. Reed, The Way of Synthesis, Wiley VCH-Weinheim 2007.
4. J. March, Advanced Organic Chemistry, Reactions Mechanisms and Structure, John Wiley, 2005.
5. R. O. C. Norman and J. M. Coxon, Principles of Organic Synthesis, Blackie Academic & Professional, 2002.
6. Fhrhop and Penzillin, Organic Synthesis-concept, Methods and Starting Materials, Verlage VCH, 1997.
7. K. C. Nicolaou and E. J. Sorensen, Classics in Total Synthesis, Wiley VCH-Weinheim, 1996.
8. W. Carruthers, Some Modern Methods of Organic Synthesis, Foundation Books, 1995.
9. Fieser and Fieser, Reagents in Organic Synthesis, Wiley, 1993.
10. H. O. House, W.A. Benjamin, Modern Synthetic Reactions, 1990.



SEMESTER–IV

Course Name - Organic Chemistry-VI (Medicinal Chemistry)

Course Code - SBS CH 010413 SE 4004

Credits: 4

Course Objective and Learning Outcomes:

This course will provide a basic understanding and fundamentals of Medicinal Chemistry. At the end of this course, students will learn about the various stages involved in drug discovery & development process and challenges encounter during the course of development of new drug which finally comes into the market, various biological drug targets, drug-target binding, mode of actions of anticancer, antibiotics, psychoactive drugs and its chemical synthesis.

UNIT I: DRUG TARGETS

Introduction to medicinal chemistry, intermolecular binding forces, Introduction to various drug targets; **Proteins**- primary, secondary and tertiary structure, protein function, proteomics; **Enzymes**- catalytic role, active site, allosteric binding, feedback control, binding interactions, isozymes, co-factors; **Receptors**- types of receptors, their roles, neurotransmitters, hormones, receptor activation and regulation; **Nucleic acids**- DNA, primary and secondary structure of DNA, function of DNA, molecular biology and genetic engineering.

UNIT II: DRUG-TARGET BINDING

Introduction to Pharmacodynamics and pharmacokinetics, Enzymes as drug targets- types of enzyme inhibitors, medicinal use of enzyme inhibitors with examples; Receptors as drug targets- agonists, antagonists, allosteric modulators, partial agonists, inverse agonists, desensitization, tolerance and dependence, affinity and efficacy; Nucleic acids as drug targets- Intercalating agents, topoisomersae poisons, alkylating/metallating agents, chain cutters, chain terminators, examples of medicinal use. Miscellaneous drug targets (tubulin)

UNIT III: DRUG DESIGN AND DEVELOPMENT

Development of new drugs, concept of lead compounds and lead modifications, structure-activity relationship (SAR), factors affecting bioactivity, resonance, inductive effect, isosterism, bio-isosterism. Theories of drug activity, Quantitative structure activity relationship, Concepts of drugs receptor, Elementary treatment of drug receptor interactions, Physico-chemical parameters: lipophilicity, partition coefficient, electronic ionization constants, steric factors.



UNIT IV: MODE OF ACTION AND SYNTHESIS

Anticancer Agents: Antineoplastic Agents, cancer chemotherapy, common targets in cancer chemotherapy, role of alkylating agents and antimetabolites in treatment of cancer. Synthesis of any three representative anticancer drugs.

Antiinfective Drugs (antibiotics)*:* Cell wall biosynthesis, inhibitors, β-lactam rings, antibiotics inhibiting protein synthesis, Synthesis of penicillin G, amoxycillin, cephalosporin, ciprofloxacin. Introductory idea of tetracycline and streptomycin.

Psychoactive Drugs: Introduction and general mode of action. CNS depressants, general anaesthgetics, mode of action of hypnotics, sedatives, anti-anxiety drugs, Synthesis of any two representative psychoactive drugs.

Suggested Readings:

1. R. B. Silverman, The Organic Chemistry of Drug Design and Drug Action, 3rd Ed., Academic Press, 2014.
2. J. J. Li, Name Reactions, 5th ed. Springer, 2013.
3. G. L. Patrick, An Introduction to Medicinal Chemistry, 5th Ed., Oxford University Press, 2013.
4. Francis A. Carey and Richard J. Sundberg, Advanced Organic Chemistry, Part A and Part B: Reaction and Synthesis, 5th ed. Springer Verlag, 2012.
5. D. Sriram and P. Yogeshwari, Medicinal Chemistry, 2nd ed., Pearson, 2012.
6. Ed Robert F Dorge, Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry, 12th Ed., 2010.
7. Ed. M E Wolff, Burger's Medicinal Chemistry and Drug Discovery, Vol. 1, 7th Ed., John Wiley, 2010
8. J. H. Hartwig, Organotransition Metal Chemistry: From Bonding to Catalysis, University Science Books, 1st Ed. 2009.
9. P. Knochel, Handbook of Functionalized Organometallics, Volume 1 and 2, Wiley-VCH, 2005.
10. R. H. Crabtree, The Organometallic chemistry of the transition metals, John Wiley, 2005.
11. W. Carruthers and Iain Coldham, Modern Methods of Organic Chemistry, 4th ed. Cambridge University Press, 2004.
12. S. Warren, N. Greeves, J. Clayden and P. Wothers, Organic Chemistry, 2nd ed. Oxford University Press, 2001.
13. S. S. Pandeya and J. R. Dmmock, An Introduction to Drug Design, 1st Ed., New Age International, 1999.
14. R. Norman, J. M. Coxon, Principles of Organic Synthesis, 3rd ed. Chapman & Hall, 1993.



PHYSICAL CHEMISTRY COURSES



SEMESTER-I

Course Name - Physical Chemistry-I (Introduction to Physical Chemistry)

Course Code - SBS CH 010103 C 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide students with a basic understanding of physical chemistry, classical thermodynamics, activity, fugacity, phase rule, essentials of chemical kinetics and principle of quantum mechanics. This course will strengthen the fundamentals of Physical Chemistry, especially thermodynamics and quantum chemistry.

UNIT I: INTRODUCTION TO PHYSICAL CHEMISTRY AND CLASSICAL THERMODYNAMICS

Logarithmic relations, Curve sketching and linear graphs, calculation of slopes, terms of mean and median, Precision and accuracy in chemical analysis, types of error, standard deviation, Numerical Problems. Classical Thermodynamics & its Laws, Maxwell's relations; spontaneity and equilibria; temperature and pressure dependence of thermodynamic quantities like entropy, enthalpy, free energy; Gibb`s-Duhem equation; Clausius-Clapyeron equation,Nernst heat theorem,Chemical potential and Work Function.

UNIT II: ACTIVITY, FUGACITY, PHASE RULE

Concepts of fugacity, fugacity of gases and its determination. Activity and activity coefficient, choice of standard states, determination of activity coefficient for solute and solvent. Phase Rule and its determination, application, Phase diagram for one component system, for two completely miscible components systems like Pb-Ag system, KI+ H_2O system, Bi-Cd system, Ferric chloride + water system, Sodium chloride + water system, Na_2SO_4-H_2O system.

UNIT III: CHEMICAL KINETICS-I

***Introduction to Chemical Kinetics*:** Methods of determining rate laws, Arrhenius equation and its theory, Collision theory, and activated complex theory.

***Chain Reactions*:** Hydrogen-bromine reaction, Pyrolysis of acetaldehyde, Decompositions of ethane. Photochemical reactions (hydrogen-bromine and hydrogen-chlorine reactions). General treatment of chain reaction (hydrogen- bromine reactions), Apparent activation energy of chain reactions, Chain length, Rice-Herzfeld mechanism of organic molecules decomposition (acetaldehyde).

UNIT IV: PRINCIPLES OF QUANTUM MECHANICS

Introduction to Quantum Mechanical Approach, Quantum Mechanical operators, Eigenvalues of Quantum Mechanical operators, Hermitian operator, commutation relations, postulates of quantum mechanics and Uncertainty Principle. Schrödinger equation for finding wave function of a particle, Energy of a particle in One-Dimension box, Extension to Schrödinger equation for finding wave function in a three-dimensional box, Energy of a particle in Three-Dimension box, Energy levels, Eigenvalue, degeneracy and selection rules.



Suggested Readings:

1. H. K. Moudgil, Textbook of Physical Chemistry, PHI Publication House, New Delhi, 2015.
2. Peter Atkins and Julio Paula, Atkins' Physical Chemistry, Oxford University Press; 10th ed., 2014
3. I. N. Levine, Quantum Chemistry, Pearson Education, 7th Ed., 2013.
4. Ira N. Levine, Physical Chemistry, Tata Mcgraw-Hill Education, 6th ed., 2011.Donald Mcquarie and John Simon, Physical Chemistry-A molecular approach, Viva, 1st ed., 2010.
5. R. K. Prasad, Quantum Chemistry, New Age International, 2001.
6. A. K. Chandra, Introductory Quantum Chemistry, Tata McGraw-Hill, 1998.
7. Keith J. Laidler, Chemical Kinetics, Pearson Education, 3rd ed., 1997.



SEMESTER-I
Course Name - Physical Chemistry Practical-I
Course Code - SBS CH 010106 C 0042

Credits: 2

Course Objective and Learning Outcomes:

To train students with introductory physical chemistry practicals like adsorption, saponification value, molecular weight determination, surface tension, viscosity, distribution law and thermochemistry.

At the end of the course students will have first-hand experience of performing simple physical chemistry experiments independently.

UNIT I: (Hands on training in Physical Chemistry Experiments)

Partial Molar Quantities

- To determine the partial molal volume of urea in aqueous solution from density measurements.
- To determine the partial molar volume of ethanol-water mixture at a given composition.

Adsorption

- To determine the adsorption isotherms of acetic acid from aqueous solution by charcoal.
- To study the adsorption of I_2 from alcoholic solution by charcoal.
- To investigate the adsorption of oxalic acid from aqueous solution by activated charcoal and to examine the validity of Freundlich & Langmuir's adsorption isotherms.

Acid and Saponification Value

- To find out the acid value of a given sample.
- To find out the saponification value of given vegetable oil.
- To determine the viscosity of highly viscous liquid.

Molecular Weight of Polymer

- To determine the molecular weight of a given polymeric solution by viscosity method.
- To determine the molecular weight of a given substance i.e. naphthalene and biphenyl by Rast method.

UNIT – II (Basics Physical Chemistry Experiments)

Surface Tension/Interfacial Tension

- To find surface tension/interfacial tension between two immiscible liquids.
- To determine surface tension of given liquid like CCl_4 by number drop method using stalganometer.

- To determine the percentage composition of a given mixture of two liquids say CCl_4 and Toluene by surface tension method.

Viscosity

- To find viscosity of unknown liquids by Ostwald's viscometer method.
- To determine the percentage composition of given unknown mixture by viscosity method.
- To determine the coefficient of viscosity of a liquid such as ethyl acetate with the help of Ostwald viscometer.

Distribution Law

- To study the distribution of benzoic acid between benzene and water at room temperature and show that benzoic acid dimerizes in benzene.
- To determine the distribution coefficient of I_2 between organic liquid and water at a given temperature.
- Study of distribution coefficient of succinic acid between organic liquid and H_2O at a given temp.

Thermochemistry

- To determine the heat of neutralization of sulphuric acid using Dewar's vacuum flask as the calorimeter.
- To determine the heat of ionization of a weak base i.e. NH_4OH using calorimeter.

(Note: Depending on availability of time and equipment's, some experiments may be added/deleted during the semester).

Suggested Readings:

1. Senior Practical Physical Chemistry, B. D. Khosla, V. C. Garg, Adarsh Gulati, R. Chand & Co., New Delhi, 2014
2. Physical Chemistry Practical, Saroj Kumar Maity, Naba Kumar Ghosh, New Central book Agency, 2012.
3. Practical Physical Chemistry, B. Viswanathan, P. S. Raghavan, M V Learning, 2010.
4. Experiments in Physical Chemistry, Shoemaker and Garland, McGraw Hill, 2005.
5. Experimental Physical Chemistry, R. C. Das, B. Behara, Tata McGraw Hill, 1984.
6. Advanced Practical Physical Chemistry, J. B. Yadav, Goel Publishing House, 1981.
7. Practical Physical Chemistry, A. M. James, F. E. Prichard, Lomgman, 1974.
8. B. P. Levitt, Findley's Practical Physical Chemistry, 9th ed. Longman Group Ltd., 1973.



SEMESTER-II

Course Name - Physical Chemistry-II (Quantum Chemistry & Group Theory)
Course Code - SBS CH 010209 C 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide students with an understanding of physical chemistry like quantum approach, enzyme kinetics, unimolecular reactions, principles of symmetry and group theory and non-equilibrium thermodynamics. This course will strengthen the essentials of Physical Chemistry, especially group theory and quantum chemistry.

UNIT I: QUANTUM APPROACH AND APPROXIMATION METHODS

***Harmonic oscillator*:** Application to diatomic molecules and Energy levels.

***Rigid rotator*:** Model for a rotating diatomic molecule and Energy level.

***The Hydrogen atom*:** Schrödinger equation for hydrogen atom and shapes of atomic orbitals.

***Approximate Methods*:** The linear variation principle, Perturbation theory (first order and non-degenerate).

UNIT II: ENZYME KINETICS AND THEORY OF UNIMOLECULAR REACTIONS

***Enzyme Kinetics*:** Kinetics of (one intermediate) enzymatic reaction: Michaelis-Menton treatment, Evaluation of Michaelis's constant for enzyme-substrate binding by line weaver-Burk plot by Dixon and by Eadie-Hofstee methods. Competitive and non-competitive inhibition.

***Unimolecular reactions*:** Dynamics of unimolecular reactions (Lindemann-Hinshelwood and Rice-Ramsperger-Kassel-Marcus [RRKM] theories of unimolecular reactions.

UNIT III: PRINCIPLES OF SYMMETRY AND GROUP THEORY

Symmetry elements and Symmetry operations; Definitions of groups, subgroups, and classes; Symmetry elements in Allene, H_2O_2, Benzene and Ferrocene; Determination of point groups of small molecules and Schönfliesand Hermann-Mauguin Notations; The Great Orthogonality theorem. Character table for point group C_n (C_2v and C_3v), D_n, (n=2 and 3), T_d and O_h.

UNIT IV: NON EQUILIBRIUM THERMODYNAMICS

General theory of non-equilibrium processes, Entropy production and entropy flow; Thermodynamic criteria for non-equilibrium states, Entropy production in heat flow, Mass flow, Electric current, Chemical reactions, Saxen`s relation, Onsager's reciprocity relation, Thermomolecular pressure difference, Electrokinetic phenomenon, Coupled reactions.

Suggested Readings:

1. H. K. Moudgil, Textbook of Physical Chemistry, PHI Publication House, New Delhi, 2015.
2. P. Atkins and J. Paula, Atkins' Physical Chemistry, Oxford University Press; 10th ed., 2014.
3. I. N. Levine, Quantum Chemistry, Pearson Education, 7th Ed., 2013.



4. F. A. Cotton, Chemical Application of Group Theory, John Willey & Sons, 3rd Ed., 2008.
5. C. Kalidas and M. V. Sangaranarayanan, Non-Equilibrium Thermodynamics: Principles & Applications, Macmillan India Ltd., 2002.
6. R. K. Prasad, Quantum Chemistry, New Age International, 2001.
7. A. K. Chandra, Introductory Quantum Chemistry, Tata McGraw-Hill, 1998.
8. K. J. Laidler, Chemical Kinetics, Pearson Education, 3rd ed., 1997.
9. G. Davidson, Group theory for Chemist, Macmillan Physical Science, 1991.
10. A. Katchalsky and P. F. Curren, Non Equilibrium Thermodynamics in Biophysics, Harvard University Press: Cambridge, 1965.



SEMESTER - II

Course Name - Physical Chemistry Practical-II

Course Code - SBS CH 010212 C 0042

Credits: 2

Course Objective and Learning Outcomes:

To provide students exposure of refractometry, chemical kinetics, solution chemistry, turbidity metry, and pH, potentio and conductometry experiments. Advanced experiments such as pH metry, potentiometry and conductometry will be carried out. First-hand experience of turbidity meter studies will be provided. At the end of this course students will be equipped to carry out instrumental analysis at the research level.

UNIT I: CHEMICAL KINETICS AND PH METRY EXPERIMENTS

Refractometry

- Variation of refractive index with composition for a mixture of two organic liquids.
- To determine the molar refractivity of CH_3OH, CH_3COOH, $CH_3COOC_2H_5$ and CCl_4 and calculate the refractive equivalent of C, H and Cl atoms.
- Find out molar refractivity of benzene, toluene, propyl alcohol, butyl alcohol *etc*. and $–CH_2-$ group of homologous series.

Chemical Kinetics

- Determination of the effect of (a) change in temperature, (b) change in concentration of reactants and catalysts (c) ionic strength of the media on velocity constant of hydrolysis of an ester.
- Determination of the rate constant of an ester catalyzed by an acid.
- Determine the velocity constant of hydrolysis of ethyl acetate using sodium hydroxide solution.

Solution Chemistry

- To determine the solubility of an inorganic salt like KCl, NaCl, KNO_3, $NaNO_3$, K_2SO_4 etc. in water at different temperature and hence to obtain the solubility curve.
- To determine the heat of solution of given substance like oxalic acid and benzoic acid by solubility method.

pH Metery

- To determine the strength of strong acid versus strong base, weak acid versus strong base, mixture of strong and weak acids versus strong base, weak acid versus weak base, strong acid versus weak base using a pH meter.
- To determine the concentration of a reductant or an oxidant i.e. Ferrous ammonium sulphate, $K_2Cr_2O_7$and $KMnO_4$ by a pH meteric titration method.
- To determine the amount of KI and KCl present in a mixture by using pH meter.

- To determine the strength of polybasic acid (H_3PO_4 and oxalic acid) with the help of pH meter.

UNIT II: POTENTIOMETRY AND CONDUCTOMETRY EXPERIMENTS

Potentiometery

- To determine the strength of strong acid versus strong base, weak acid versus strong base, mixture of strong and weak acids versus strong base, weak acid versus weak base, strong acid versus weak base using a potentiometer.
- To prepare and test the standard reference electrode i.e. calomel electrode or silver- silver chloride electrode.
- Titrate Mohr's salt against $KMnO_4$potentiometrically and carry out the titration in reverse order.

Turbiditymetry

- To find the turbidity of given solution by using Nephthalo turbidity meter.

Conductometry

- Study of conductometric titration of NH_4Cl versus NaOH solution and comment on the nature of graph.
- Study of conductometric titration of CH_3COONa versus HCl and comment on the nature of graph.
- Study conductometric titration of $MgSO_4$ versus $Ba(OH)_2$ and comment on the nature of the graph.
- Study conductometric titration of $BaCl_2$ and K_2SO_4 and comment on the nature of graph.
- To study stepwise neutralization of polybasic acid *i.e*. oxalic acid, citric acid, succinic acid, phosphoric acid by conductometric titration and explain the variation in the graph.
- To determine the relative strength of two acid mixtures (strong and weak acid) using conductometer.

(Note: Depending on availability of time and equipment's, some experiments may be added/deleted during the semester).

Suggested Readings:

1. B. D. Khosla, V. C. Garg, Adarsh Gulati, Senior Practical Physical Chemistry, R. Chand & Co., New Delhi, 2014.
2. S. K. Maity and N. K. Ghosh, Physical Chemistry Practical, New Central book Agency, 2012.
3. Shoemaker and Gailand, Experiments in Physical Chemistry, McGraw Hill, 2005.
4. R. C. Das and B. Behara, Experimental Physical Chemistry, Tata McGraw Hill, 1984.
5. J. B. Yadav, Advanced Practical Physical Chemistry, Goel Publishing House, 1981.
6. A. M. James and F. E. Prichard, Practical Physical Chemistry, Lomgman, 1974.
7. B. P. Levitt, Findley's Practical Physical Chemistry, 9th ed. Longman Group Ltd., 1973.



SEMESTER-III

Course Name - Molecular Spectroscopy
Course Code - SBS CH 010314 C 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide students with an understanding of the basics of molecular spectroscopy like rotational, vibrational, Raman, electronic and solid state and surface spectroscopy. This course will strengthen the essentials of molecular spectroscopy, especially microwave and infrared spectroscopy.

UNIT I: ROTATIONAL SPECTROSCOPY

Basics of Molecular Spectroscopy

Electromagnetic radiation and its region, representation of spectra, signal to noise ratio, resolving power, width and intensity of spectral lines.

Rotational (Microwave) Spectroscopy

Rotational Spectroscopy-Rigid diatomic Rotator, Selection rule for rotational/microwave spectrum, determination of bond-length, intensity of spectral lines, effects of isotopes on rotational spectra, Non-rigid rotator, Stark effect, Rotational spectra of linear polyatomic molecules, Application of microwave spectroscopy.

UNIT II: VIBRATIONAL AND RAMAN SPECTROSCOPY

Infrared (Vibrational) Spectroscopy

Vibration in Diatomic molecules, Simple Harmonic OscillatorModel,Anharmonic Oscillator, Selection Rule, Population of VibrationalEnergy level, Diatomic Vibrating Rotator, P-Q-R Branches of Spectra, Breakdown of Born Oppenheimer Approximation, Fundamental Vibration and their Symmetry, Overtone andCombination frequency, Applications of Infra-red spectroscopy.

Raman Spectroscopy

Stokes and anti-Stokes lines.Polarizability ellipsoids.Pure Rotational Raman spectra, pure vibrational Raman spectra.Selection rules.Rule of Mutual Exclusion.Polarization of light, Raman Effect, Application of Raman and Infra-red spectroscopy in structure determination.

UNIT III: ELECTRONIC SPECTROSCOPY

Principle of electronic spectroscopy, Total electronic angular momentum, Term symbol.Vibrational Coarse Structure: Progressions, Franck-Condon Principle, Dissociation energy and dissociation products, Rotational fine structure of electronic-vibration transitions, Fortrat diagram, Pre-dissociation.

UNIT IV: SOLID STATE AND SURFACE SPECTROSCOPY

Electronic Energy loss Spectroscopy (EELS), Reflection-Absorption Infrared Spectroscopy (RAIRS), Photoelectron spectroscopy (PES): X-ray PES and Ultra-violet PES, Auger Electron Spectroscopy (AES) and X-ray Fluorescence (XRF).



Suggested Readings:

1. C. N. Banwell and E. M. McCash, Fundamental of Molecular Spectroscopy, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 4th ed., 2017.
2. D. N. Satyanarayana, Handbook of Molecular Spectroscopy: From radio waves to gamma rays, I. K. International Publishing House, New Delhi, 2015.
3. R. Kakkar, Atomic & Molecular Spectroscopy, Cambridge University Press, 2015.
4. J. M. Hollas, Modern Spectroscopy 4th Ed., John Wiley & Sons, 2004.
5. B. E. Warren, X-Ray Diffraction, Dover Publications, 1990.
6. G. E. Bacon, Fifty Years of Neutron Diffraction, Hilger, 1987.
7. J. C. D. Brand and J. C. Speakman, Molecular Structure: The Physical Approach, 2nd Ed., Edward Arnold: London 1975.
8. W. J. Moore, Physical Chemistry, 4th Ed. Prentice-Hall, 1972.
9. R. Chang, Basic Principles of Spectroscopy, McGraw-Hill, New York, N.Y., 1970.



SEMESTER-III

Course Name - Physical Chemistry-III (Statistical Mechanics, Surface and Interface Chemistry)

Course Code - SBS CH 010307 SE 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide students with an understanding of advanced physical chemistry like statistical mechanics and thermodynamics, surface chemistry and electrified interface. This course will strengthen the essentials of Physical Chemistry, statistical mechanics and surface chemistry.

UNIT I: STATISTICAL MECHANICS

Concept of distribution, Thermodynamic probability and most probable distribution, Canonical, grand canonical and micro canonical ensembles. Maxwell-Boltzmann statistics, Boltzmann distribution, Derivation of the Boltzmann distribution expression, Determination of the Boltzmann constant, Maxwell distribution law of velocity from Boltzmann distribution expression, The Bose-Einstein statistics, Statistics of a photon gas, Fermi-Dirac statistics and comparison of three statistics.

UNIT II: STATISTICAL THERMODYNAMICS

Partition function and thermodynamic properties, Factorization of partition function, Relationship of partition function to thermodynamic properties, Translational partition function, Calculation of absolute entropy of an ideal monoatomic gas, Secure-Tetrode equation. Vibrational and rotational partition function of diatomic molecules. Calculation of contribution of vibrational, rotational partition functions towards various thermodynamic properties. Electronic partition function, Effect of change of zero point energy on partition function. Chemical equilibrium and equilibrium constant in terms of partition functions.

UNIT III: SURFACE CHEMISTRY

The extent of adsorption: Physical and Chemisorptions, Adsorption isotherms, Rates of surface processes (adsorption, desorption and mobility on surfaces). BET equation.
Heterogeneous catalysis: Mechanism of heterogeneous catalysis; Langmuir–Hinshelwood mechanism.

UNIT IV: ELECTRIFIED INTERFACES

Thermodynamics of electrified interfaces, Electrocapillary thermodynamics, Non-polarizable interface and Thermodynamic equilibrium. Fundamental thermodynamic equation of polarizable interfaces. Determination of excess charge density on the electrode, electrical capacitance and surface excess of the interface, potential of zero charge, Helmholtz-Perrin model, Gouy-Chapman model, Stern and Devanathan model.

Suggested Readings:

1. B. Bagchi, Statistical Mechanics for Chemistry and Material Science, CRC Press, 2018.
2. R. K. Pathria and Paul D. Beal, Statistical Mechanics, Elsevier III ed., 2016.



3. P. Atkins and J. P. Atkins' Physical Chemistry, Oxford University Press; 10th ed., 2014.
4. D. McQuarie and J. Simon, Physical Chemistry-A molecular approach, Viva, 1st ed., 2010.
5. Terrell L. Hill, An Introduction to Statistical Thermodynamics, Dover Publication, 2008.
6. L. D. Landau and E. M. Lifshitz, Statistical Mechanics, Part I, Butterworth-Heinemann, 3rd ed., 2005.
7. J. M. Bockris and A. K. N. Reddy, Modern Electrochemistry-1 (Ionics), Springer, 2006.
8. D. A. McQuarrie, Statistical Mechanics, Viva Books Pvt. Ltd., New Delhi, 2003.



SEMESTER - III

Course Name - Physical Chemistry-IV (Solid State Chemistry & Electro-Analytical Methods)

Course Code - SBS CH 010308 SE 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide students with an understanding of advanced physical chemistry like electrochemistry, electroanalytical and potentiometric methods and solid state chemistry. This course will strengthen the fundamentals of Physical Chemistry, especially electrochemistry and solid state chemistry.

UNIT I: ELECTROCHEMISTRY-II

Contact adsorption on the electrode, Free energy of contact adsorption, The degree of contact adsorption and the measurement of contact adsorption, The influence of the contact adsorption on the capacity of the interface, Capacity-potential curve, The position of the OHP and the constant capacity, The capacitance hump, Variation of the population of contact-adsorbed ions with electrode charge, The lateral-repulsion model and the water Flip-Flop model of contact adsorption, The contribution of adsorbed water dipoles to the capacity of the interface.

UNIT II: ELECTRO-ANALYTICAL & POTENTIOMETRIC METHODS

Electrode potentials. Polarization (overvoltage) phenomenon and its theories, Description of standard hydrogen electrode, Measurement of potentials, Effect of concentration on cell potential. Concept of Liquid Junction potential. Ohmic potential (IR drop), Reference electrodes (Calomel, Ag/AgCl, Tl/TlCl) Metallic Redox indicator electrode: Membrane and ion selective electrodes: Principle and design. Glass electrode, Gas sensing probes. Enzyme electrode. Principle and applications of potentiometric methods.

UNIT III: SOLID STATE CHEMISTRY-I

Thermal decomposition reactions, Nucleation, Free energy of nucleation: Laws, Classification, Functions and growth of nuclei. Kinetic expressions for diffusion controlled, phase boundary controlled and nucleation and growth controlled reactions. Perfect and imperfect crystals, Intrinsic and extrinsic defects, Point defects, Line and plane defects, Vacancies: Schottky and Frenkel defects, Thermodynamics of Schottky and Frenkel defect formation, Colour centres, non-stoichiometric defects.

UNIT IV: SOLID STATE CHEMISTRY-II



Classification of solids, Lattice energy, Evaluation of Madelung constant (NaCl), Calculation of repulsive potential exponent: Lattice heat capacity. Einstein and Debye model of lattice heat capacity, Debye T^3 law.

Suggested Readings:

1. H. K. Moudgil, Textbook of Physical Chemistry, PHI Publication House, New Delhi, 2015.
2. P. Atkins and J. Paula, Atkins' Physical Chemistry, Oxford University Press, 10th ed., 2014.
3. D. Mcquarie and J. Simon, Physical Chemistry-A Molecular Approach, Viva, 1st ed., 2010.
4. J. M. Bockris and A. K. N. Reddy, Modern Electrochemistry 1 (Ionics), Springer, 2006.
5. J. O. M. Bockris and A. K. N. Reddy, Modern Electrochemistry II, Springer, 2006.
6. L. E. Smart, E. A. Moore, Solid State Chemistry-An Introduction, 3rd Ed., CRC Press, 2005.
7. A. R. West, Basic Solid State Chemistry, 2nd Ed., John Wiley & Sons, 2000.



SEMESTER - III

Course Name - Physical Chemistry Practical-III

Course Code - SBS CH 010309 SE 0084

Credits: 4

Course Objective and Learning Outcomes:

To provide students exposure of solution chemistry, phase rule, spectrophotometry, polarimetry, ultrasonic interferometry and pH metry, potentiometry and conductometry experiments. Advanced experiments such as ultrasonic interferometer and spectrophotometer will be carried out. First-hand experience of polarimeteric studies will be provided. At the end of this course students will be equipped to carry out instrumental analysis at the research level.

UNIT I: CONDUCTOMETRY, pH METRY AND SPECTROPHOTOMETRY

Conductometry

- Determination of the equivalent conductance of strong electrolytes such as HCl, KCl, KNO_3, $AgNO_3$ and NaCl and the validity of Onsager equation.
- Determination of the solubility of lead sulfate and silver halides.
- Conductometric titration of Strong acid *vs*. strong base, weak acid *vs*. strong base, Strong acid *vs*. weak base, weak acid *vs*. weak base using conductivity meter.
- To find CMC value of a given surfactant solution.

pH Metry

- Acid base titration of a non-aqueous media using pH meter.
- Determination of dissociation constant of acetic acid in DMSO, DMF, acetone and dioxane by titrating it with KOH.
- To determine the strength of strong acid versus weak base (NH_4OH), weak acid versus weak base, strong and weak acid mixture against a weak base using a pH meter.
- To determine the thermodynamic parameter for a reaction from pH measurement.
- To prepare a series of buffer solution and to check resist in its pH value by pH meter method.
- To determine the degree of hydrolysis and hydrolysis constant of aniline, acetic acid by pH metrically.

Colorimetry/Spectrophotometry

- Determine the concentration of Crystal violet and Aurine in mixture of (Crystal violet + Aurine) solution.
- To determine the dissociation constant (K_a)of Methyl red using UV-visible absorption spectrophotmeter.
- Verification of Beer law using solutions such as I_2 in CCl_4, and $CuSO_4$ in water, $K_2Cr_2O_7$ and $KMnO_4$ in sulphuric acid medium.

Polarimetery

- To determine the concentration of an optically active substance.

- To determine the percentage of two optically active substances in a given mixture.

Solution Chemistry

- Determination of Solubility by evaporation method.
- Determination of Solubility by gravimetric method.
- Determination of transition temperature by thermometric method.

UNIT II: PHASE RULE AND POTENTIOMETRY EXPERIMENTS

Phase Rule

- To verify the phase rule for a given two and three component Azeotropic mixtures.
- To determine the transition temperature of given salt hydrate like Sodium sulphate, Strontium sulphate or Sodium thiosulphate.
- To determine the critical solution temperature of phenol water system.

Potentiometry

- To determine the thermodynamic parameters for a reaction from EMF measurement.
- To determine the formal potential of a redox couple, $Fe(CN)_6^{3-}/Fe(CN)_6^{4-}$ in different media.
- To determine the pH of a series of buffer solutions by potentiometric method.
- To determine the solubility product of AgCl and to determine instability constant of $Ag(NH_3)_2^+$ complex.
- To determine the activity of hydrogen ion in acid medium using hydrogen electrode, hence to determine the ionic product of water and hydrolysis constant of sodium acetate.
- To determine the degree of hydrolysis and hydrolysis constant of aniline, weak acid by potentiometry.
- To determine the concentration of a reductant or an oxidant i.e. Ferrous ammonium sulphate and Ceric sulphate by a potentiometric redox titration.
- To determine the amount of KI and KCl present in a mixture by potentiometric titration.

Ultrasonic Interferometer

- To find ultrasonic speed of given organic binary liquid mixtures of different composition.
- To study the effect of temperature on ultrasonic speed of given organic mixture.

(Note: Depending on availability of time and equipment's, some experiments may be added/deleted during the semester).

Suggested Readings:

1. Senior Practical Physical Chemistry, B. D. Khosla, V. C. Garg, Adarsh Gulati, R. Chand & Co., New Delhi, 2014.
2. S. K. Maity and N. K. Ghosh, Physical Chemistry Practical, New Central book Agency, 2012.
3. Practical Physical Chemistry, B. Viswanathan, P. S. Raghavan, M V Learning, 2010.
4. Experiments in Physical Chemistry, Shoemaker and Gailand, McGraw Hill, 2005.
5. R. C. Das, B. Behara, Experimental Physical Chemistry, , Tata McGraw Hill, 1984.



6. Advanced Practical Physical Chemistry, J. B. Yadav, Goel Publishing House, 1981.
A. M. James, F. E. Prichard, Practical Physical Chemistry, Lomgman, 1974.
B. P. Levitt, Findley's Practical Physical Chemistry, 9th ed. Longman Group Ltd., 1973.

SEMESTER-IV

Course Name - Physical Chemistry-V (Polymer & Surface Chemistry)
Course Code - SBS CH 010414 SE 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide students with an understanding of advanced physical chemistry like polymer chemistry, polymer characterization and chemistry of surfactants. This course will strengthen the fundamentals of Physical Chemistry, especially polymer chemistry and chemistry of surfactants.

UNIT I: POLYMER CHEMISTRY

Classification of polymers, Polymerization: Condensation, Addition, Radical chain, Ionic, Coordination and Co-polymerization. Polymerization conditions and polymer reactions. Polymerization in homogeneous and heterogeneous systems. Kinetics of polymerization. Polydispersion-average molecular weight concept. Number, weight and viscosity average molecular weights. Polydispersity and molecular weight distribution.

UNIT-II: POLYMER CHARACTERIZATION

The practical significance of molecular weight. Measurement of molecular weights: End-group, Osmotic and Ultracentrifugation methods. Analysis and testing of polymers: Chemical analysis of polymers, Spectroscopic methods and Microscopy. Thermal analysis and physical testing: Tensile strength, fatigue, impact, tear resistance and hardness and abrasion resistance.

UNIT–III: CHEMISTRY OF SURFACTANTS-I

Adsorption of surface active agents at Solid/Liquid, Liquid/Gas and Liquid/Liquid interfaces. Mechanism of adsorption, adsorption isotherm, effects of adsorption from aqueous solution on the surface properties of solid adsorbent, adsorption from non-aqueous solution. Determination of surface areas of solids. Gibb's and BET adsorption equation and its utilization to calculate surface concentration and surface area per molecule.

UNIT-IV: CHEMISTRY OF SURFACTANTS-II

Critical micelle concentration (CMC), Methods of determining CMC, Factors affecting CMC, Micellar structure and shape, Micellar aggregation. CMC in non-aqueous media. Thermodynamic parameters of micellization.



Effectiveness of adsorption at Liquid/Gas and Liquid/Liquid interfaces, Szyszkiwski, Langmuir and Frumkin adsorption equations. Derivation of thermodynamics parameters of adsorption at the Liquid/Gas and Liquid/Liquid interfaces.

Suggested Readings:

1. V. R. Gowariker, N. V. Viswanathan and J. Sreedhar, Polymer Science, New Age Internat. Pvt. Ltd., 2015.
2. F. W. Billmeyer Jr., Textbook of Polymer Science, Wiley India Pvt. Ltd., 2014.
3. M. J. Rosen, Surfactants and Interfacial Phenomenon, 4th ed., Wiley, 2012.
4. P. Becher, Emulsions: Theory and Practice, American Chemical Society, 2011.
5. H. R Alcock and F. W. Lamb, Contemporary Polymer Chemistry, Prentice Hall, 2011.
6. J. M. G. Cowie, Physics and Chemistry of Polymers, Blackie Academic and Professional, 2004.
7. F. Wold, Macromolecules: Structure and Function, Prentice Hall of India, 2001.
8. K. Takemoto, R. M Ottanbrite and M. Kamachi, Functional Monomers and Polymers, 2nd Ed., CRC press, 1997.



SEMESTER-IV

Course Name - Physical Chemistry-VI (Applied Electrochemistry)
Course Code - SBS CH 010415 SE 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide students with an understanding of applied physical chemistry like electrodics, fuel cell and batteries, current potential laws and corrosion of metals and their alloys. This course will strengthen the applications of Physical Chemistry, especially fuel cells and batteries and corrosion.

UNIT I: ELECTRODICS

Rate of charge transfer reactions under zero field, under the influence of an electric field. The equilibrium exchange current density, the non-equilibrium drift-current density (Butler-Volmer) equation. High-field and low-field approximations. Physical meaning of the symmetry factor (β), A simple picture of the symmetry factor and its dependence on over potential. Polarizable and nonpolarizable interfaces.

UNIT II: FUEL CELLS AND BATTERIES

The maximum intrinsic efficiency, Actual efficiency and Current-Potential relation in an electrochemical energy converter. Factors influencing the electrochemical energy conversion, The power output of an electrochemical energy converter. Electrochemical electricity generators (fuel cells). Brief idea about H_2-O_2 fuel cell, Hydrocarbon-air fuel cells, and Natural gas, CO-air fuel cells, Electricity storage: Some important quantities in electricity storage (like electricity storage density, energy density and power), Desirable conditions for an ideal storer, Storage of electricity using the lead-acid battery, Dry cell, Silver-Zinc cell and Sodium-Sulfur cell.

UNIT III: CORROSION

Electrochemistry of corrosion of metals, Factors affecting corrosion, Electrochemical cell formation, Polarization of metal electrode *i.e*. Concentration, Resistance and Activation polarization. Anodic and cathodic polarization curves (Evan's diagram). Electrochemical measurement of corrosion current density, corrosion potential and mixed potential theory and Tafel slope. Anodic passivation and passivation potential. Passivity theory. Methods of protecting metal and their alloys from corrosion (anodic protection, cathodic protection, sacrificial protection, barrier protection, use of chemical inhibitors, environment modifiers).

UNIT IV: CURRENT POTENTIAL LAWS

Application of the current-potential laws, Comparison of electrolytic interface to other type of charged interfaces *i.e.* semiconductors *p-n* junctions. The current across biological membranes, Hot and cold emission of electrons from a metal into vacuum.



Suggested Readings:

1. M. G. Fontana, Corrosion Engineering, McGraw Hill Ed., 2017.
2. H. K. Moudgil, Textbook of Physical Chemistry, PHI Publication House, New Delhi, 2015.
3. S. Glasstone, An introduction to Electrochemistry, Est West Press Ltd., 2006.
4. J. O. M. Bockris and A. K. N. Reddy, Modern Electrochemistry-I, Springer, 2000.
5. R. Narain, An Introduction to Metallic Corrosion, Oxford and IBH Pub Co., 1983.



DISCIPLINE CENTRIC ELECTIVE COURSES (DCEC)



SEMESTER-I

Course Name - Household and Applied Chemistry
Course Code - SBS CH 010101 DCEC 2002
Credits: 2

Course Objective and Learning Outcomes:

The course is designed to introduce student about the basic use of chemicals in everyday life. We will make the subject interesting and students can develop his skill towards applied sciences.

UNIT I: HOUSEHOLD CHEMICALS

Household chemicals like floor cleaner, toilet cleaner, food additives and preservatives, tooth paste, mouth wash, shaving cream, after shave, perfumes, deordants, etc. Fire Extinguishers and its types, Antibiotics and Antiseptic drugs, Amino acids and Proteins, carbohydrates.

UNIT II: OIL, FAT, SOAP AND WAX

Chemical composition, constitution and cleaning action of the soap and detergents. Difference between soaps and detergents. Saturated and unsaturated fats, good and bad cholesterol, Waxes and its types.

UNIT III: COSMETICS

Creams, powders, fragrances, lipsticks, eye and facial makeup, hair colors, dental oral sprays and gels, deodorants, hands sanitizer their chemical compositions and applications.

UNIT IV: PAINTS AND VARNISH

Definition, classification and types of varnishes. Ingredients in paints and varnishes. Paint choice and surface preparation.

Suggested Readings:

1. F. Wold, Macromolecules: Structure and Function, Prentice Hall, 2009.
2. I. L. Finar, Organic Chemistry, Vol-1, 6th ed., Pearson, 2005.
3. V. P. Sharma, Bio-Organic Chemistry, ed. XI, Pragati Prakshan, 2002.



SEMESTER-I

Course Name - Reaction Mechanism: Structure and Reactivity

Course Code - SBS CH 010102 DCEC 2002

Credits: 2

Course Objective and Learning Outcomes:

To provide the advance knowledge of Physical Organic Chemistry. At the end of this course, students will learn about the structure, synthesis and stability of various reactive intermediates, thermodyanamic and kinetic approach of product formation, various methods determining an organic reactions and stereoelectronic effects in organic Chemistry

UNIT I: REACTIVE INTERMEDIATES

Introduction to structure, formation, stability and reactions of carbocations, carbanions, free radicals, radical anions, radical cations, arynes, carbenes and nitrenes.

UNIT II: CHEMICAL EQUILIBRIA AND CHEMICAL REACTIVITY

Thermodynamic and kinetic control of reactions, Correlation of reactivity with structure, linear free energy relationships, substituent constants and reaction constants. Hammond's postulate; Curtin-Hammett principle.

UNIT III: KINETICS AND NON-KINETIC METHODS TO STUDY MECHANISM

Kinetic methods: primary and secondary kinetic isotopic effects; non-kinetic methods: study of intermediates, isotopic labeling, stereochemical studies and cross over experiments.

UNIT IV: STEREOELECTRONIC EFFECTS IN ORGANIC CHEMISTRY

Reactions at sp^3, sp^2, and sp carbons (Baldwin's rule); Allylic starin ($A^{1,2}$ and $A^{1,3}$) and other strains.

Suggested Readings:

1. F. A. Carey and R. J. Sundberg, Advanced Organic Chemistry, Part A, 5th ed., Springer, 2012.
2. E. V. Anslyn and D. A. Dougherty, Modern Physical Organic Chemistry, University Science Books, 2005.
3. Warren, S.; Greeves, N.; J. Clayden and P. Wothers, Organic Chemistry, 2nd ed., Oxford University Press, 2001.
4. J. March, Advanced Organic Chemistry, Reactions, Mechanisms and Structure, 4th ed., John-wiley, 1999.

5. N. S. Isaacs, Physical Organic Chemistry, 2nd ed., Longman Scientific & Technical, 1995.
6. P. Sykes, A guide book to Mechanism in Organic Chemistry, 5th ed., Longman Scientific Technical, 1985.
7. P. Deslongchamps, Stereoelectronic Effects in Organic Chemistry, Pergamon, 1983.



SEMESTER-I

Course Name - Chemistry of Nutraceuticals

Course Code - SBS CH 010103 DCEC 2002

Credits: 2

Course Objective and Learning Outcomes:

To provide the basic knowledge and understanding of nutraceuticals and chemistry involved. At the end of this course, students will learn about the history, source, occurrence, chemistry, metabolism, scope and future perspective of nutraceuticals.

UNIT I: INTRODUCTION

Introduction of nutraceuticals, Historical perspective, classification, Sources of Nutraceuticals, Scope & future prospects.

UNIT II: CHEMISTRY OF CARBOHYDRATES

Structure, Function, Classification, Glycogen metabolism, its breakdown, glycogen storage diseases, Glycolysis, gluconeogenesis

UNIT III: PROTEIN AND ITS DISTRIBUTION

Essential and nonessential amino acids, classification, denaturation of proteins, Metabolic breakdown and synthesis of amino acids, Distribution of proteins, amount and type of proteins in food groups, vegetable proteins, proteins of egg, fish, milk, soya, Storage proteins of cereals and legumes, anti-freeze proteins, stress proteins.

UNIT IV: LIPIDS AND NUCLEIC ACIDS

Classification, saturated and unsaturated, essential fatty acids, structure and function of acylglycerols, phospholipids, sphingolipids, glycolipids, steroids

Nucleic Acids: Structure of nucleotides, DNA, forms of DNA, replication, transcription and translation

Suggested Readings:

1. W. R. Victor, A. B. David, M. B. Kathleen, J. K. Peter and P. A. Weil, Harpers Illustrated Biochemistry, 31st ed., Lange, 2015.
2. J. Clayden, B. Greeves and S. Warren, Organic Chemistry, second ed., Oxford University Press, 2012.
3. D. L. Nelson, M. M. Cox, Lehninger Principles of Biochemistry, 7th ed., W.H. Freeman & Com, 2012.
4. P. Y. Bruce and K. J. R. Prasad, Essential Organic Chemistry, Pearson Education, New Delhi, 2008.



SEMESTER-II

Course Name - Green and Sustainable Chemistry
Course Code - SBS CH 010204 DCEC 2002

Credits: 2

Course Objective and Learning Outcomes:

To provide the knowledge and understanding of principles and concept of Green Chemistry. At the end of this course, students will learn about the sustainable development, catalysis and renewable raw materials and use of alternative solvents towards the development of green technology and alternative energy.

UNIT I: PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY

Chemistry in the context of sustainable development, Current status and future perspective. The twelve principles of Green Chemistry.

UNIT II: CATALYSIS AND RENEWABLE RAW MATERIALS

Introduction to catalysis. Homogeneous and Heterogeneous catalysis, Phase-transfer catalysis and Biocatalysis. Chemical products based on renewable sources.

UNIT III: ALTERNATIVE SOLVENTS

Volatile organic compounds (VOCs) Supercritical fluids. Alternatives in extraction and chromatography. Ionic liquids as solvents: its types, properties and applications.

UNIT IV: GREEN TECHNOLOGY AND SOURCES OF ALTERNATIVE ENERGY

Photochemical and Electrochemical reactions. Reactions under Microwave, sonication and ball milling. Flow techniques.

Suggested Readings:

1. S. E. Manahan, Fundamentals of Environmental Chemistry, 3rd ed., CRC Press, 2009.
2. R. A. Sheldon, I. Arends and U. Hanefeld, Green Chemistry and Catalysis, 1st ed., Wiley-VCH, 2007.
3. V. K. Ahluwalia and M. Kidwai, New Trends in Green Chemistry, 1st ed., Springer, 2004
4. T. Clifford, Fundamentals of Supercritical Fluids, 1st ed., Oxford press, 1999.
5. C.-J. Li, T.-K. Chan, Organic Reactions in Aqueous Media, 1st ed., Wiley-Interscience, New York, 1997.



SEMESTER-II

Course Name - Introduction to Nanomaterials
Course Code - SBS CH 010205 DCEC 2002
Credits: 2

Course Objective and Learning Outcomes:

This course is designed to give exposure of nanomaterials and chemistry of it to the fresh postgraduate students. Many important nanomaterials such as graphene, carbon nanotubes, nanorods etc, their classification, synthesis, characterization and applications would be introduced to the students.

UNIT I: INTRODUCTION

Nanomaterials: An Introduction. Nanomaterials and Nanocomposites. Elementary Consequences of Small Particle Size - Surface of Nanoparticles. Classification of nanomaterials - one dimensional (1D)-two dimensional (2D)-three dimensional (3D) nanomaterials.

UNIT II: SYNTHESIS

Gas-Phase Synthesis of Nanoparticles - Physical and Chemical Vapor Synthesis Processes.Radio- and Microwave Plasma Processes. Flame Aerosol Process. Synthesis of Coated Particles.

UNIT III: CHARACTERIZATION

Characterization of Nanomaterials: Global Methods for Characterization, X-Ray and Electron Diffraction, Electron Microscopy, Scanning Transmission Electron Microscopy.

UNIT IV: NANOTUBES, NANORODS, AND NANOPLATES

Introduction of Nanotubes, Nanorods, and Nanoplates, One-Dimensional Crystals, Carbon Nanotubes and Graphene, Nanotubes and Nanorods from Materials other than Carbon, Synthesis of Nanotubes and Nanorods.

Suggested Readings:

1. D. Vollath, Nanomaterials: An Introduction to Synthesis, Properties and Applications, 2nd Ed., Wiley-VCH, 2013.
2. D. C. Agarwal, Introduction to Nanoscience and Nanomaterials, World Scientific, 2013.



SEMESTER-II

Course Name - Analytical Techniques in Chemistry
Course Code - SBS CH 010206 DCEC 2002
Credits: 2

Course Objective and Learning Outcomes:

To provide the advance knowledge various analytical techniques in Chemistry. At the end of this course, students will learn various methods of analytical chemistry such as thermal, imaging and chromatographic techniques.

UNIT I: THERMAL METHODS

Principle, instrumentation of TGA, DTA, and DSC. Effect of heat on Materials, Chemical decomposition and T. G. Curves, Analysis of T.G. curve to show nature decomposition reactions, the product and qualities of compounds expelled, T.G. in controlled atmosphere, applications. DTA, instrumentation and Methodology, applications.DSC, theory, instrumentation and applications. Thermometric titrations method and applications.

UNIT II: IMAGING TECHNIQUES

An introduction to microscopy, the transmission and scanning electron microscope, electron optics, TEM specimens preparation and imaging system, kinematics of scattering by atomic nucleus, electron electron scattering, dynamics of scattering, electron diffraction pattern, operating principle of SEM, penetration of electron in solids, secondary electron images backscattered electron images, SEM operating conditions and specimen preparation, electron beam lithography.

UNIT III: CHROMATOGRAPHIC TECHNIQUES

Theory, instrumentation and applications of: Exclusion chromatography, gel permeation, retention behavior, inorganic molecular sieves, determination of molecular weight of polymers. Super Critical fluid Chromatography, Inverse gas chromatography, Affinity Chromatography

UNIT IV: ANALYSIS OF METAL, ALLOYS, SOIL AND FERTILIZERS

Foundry materials, analysis of coal, ferroalloys, and special steels, slags, fluxes, brass and bronze. Method of soil analysis, soil fertility its determination, determination of inorganic constituents of plant materials, Chemical analysis as measure of soil fertility, analysis of fertilizers.

Suggested Readings:

1. G. D. Christian, Analytical Chemistry, 7th ed., Wiley, 2014.
2. R. F. Egerton, Physical Principles of Electron Microscopy: An Introduction to TEM, SEM and AFM, 2013
3. H. H. Willard, L. L. Merritt, J. A. Dean and F. A. Settle, Instrumental methods of analysis, 7th ed., 2010.
4. T. Braun and G. Ghersene, Extraction chromatography, Elsevier, 2002



5. D. A. Skoog, D. M. West, R. J. Holler and T. A. Nieman. Principles of Instrumental Analysis, 5th ed., Neiman, 2001
6. S. M. Khopkar, Concepts in analytical Chemistry, 1995

SEMESTER-II

Course Name - Computational Chemistry
Couse Code - SBS CH 010207 DCEC 2002
Credits: 2

Course Objective and Learning Outcomes:

To provide the basic knowledge of computational Chemistry. At the end of this course, students will learn various parameters and software involved in computational Chemistry and its application towards understanding the stability of molecules and proposing its reaction mechanism.

UNIT I: INTRODUCTION TO COMPUTATIONAL CHEMISTRY

Computational chemistry map, scope of computational chemistry, Born-Oppenheimer approximation, idea of self-consistency, restricted and unrestricted Hartree-Fock.

UNIT II: DENSITY FUNCTIONAL THEORY

Electron density, exchange-correlation functional, local Density approximation, generalized gradient approximation, hybrid density functional methods, self-Interaction corrections.

UNIT III: BASIS SETS AND POTENTIAL ENERGY SURFACES

Definition of basis sets, Slater and Gaussian type orbitals, minimal, double-zeta, split-valence, core-valence, Pople style basis Sets, polarization and diffuse functions, calculation of basis functions, pseudopotentials or effective core potentials, choice of basis bets.

UNIT IV: BASIC CONCEPTS OF POTENTIAL ENERGY SURFACES

Stationary Points, geometry optimization, local and global minima, and transition state theory.
Computations of single point energy, optimizations and transition states of polyatomic molecules, intrinsic reaction coordinate analysis.

Suggested Readings:

1. J. B. Foresman and A. Frisch, Exploring Chemistry with Electronic Structure Methods, 2nd ed., Gaussian Inc., 2015.
2. F. Jensen, Introduction to Computational Chemistry, John Wiley & Sons, 2007
3. C. J. Cramer, Essentials of Computational Chemistry: Theories and Models, 2nd ed., John Wiley & Sons Ltd, 2004.
4. C. J. Cramer, Essentials of Computational Chemistry: Theories and Models, 2nd ed., John Wiley & Sons Ltd, 2002.
5. D. A. McQuarrie, Physical Chemistry: A molecular Approach, 1st ed., University Science Books, 1997.



SEMESTER-II

Course Name - Carbohydrate Chemistry and its Applications
Course Code - SBS CH 010208 DCEC 2002
Credits: 2

Course Objective and Learning Outcomes:

To understand the chemistry of carbohydrates and their reactions in addition to their importance.

At the end of this course, students will acquire the knowledge of different classes of carbohydrates. They will also learn about the chemical, physical and stereochemical aspects of carbohydrates in addition to their applications.

UNIT I: CARBOHYDRATES-I

Introduction and biomedical Importance, Classification: Monosaccharides, oligosachharides and polysaccharides, Sugars and non-sugars, Reducing and non-reducing sugars.

Monosaccharides: Nomenclature, Structural representation, Isomerism. Physical and chemical properties of some important monosaccharides including stereochemical aspects wherever needed.

UNIT II: CARBOHYDRATES-II

Synthesis of glucose and fructose.

Oligosaccharides: Nomenclature and important terminology, Structural representation, Isomerism, physical and chemical properties of some important disaccharides (lactose, maltose and sucrose).

UNIT III: CARBOHYDRATES-III

Polysaccharides: Nomenclature and important terminology, Homo and heteroploysaccharides, Structural representation. Physical and chemical properties of some important polysaccharides (Cellulose, Starch, Chitin). Glycolysis: Metabolism of Glucose.

UNIT IV: CARBOHYDRATE-IV

Applications: Importance of monosaccharides and their derivatives like deoxy sugars, glycosides, myoinositol, amino sugars, *N*-acetylmuramic acid, sialic acid in different fields. Importance of oligosaccharides and polysaccharides in different sectors. Artificial sweeteners: Synthesis and importance

Suggested Readings:

1. P. Y. Bruice, Organic Chemistry, 5th Edition, Pearson, 2014.
2. M. Sinnott, Carbohydrate Chemistry and Biochemistry: Structure and Mechanism, 2nd Edition, Royal Society of Chemistry, 2013.
3. P. Y. Bruce and K. J. R. Prasad, Essential Organic Chemistry, Pearson Education, New Delhi, 2008.
4. T. K. Lindhorst, Essentials of Carbohydrate Chemistry and Biochemistry, 3rd Edition, Wiley, 2007.
5. L. Nelson, M. M. Cox and W. H. Freeman, Lehninger Principles of Biochemistry, 4th edition, 2004.
6. M. Loudon, Organic Chemistry, Oxford University Press, New Delhi, 2002.



SEMESTER-II

Course Name - Nanoparticulate Drug-Delivery Systems
Course Code - SBS CH 010209 DCEC 2002
Credits: 2

Course Objective and Learning Outcomes:

To provide students exposure about various drug molecules and how they are delivered using improvised delivery vehicles made of various nanomaterials.

UNIT I: NANOPARTICULATE DRUG-DELIVERY SYSTEMS

Introduction, methods of measurements and characterization of nanomaterials, manufacture of nanomaterials, drug-delivery systems, some commercially available nanoparticles.

UNIT II: DRUG NANOCRYSTALS

The universal formulation approach for poorly soluble drugs-Definition, physicochemical properties of drug nanocrystals, potential clinical advantages of drug nanocrystals, particle size reduction techniques, final formulations for drug nanocrystals.

UNIT III: BIOLOGICAL REQUIREMENTS FOR NANOTHERAPEUTIC APPLICATIONS

The chemical compositions of cells, fabrication of nanodevices, nanotherapeutic devices, requirements for nanotherapeutic applications.

UNIT IV: PHARMACEUTICAL APPLICATIONS

Advantages of nanoparticulate drug-delivery systems, nanoparticulate drug-delivery systems for proteins and peptides, nanoparticulate drug-delivery systems for central nervous system, nanoparticulate drug-delivery systems for enzymes, nanoparticulate drug delivery in cancer treatment, nanoparticulate systems: known and unknown risks.

Suggested Readings:

1. Y. Yeo; Nanoparticulate Drug Delivery Systems: Strategies, Technologies, and Applications, John Wiley & Sons, Inc., Hoboken, New Jersey, 2013.
2. Y. Pathak and D. Thassu; Drugs and Pharmaceuticals Sciences: Drug Delivery Nanoparticles Formulation and Characterization, Volume 191, Informa Healthcare, New York, 2009.
3. D. Thassu, M. Deleers and Y. Pathak; Drugs and Pharmaceuticals Sciences: Nanoparticulate Drug-Delivery Systems, Volume 166, Informa Healthcare, New York, 2007.



SEMESTER-III

Course Name - Waste Management
Course Code - SBS CH 010310 DCEC 4004

Credits: 4

Course Objective and Learning Outcomes:

The course is designed to understand the nature of human induced environmental pollutions like waste, its significance, sources, compositions and types. Initiate waste to energy initiatives for integrated/sustainable waste management options.

UNIT I: BIODEGRADABLE SOLID WASTE

Biodegradable solid waste: Chemical composition and classification: Source and generation: Health hazards: Management Techniques

UNIT II: NON-BIODEGRADABLE SOLID WASTE

Non-Biodegradable Solid waste: Sources, generation, chemical composition, classification of plastic waste and its management: Sources, generation, chemical composition, classification of e-waste and its management.

UNIT III: HOSPITAL AND PHARMACEUTICAL WASTE

Hospital and Pharmaceutical Waste: Classification: Source and generation: Health hazards: Management Techniques

UNIT IV: WASTE MINIMIZATION TECHNOLOGIES

Waste minimization technologies: Reuse/ recycling of different types of waste: Metal recovery from waste using chemical, biological and hybrid techniques

Suggested Readings:

1. D. Pant, D. Joshi, M. K. Upreti and R. K. Kotnala, Chemical and Biological Extraction of Metals Present in E Waste: A Hybrid Technology, Waste Management, Elsevier Science, Vol. 32, pg. 979-990, 2012.
2. D. Pant, R. Singh, S. Kumar, Management of Waste Poly Vinyl Chloride (PVC) through Chemical Modification, ScInd Res., Vol. 71, pg. 181-186, 2012.



3. D. Pant, Waste Management in Small Hospitals Trouble for Environment, Environmental Monitoring and Assessment, Springer, 2011.
4. D. Pant, Pharmaceutical Waste Management, Lambart Academic, 2011.
5. D. Pant, Electronic Waste Management Lambart Academic Publishing, 2010.
6. Frank Kreith, Handbook of Solid Waste Management, McGraw-Hill, Inc., New Delhi, 1994.
7. M. Roy III. Harrison, Pollution; Causes, Effects and Control. The Royal Society of Chemistry, Cambridge, 1994.
8. John R. Holmes, Practical Waste Management, John Wiley & Sons, New York/Singapore, 1983.

SEMESTER-III

Corse Name - Chemistry of Toxic Substances

Course Code - SBS CH 010311 DCEC 4004

Credits: 4

Course Objective and Learning Outcomes:

The course is designed to introduce students to the fundamental concepts of toxic and hazardous waste; provide knowledge about the identification of various toxic and hazardous waste, and introduce Management techniques for toxic and hazardous waste.

UNIT I: PHYSICAL AND TOXIC PROPERTIES OF CHEMICAL SUBSTANCES INCLUDING HAZARDOUS WASTE

Pathway of entry, Detoxication, Bioactivation, Vapor pressure, Vapor density, Solubility

UNIT II: TOXIC AND HAZARDOUS CHARACTERISTIC VARIOUS ORGANIC CHEMICALS

Acids, Aldehydes, Amines, Dioxins, Ethers, Cyanides.

UNIT III: COMMON TOXIC AND FLAMMABLE GASES AND CANCER-CAUSING CHEMICALS

Hydrogen, Carbon mono and dioxide, Nitrogen Oxide, Concept of carcinogenesis, Mechanism of chemical carcinogens, Human carcinogens

UNIT IV: HAZARDOUS PROPERTIES OF SOME CHEMICALS AND MANAGEMENT TECHNIQUES

Arsenic, Cadmium, Lead, Mercury, Insecticides, Asbestos, Flyash, Ozone and PAN pesticides, Chemical and Biological agents including warfare Agents, Management techniques for toxic and hazardous waste.

Suggested Readings:

1. P. Patnaik, A Comprehensive Guide to the Hazardous Properties of Chemical Substances (3rd ed.) John Wiley & Sons, Inc., Hoboken, New Jersey, 2015.
2. Healtth Hazards of Environmental Arsenic Poisoning, Imperial College Press. (ISBN 978-981-4291-81-1), 2015.
3. H. K., Moffatt and Shuckburgh, Environmental Hazards, Imperial College Press, 2012.



4. C. Oloman, Material and Energy Balance for Engineers and Environmentalist, Imperial College Press, 2009.
5. T. F. Yen, Chemical Processes for Environmental Engineering, Imperial College Press, 2007.
6. C. N. Madu, Environmental Planning and management, Imperial College Press, 2004.
7. L. C. Batty and K. B. Hallberg, Ecology of Industrial Pollution, Cambridge University press, New Delhi, 2002.



SEMESTER-III

Course Name - Environmental Chemistry
Course Code - SBS CH 010312 DCEC 4004

Credits: 4

Course Objective and Learning Outcomes:

The course is designed to introduce students to the fundamental concepts of analytical techniques environmental chemistry; provide knowledge about various kinds of quantitative techniques; and introduce computation of analytical results, significant figures, concept of error, precision and accuracy, standard deviation, rejection of doubtful values.

UNIT I: FUNDAMENTAL CONCEPTS

Parameters for monitoring**,** Environmental Divisions**,** Natural Cycles

UNIT II: CHEMISTRY OF AIR

- Introduction
- Air Pollutants and its source
- Toxic effects of Carbon monoxide, Nitrogen Oxide, Sulphur Oxides.
- Acid rain
- Depletion of Ozone Layer
- Particulate matter (PM)
- Smog

UNIT III: CHEMISTRY OF WATER

- Water Pollution
- Oxygen demanding waste
- Disease Causing waste
- Synthetic organic compounds and oil pollutant
- Inorganic Pollutant
- sediments
- Radioactive Materials
- Thermal Pollution

UNIT IV: WATER AND SOIL POLLUTION

- Domestic water quality
- Industrial water quality
- Trace /Heavy elements in water and their removal
- Waste water treatment
- Types of rocks
- Cause of soil pollution
- Control of soil pollution



Suggested Readings:

1. Gary W. Vanloon, Environmental Chemistry, New York: Oxford, 2010.
2. S. Manahan, Environmental chemistry, Boca Raton: CRC, 2010.
3. M. N. Rao, Air pollution, New Delhi: TMH, 2010.
4. O'Neill, Environmental chemistry, London: Blackie, 2009.
5. M. Srivastava, Environmental Chemistry, Delhi: Sree, 2009.
6. G. Vanloon, Environmental Chemistry, New York: Oxford, 2009.
7. Levin, Aerosol pollution impact on precipitation. New York Springer, 2009.
8. J. Rogers, Environment and water resources, USA: ASCE, 2007.
9. Ronand Marcos, Biological waste water treatment in warm climate regions, London: IWA, 2006.
10. J. S Bali, Bioindustrial Watershed Management. New Delhi: JCS, 2005.
11. S. E. Manahan, "Frontmatter "*Environmental Chemistry* Boca Raton: CRC Press LLC, 2000.
12. K. Bucher, Global Climate, Wiley, New York 1976.
13. J. Heichlen, Atmospheric Chemistry, Academic Press, New York 1976.
14. A. K. De, Environmental Chemistry 4th ed., New Age International (P) Ltd., New Delhi.



SEMESTER-III

Course Name – Agrochemicals

Course Code - SBS CH 010313 DCEC 2002

Credits: 2

Course Objective and Learning Outcomes:

To provide the knowledge of pesticides, fertilizes, soil science and plant growth regulators. At the end of this course, students will learn history, importance, occurrence, chemistry and futures perspective of agrochemicals.

UNIT I: PESTICIDES

Pests and Pesticides, History of pesticide use, Chemical and Botanical pesticides, Classification based on chemical nature, and types of targets, Systemic and nonsystemic pesticides. Insecticides, Herbicides, Fumigants and Rodenticides. Various chemical classes of pesticides. Environmental and health hazards f pesticides, Semiochemicals.

UNIT II: FERTILIZERS

Classification and types of fertilizers, Essential fertility requirement of the Nitrogenous fertilizers: Ammonium nitrate, Urea, Calcium Cyanamide, Calcium Ammonium Nitrate, Phosphate fertilizers: Normal super phosphate, Triple Super Phosphate, Ammonium Phosphate; Potassic fertilizers, Indian Fertilizer Industry. Biofertilizers

UNIT III: SOIL SCIENCE AND MICRONUTRIENTS

Importance of Soil formation, Properties and Composition of Soils, Soil profile, Organic matter in soil, Soil micronutrients, Acid and Alkaline soil, Absorption of toxic metal and chemicals by soil, Nitrogen fixation and its chemistry, Micro- nutrients, Manufacture of Micronutrients.

UNIT IV: PLANT GROWTH PROMOTERS AND HORMONES

Various plant growth promoters and hormones, chemical structures and types; Gibberellins, Auxins, Cytokinins, Abscicic acid, Ethylene. Synthetic plant hormones.

Suggested Readings:

1. B. K. Sharma, Industrial Chemistry, 2013.
2. F. E. Bear, Chemistry of the soil, 2nd ed., Scientic Publsihers, 2012.
3. A. M. Deshmukh, R. M. Khobragade and P. P. Dixit, Handbook of Biofertilizers and Biopesticides, ABD Publishers, 2007.
4. M. Ashman and G. Puri, Essential Soil Science: A Clear and Concise Introduction to Soil Science, Wiley-Blackwell, 2002.

5. M. B. Green, G. S. Hartley and T. F. West, Chemicals for Crop Improvement and Pest Management, Pergamon Press, 1987.
6. N. N. Melnikov, Chemistry of Pesticides, Springer, 1971.



SEMESTER-III

Course Name - Industrial Chemistry
Course Code - SBS CH 010314 DCEC 2002

Credits: 2

Course Objective and Learning Outcomes:

To provide the basic knowledge of Chemicals and process involved in Chemical Industry. At the end of this course, students will learn about the Inorganic Chemicals, blends and additives, petrochemicals and various kind of pollutions produced by industry and its remedies.

UNIT I: INTRODUCTION TO INORGANIC CHEMICALS

Sulphuric acid, phosphoric acid, lime, soda ash, titanium dioxide, sodium chloride and chloralkali. Industrially important polymers: polyethylene, polypropylene, polyvinyl chloride, polyester, nylon, fluoropolymers, acetal resins.

UNIT II: BLENDS AND ADDITIVES

Blends, antioxidants, UV stabilizers, antistatic agents, peroxides, lubricants, fire retardants, heat stabilizers, plasticizers. Agricultural Chemicals: Fertilizers, insecticides, herbicides, fungicides.

UNIT III: PETROCHEMICALS

Crude oil and natural gas, refinery operations, energy consumption, lower olefins and acetylenes, cracking processes, synthesis gas, ammonia and methanol production, acetic acid and acetic anhydride production, C_1 products : Formic acid, hydrogen cyanide, chloromethanes, C_2 products: ethanol, acetaldehyde, ethylene oxide.

UNIT IV: INDUSTRIAL POLLUTION

Source of Pollution: Air pollution-various pollutants, Water pollution-Organic/inorganic pollutants, Noise pollution, Pesticide pollution, Radiation pollution. Control and treatment of pollution and waste from industrial sites.

Suggested Readings:

1. A. Heaton, An introduction to Industrial Chemistry, 3rd ed. Springer Science, 2013.
2. Kanwar and Chopra, Analytical agricultural Chemistry, 2008.
3. J. A. Tyrell, Fundamental of Industrial Chemistry, Wiley, 2005.
4. T. Godish, Air quality, 5thed, CRC Press, 2002.

SEMESTER-III

Course Name - Carbon Management
Course Code - SBS CH 010315 DCEC 2002

Credits: 2

Course Objective and Learning Outcomes:

Course will provide scientific understanding of Carbon Management or sequestration and develop to the point of deployment those options that ensure environmentally acceptable sequestration to reduce anthropogenic CO_2 emissions and/or atmospheric concentrations.

UNIT I: INTRODUCTION OF CARBON MANAGEMENT

Background concepts, Change in carbon pools, management plans are focused on (*a*) minimizing emission (*b*) maximizing environmentally sound reuse, reduce and recycling; (*c*) effective treatment and (*d*) converting carbon into valuable products with atom economy.

UNIT II: CHEMICAL AND BIOLOGICAL METHODS FOR CARBON MANAGEMENT

Various chemical reaction involved in carbon management like as Kolbe-Schmitt, Carboxylation, cyclization, polymerization, amination, Boudouard reaction, Friedel-Crafts acylation, Reductive hydrogenation, photochemical and Formato-metal complex reactions, Carbon capture from adsorbents, Membrane based separation. Biological sequestration relates to the use of higher plants and micro-organisms**, Microbial electrosynthesis,** Symbiosis (in *vivo* associations of plant and microbes).Chemical-biological Hybrid modification

UNIT III: CARBON CAPTURE AND UTILIZATION

Carbon capture and Utilization; biotechnological interventions for carbon dioxide capture and utilization, options for mitigating methane emissions, carbon sequestration and organic farming

UNIT IV: MODIFICATION IN CARBONIC ANHYDRASE (CA)

Modification in CA in terms residue and group as target. Residue specific modification involving ligand-ligand interaction in terms of substitution/addition and group specific modification targets the various functional groups. Role of metal interaction and solvents/medium.

Suggested Readings:

1. R. Emmanuel and K. Baker, Carbon Management in the Built Environment, 1st ed., 2013.
2. S. Schaltegger, D. Zvezdov, E. I. Alvarez, M. Csutora and E. Günther, Corporate Carbon and Climate Accounting, 2015 (ISBN 978-3-319-27718-9), 2008.

SEMESTER-III
Course Name - Pharmaceutical Chemistry
Course Code - SBS CH 010316 DCEC 2002

Credits: 2

Course Objective and Learning Outcomes:

This course will provide a basic understanding of Pharmaceutical Chemistry. At the end of this course, students will learn about the various stages involved in drug design, lead concept and its modification, drug receptors, mode of action and recent developments of anticancer, antibiotics, cardiovascular and psychoactive drugs.

UNIT I: DRUG DESIGN

Development of new drugs, concept of lead compounds and lead modifications, structure-activity relationship (SAR), factors affecting bioactivity, resonance, inductive effect, isosterism, bio-isosterism. Theories of drug activity, Quantitative structure activity relationship, Concepts of drugs receptor, Elementary treatment of drug receptor interactions, Physico-chemical parameters: lipophilicity, partition coefficient, electronic ionization constants, steric factors.

UNIT II: ANTINEOPLASTIC AGENTS

Introduction, cancer chemotherapy, targets of cancer chemotherapy, role of alkylating agents and antimetabolites in treatment of cancer. Synthesis of any three representative anticancer drugs, Recent development in cancer chemotherapy.

UNIT III: ANTIBIOTICS AND CARDIOVASCULAR DRUGS

Cell wall biosynthesis, inhibitors, β-lactam rings, antibiotics inhibiting protein synthesis, Synthesis of penicillin G, ciprofloxacin. Introductory idea of tetracycline and streptomycin. Antibiotic resistance, MDR and XDR bacteria and associated challenges.

UNT IV: LOCAL ANTIINFECTIVE DRUGS AND PSYCHOACTIVE DRUGS

Introduction and general mode of action of local antiinfectives, Furazolidone, naldixic acid, dapsone, isoniazid, ethambutol, gluconazole, chloroquin and primaquin, Introduction to neurotransmitters, CNS depressants, general anaesthgetics, mode of action of hypnotics, sedatives, anti-anxiety drugs, benzodiazepines, Antipsychotic drugs – the neuroleptics, antidepressants.

Suggested Readings:

1. R. B. Silverman, The Organic Chemistry of Drug Design and Drug Action, 3rd ed., Academic Press, 2014.

2. D. Sriram and P. Yogeshwari, Medicinal Chemistry, 2nd ed., Pearson, 2012.
3. G. L. Patrick, An Introduction to Medicinal Chemistry, 5th ed., Oxford University Press, 2013.
4. Ed. Robert and F. Dorge, Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry, 12th ed., 2010.
5. Ed. M. E. Wolff, Burger's Medicinal Chemistry and Drug Discovery, Vol. 1, 7th ed., John Wiley, 2010.
6. S. S. Pandeya and J. R. Dmmock, An Introduction to Drug Design, 1st ed., New Age International, 1999.

SEMESTER-III

Course Name - Enzymes: Chemistry and Applications

Course Code - SBS CH 010317 DCEC 2002

Credits: 2

Course Objective and Learning Outcomes:

To acquire a basic understanding of enzymes and their applications in different sectors. At the end of this course, students will gain the knowledge of enzymes and their advantages in different sectors including organic synthesis.

UNIT I: ENZYMES-I

Introduction, Building blocks of enzymes, Chemical and biological catalysis, Properties of enzymes like catalytic power, Specificity and regulation. Enzymes' classification and nomenclature. Fischer's lock and key, Koshland's induced fit hypothesis, Concept and identification of active sites, Enzyme inhibition, Kinetics of enzymatic catalysis.

UNIT II: ENZYMES-II

Transition-state theory, Orientation and steric effect, Acid-base catalysis, Covalent catalysis. Enzyme mechanisms for chymotrypsin and carboxypeptidase A. Cofactors as derived from vitamins, Coenzymes, Prosthetic group, Apoenzymes. Structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate, NAD+, NADP+, lipoic acid, vitamin B12. Mechanisms of processes catalysed by these cofactors.

UNIT III: ENZYMES-III

Reactions catalysed by enzymes: Nucleophilic displacement, Group transfer, Addition and elimination reactions, Isomerization, Condensation, β-cleavage, Rearrangements, Carboxylation and decarboxylation reactions.

UNIT IV: ENZYMES-IV

Applications in different sectors: Food and drink manufacturing, Animal nutrition, Cosmetics, Medication, Pulp and paper industry, Organic synthesis, and Remediation of agro-industrial wastes.

Suggested Readings:

1. P. Y. Bruce and K. J. R. Prasad, Essential Organic Chemistry, Pearson Education, New Delhi, 2008.
2. D. L. Nelson and M. M. Cox, Lehninger Principles of Biochemistry, 4th Edition, W. H. Freeman, 2004.
3. G. Patrick, Medicinal Chemistry, Viva Books Private Limited, New Delhi, 2002.
4. C. M. Loudon, Organic Chemistry, Oxford University Press, New Delhi, 2002.
5. R. B. Silverman, The Organic Chemistry of Enzyme-Catalyzed Reactions, Academic Press, 2000.

6. T. Bugg, An Introduction to Enzymes and Coenzyme Chemistry, Blackwell Science, 1997.
7. H. Dugas, Bioorganic Chemistry: A Chemical Approach to Enzyme Action, Springer Verlag, 1996.



SEMESTER-IV

Course Name - Adsorption Science and Technology
Course Code - SBS CH 010418 DCEC 2002

Credits: 2

Course Objective and Learning Outcomes:

To provide students exposure about adsorption of various small molecules (both gas and vapor) by porous materials and its application in industry and energy storage.

UNIT I: GENERAL

Adsorption kinetics: theory, applications and recent progress, Pressure swing adsorption technology for hydrogen purification, New nanoporous adsorbents (Coordination Polymers, Covalent Organic Frameworks).

UNIT II: EXPERIMENTAL METHODS

Experimental methods for single and multi-component gas adsorption equilibria, Experimental determination of heat effects that accompany sorption equilibrium processes, Supercritical adsorption mechanism and its impact to application studies.

UNIT III: FUNDAMENTALS

New methodology in the use of super-critical adsorption data to determine the micropore size distribution, Effect of porosity and functionality of activated carbon in adsorption, Phase behavior of simple fluids confined in coordination nanospace.

UNIT IV: APPLICATIONS

Storage and separation of small gas molecules (H_2, N_2, CH_4, CO, CO_2, C_2H_2), Large scale CO separation by VPSA using CuCl/zeolite adsorbent.

Suggested Readings:

1. L. Zhou, Adsorption, Progress in Fundamental and Application Research, World Scientific, 2007.
2. E. I. Altman, M. Bienfait, H. P. Bonzel, R. Diehl, M. Y. L. Jung, V. G. Lifshitz, M. E. Michel, R. Miranda, R. McGrath, K. Oura, A. A. Saranin, E. G. Seebauer, P. Zeppenfeld, A. V. Zotov, Adsorption on Surfaces and Surface Diffusion of Adsorbates, Springer, 2001.
3. Alírio E. Rodrigues, M. Douglas LeVan, Daniel Tondeur, Adsorption: Science and Technology, Kluwer Academic Publishers, 1989.



SEMESTER-IV

Course Name - Asymmetric Catalysis: Fundamentals to Frontiers
Course Code - SBS CH 010419 DCEC 2002

Credits: 2

Course Objective and Learning Outcomes:

To provide the advance knowledge of asymmetric catalysis in organic synthesis. At the end of this course, students will learn about the basic of asymmetric catalysis, mechanistic studies and its applications in organic synthesis.

UNIT I: ASYMMETRIC CATALYSIS

Basics of asymmetric catalysis including energetic of reactions; Lewis acid and Lewis base catalysis; Chiral auxiliary: Basic requirements of chiral auxiliary; Chiral pool sources:selected examples of few most common chiral auxiliaries (Oppolzer, Evans oxazolidones, Myers amides, 8-phenylmenthol).

UNIT II: KINETIC RESOLUTION AND DESYMMETRIZATION

Kinetic, dynamic kinetic and parallel kinetic resolution; Desymmetrization reactions.

UNIT III: MECHANISTIC STUDIES AND MULTIFUNCTIONAL CATALYSIS

Mechanistic studies of asymmetric reactions; Non-liner effects and Chiral amplifications. Bifunctional, dual and multifunctional catalyst

UNIT IV: MODERN ASPECTS OF ASYMMETRIC CATALYSIS

Modern aspects of asymmetric catalysis: Counteranion directed catalysis, cooperative catalysis, dual and merged catalysis, asymmetric photocatalysis.

Suggested Readings:

1. E. M. Carreira, L. Kvaerno, Classics in Stereoselective Synthesis, Wiley-VCH: Weinheim, Germany, 2009.
2. M. Nogrady, Stereoselective Synthesis: A Practical Approach, Wiley, 2008.
3. P. J. Walsh, M. C. Kozlowski, Fundamentals of Asymmetric Catalysis, University Science Book, 2009.
4. A. Berkessel, H. Groger, Asymmetric Organocatalysis: From Biomimetic Concepts to Applications in Asymmetric Synthesis, Wiley-VCH, 2005.
5. I. Ojima, Catalysis in Asymmetric Synthesis, Wiley-VCH, 2004.
6. Recent review and research articles relevant to above topics (reprints to be handed over to students).



SEMESTER-IV

Course Name - Toxicology Lab
Course Code - SBS CH 010420 DCEC 2002

Credits: 2

Course Objective and Learning Outcomes:

The course is designed to introduce practical exposure about the identification of toxic waste; with management techniques for toxic waste.

UNIT I: PRACTICAL EXPOSURE

- About the identification of toxic waste;
- Management techniques for toxic waste

UNIT II: PHYSICAL PROPERTIES OF TOXIC

- Experiment based on physical properties of toxic waste on the basis of vapour pressure, vapour density and solubility

UNIT III: IDENTIFICATION OF TOXIC SUBSTANCES IN FOOD SAMPLE. IT INCLUDES THE IDENTIFICATION OF

- Acids,
- Aldehydes
- Amines
- Dioxins
- Ethers
- Cyanides

UNIT IV: TOXICITY ISSUE RELATED WITH

- Arsenic
- Cadmium
- Lead
- Mercury
- Carbon monoxide

Suggested Readings:

1. C. N. Madu, Environmental Planning and management, Imperial College Press, 2015.
2. Healtth Hazards of Environmental Arsenic Poisoning, Imperial College Press, 2014.
3. T. F. Yen, Chemical Processes for Environmental Engineering, Imperial College Press, 2013.
4. H. K. Moffatt and Shuckburgh, Environmental Hazards, Imperial College Press, 2011.
5. P. Patnaik, A Comprehensive Guide to the Hazardous Properties of Chemical Substances (3rd ed.) John Wiley & Sons, Inc., Hoboken, New Jersey, 2007.



6. C. Oloman, Material and Energy Balance for Engineers and Environmentalist, Imperial College Press, 2005.
7. L. C. Batty and K. B. Hallberg, Ecology of Industrial Pollution, Cambridge University press, New Delhi, 2004.



SEMESTER-IV

Course Name - Molecules of Life

Course Code - SBS CH 010421 DCEC 2002

Credits: 2

Course Objective and Learning Outcomes:

To provide the knowledge fundamentals of molecules of life. At the end of this course, students will learn about the chemistry of molecules of life.

UNIT I: NUCLEIC ACIDS

Secondary structure of DNA and RNA, stabilizing forces, polymorphic nature of DNA, multistranded DNA structures, sequence determination by chemical and enzymatic methods, chemical synthesis of DNA

UNIT II: PEPTIDES AND PROTEINS

Classification of naturally occurring peptides, depsipeptides and polypeptide alkaloids, Sequence determination, chemical, enzymatic and mass spectral methods, Modern methods of peptide synthesis with protection and deprotection. Solid phase synthesis, combinatorial synthesis of peptides, Chemistry of oxytocin, valinomycin, enkephalins, self-assembly and aggregation of peptides.

UNIT III: LIPIDS

Classification and biological importance of fatty acids and lipids, stereochemical notation in lipids, chemical synthesis of phospholipids and glycolipids, properties of lipid aggregates, micelles, bilayers, lyposomes, and biological membranes.

UNIT IV: CARBOHYDRATES

Types of naturally occurring sugars, deoxysugars, amino sugars, branched chain sugars, sugar methyl esters and acid derivatives of sugars, polysaccharides of industrial and biological importance.

Suggested Readings:

1. R. P. Sinden, DNA Structure and Function Academic Press, 1994
2. I. L. Finar and A. L. Finar, Organic Chemistry, Vol. 2, Addison Wesley, 1998.
3. I. L. Finar, Organic Chemistry Vol. 1, Longman, 1998.
4. H. Dugas, and C. Penney, Bioorganic Chemistry-A Chemical Approach to Enzyme Action, Springer-Verlag, 1989.
5. M. Bodansky, Peptide Chemistry: A Practical Textbook Springer-Verlag, 1988.
6. W. Saenger, Principles of Nucleic Acid Structure Springer-Verlag, 1984.
7. Ed. M. J. Gait, Oligonucleotide Synthesis-A Practical Approach ORL Press, 1984.



SEMESTER-IV

Course Name - Molecular Magnetism

Course Code - SBS CH 010422 DCEC 2002

Credits: 2

Course Objective and Learning Outcomes:

To provide the basic knowledge of molecular magnetism. At the end of this course, students will learn about the basic concept of magnetism, magnetic interaction, spin transition and magnetic exchange.

UNIT I: BASIC CONCEPTS OF MAGNETISATION

Origin of magnetism, magnetic susceptibility, measurement of magnetic susceptibility: Gouy method, induction method, superconducting quantum interference device magnetometer, Evans method, zero-field cooled measurements, field scan, reduced magnetization, hysteresis, AC susceptibility, classification of magnetic behaviour: diamagnetic, paramagnetic, ferromagnetic, ferromagnetic, antiferromagnetic compounds.

UNIT II: MAGNETIC INTERACTION

Classical *vs*. quantum model, Curie Law, Curie-Weiss Law, spin-orbit coupling, anomalous magnetic moments: equilibrium between two spin states, magnetically non-equivalent sites in the unit cell, solute-solvent interaction, solute-solute interaction configurational equilibrium..

UNIT III: SPIN TRANSITION

Van Vleck equation, magnetic anisotropy, low spin high spin transition, mechanism of spin transition, spin cooperativity, molecular electronics, intermediate spin and spin-admixed states.

UNIT IV: MAGNETIC EXCHANGE

Magnetic exchange, Bleany-Bowers equation, mechanism of exchange coupling, spin hamiltonian, magnetic interaction in oligonuclear complexes, magneto-structural correlations, quantum tunneling of magnetization, single molecule magnets.

Suggested Readings:

1. G. L. Miessler and D. A. Tarr, Inorganic Chemistry, 3rd ed. Pearson, 2018.
2. D. Gatteschi, R. Sessoli and J. Villain, Molecular Nanomagnets, Oxford University Press, Oxford, 2006.
3. O. Kahn, Molecular Magnetism, VCH Publishers, Inc., Orsay, France, 1993.



SEMESTER-IV

Course Name - Analytical Chemistry

Course Code - SBS CH 010423 DCEC 2002

Credits: 2

Course Objective and Learning Outcomes:

The course is designed to introduce students to the fundamental concepts of analytical techniques environmental monitoring; provide knowledge about various kinds of quantitative techniques and introduce computation of analytical results, significant figures, concept of error, precision and accuracy, standard deviation, rejection of doubtful values.

UNIT I: ERRORS AND SAMPLE ANALYSIS

Computation of analytical results, significant figures, concept of error, precision and accuracy, standard deviation, rejection of doubtful values with special reference to volumetric and gravimetric analysis, calibration of analytical equipments. Methods of expressing concentrations, primary and secondary standards.Theory and indicators for neutralizations, oxidation- reduction, precipitation titration.

UNIT II: GRAVIMETRIC ANALYSIS

Method of gravimetric analysis, physical gravimetry, thermogravimetry and combustion analysis, precipitative gravimetric analysis, electrodeposition.

UNIT III: COMPLEXOMETRIC TITRATIONS

Complexometric methods using EDTA, principle of complexometric titrations, chelating agents, indicators, titrations with disodium edetate.

UNIT IV: NONAQUEOUS TITRATIONS

General discussion and principle of titrations in non-aqueous media, aprotic, protophil protogenic and amphiprotic solvents. Titrations with perchloric acid, potassium methoxide and tetrabutyl ammonium hydroxide.

Suggested Readings:

1. D. Harvey, Modern Analytical Chemistry, McGraw-Hill Higher Education, New Delhi, 2014.
2. Advances in Sampling and Analysis, John Wiley & Sons, Ltd., 2011.
3. M. L. Shrivastava, Bioanalytical Techniques, New Delhi: Narosa, 2008.
4. G. D. Christian, Analytical chemistry, New Delhi: Wiley, 2004.
5. P. Quevauviller and K. C. Thompson, Analytical Methods for Drinking Water, 2002.
6. G. H. Jeffery, J. Bassett, J. Mendham and R. C. Denney, Vogel's Text Book of Quantitative Chemical Analysis 5th ed., ELBS, U.K. 1989.
7. Keneth and Connors, A Text Book of Analysis, 3rd ed. Wiley Interscience Singapore, 1982.



8. e-book: D. Pant, Lab Manual Quantitative Analytical Method Book Rix Publication. www.bookrix.com



SEMESTER-IV

Course Name - Antibiotics and Anti-inflammatory Agents: Chemistry and Applications

Course Code - SBS CH 010424 DCEC 2002

Credits: 2

Course Objective and Learning Outcomes:

To acquire a basic understanding about antibiotics and anti-inflammatory agents. To gain knowledge about their common synthetic routes, mode of action and applications.

At the end of this course, students will acquire basic understanding about antibiotics and anti-inflammatory compounds. They would also learn about their common synthetic routes, mode of action and applications.

UNIT I: ANTIBIOTICS-1

Introduction, biomedical importance and classification of antibiotics, common targeted pathways of antibiotics.

Penicillins antibiotics: Discovery, Mode of action, SAR, Penicillins and semi-synthetic penicillins, problems of sensitivity to acids, β-Lactamases and narrow spectrum of activity, Synthesis of oxacillin, cloxacillin, ampicillin, amoxycillin, carbenicillin and carfecillin.

UNIT II: ANTIBIOTICS-2

β-Lactamase inhibitors: clavulanic acid, olivanic acid.

Cephalosporins: Classification, Mode of action, SAR, Synthesis of cephalosporin-C, recent advances of fourth generation cephalosporins.

Sulfanilamides: Classification, Mode of action, Synthesis of Sulfathiazole, sulfadiazine, sulfacetamide

UNIT III: ANTIBIOTICS-3

Macrolides: Classification, Mode of action, erythromycin, azithromycin, recent developments, Synthesis of chloramphenicol.

Quinolones: Structure and classification, Mode of action, Synthesis of nalidixic acid, ciprofloxacin.

UNIT IV: ANTI-INFLAMMATORY AGENTS

Anti-inflammatory agents: Classification, Mode of action, COX-2 inhibitors, Synthesis of celecoxib, valdecoxib, aspirin, phenbutazone, mefanamic acid, indomethacin, piroxicam, diclofenac, Naproxen.

Suggested Readings:

1. G. L. Patrick, An Introduction to Medicinal Chemistry, Oxford University Press, 2013.
2. J. N. Delgado and W. A. Remers, Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry, Lippincott-Raven, 2010.
3. W. O. Foye, Foye's Principles of Medicinal Chemistry, Lippincott Williams & Wilkins; 6th edition, 2007.



4. R. B. Silverman, The Organic Chemistry of Drug Design and Drug Action, Academic Press, 2004.
5. M. E. Wolff, Burger's Medicinal Chemistry and Drug Discovery, Vol. 1, Ed. M E Wolff, John Wiley, 1995.

GENERIC ELECTIVE COURSES (GEC)

ELECTIVE COURSE OFFERED BY THE DEPARTMENT TO STUDENTS OF OTHER DEPARTMENTS



SEMESTER-I

Course Name - Chemistry of Materials
Course Code - SBS CH 010101 GEC 4004

Credits: 4

Course Objective and Learning Outcomes:

Students of GEC come from various backgrounds (social science, science and humanities). This course will try to give a very basic understanding of Chemistry of nanomaterials, porous materials and some photophysical phenomena with focus on energy and environment.

UNIT I: NANOMATERIALS

An Introduction, Elementary Consequences of Small Particle Size - Surface of Nanoparticles. Classification of nanomaterials-one dimensional (1D)-two dimensional (2D)-three dimensional (3D) nanomaterials.Gas-Phase Synthesis of Nanoparticles - Physical and Chemical Vapor Synthesis Processes.Radio- and Microwave Plasma Processes. Flame Aerosol Process. Synthesis of Coated Particles.

UNIT II: CHARACTERIZATION OF NANOMATERIALS

Global Methods for Characterization, X-Ray and Electron Diffraction, Electron Microscopy, Scanning Transmission Electron Microscopy.

Nanotubes, Nanorods, and Nanoplates, One-Dimensional Crystals, Graphene and Carbon Nanotubes.Nanotubes and Nanorods from Materials other than Carbon, Synthesis of Nanotubes and Nanorods.

UNIT III: HYBRID MATERIALS

Coordination Polymers, Introduction, Classification of Coordination Polymers, Design Strategies of Coordination Polymers-Metal Nodes and Linkers, Secondary Building Unit Concept, Topology and Interpenetration, Synthesis of Coordination Polymers-Solvothermal/Hydrothermal, Sonochemical, Microwave, Mechanochemical. Charaterization: X-ray diffraction and Spectroscopic Methods. Applications of Coordination Polymers in Gas Storage, Gas Separation, Catalysis and Drug Delivery.

UNIT IV: PHOTOPHYSICAL PHENOMENA

Interaction of electromagnetic radiation with matter, Grotthus-Draper law, Stark-Einstein law of photochemical equivalence, quantum yield, electronically excited singlet states, life time of electronically excited state, construction of Jablonski diagram, electronic transitions and intensity of absorption bands, types of photophysical pathways, radiationless transitions, fluorescence emission, phosphorescence emission, Fluorescence quenching, chemiluminescence, photochemical reactions.

Suggested Readings:

1. S. Kaskel, The Chemistry of Metal-Organic Frameworks, Vol. 1, Wiley-VCH, 2016.



2. D. Vollath, Nanomaterials: An Introduction to Synthesis, Properties and Applications, 2nd ed., Wiley-VCH, 2013.
3. D. C. Agarwal, Introduction to Nanoscience and Nanomaterials, World Scientific, 2013.
4. L. R. Macgillivray, Metal-Organic Frameworks: Design and Applications, Wiley, 2010.
5. W. D. Jr. Callister and D. G. Rethwisch, Fundamentals of Materials Science and Engineering: An Integrated Approach, John Wiley and Sons, 2012.
6. K. K. Rohatgi and K. K. Mukherjee; Fundamentals of Photochemistry, 3rd ed. New Age International (P) Ltd., 2014.



SEMESTER-I

Course Name - Basic Concepts in Chemistry
Course Code - SBS CH 010102 GEC 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide the basic concepts in Chemistry to the Students of other Department. At the end of this course, students will learn about the basic knowledge of inorganic, organic and physical chemistry.

UNIT I: THE PERIODIC TABLE-HISTORY AND DEVELOPMENTS

Overview of the periodic system, discoverers of the periodic system, quantitative relationships among the elements and origin of periodic table, the acceptance of Mendeleev's periodic table, Moseley's law and periodic table, radioactivity, atomic number and isotopy, transuranium elements, newly discovered elements and completion of periodic table.

UNIT II: INTRODUCTION TO INORGANIC CHEMISTRY

History of inorganic chemistry, definition and contrast with organic chemistry, distribution of elements on earth, atomic structure and simple bonding theory, symmetry and its applications, molecular orbitals : heteronuclear diatomic and larger molecules, acid-base and donor accepter chemistry, coordination chemistry : history and modern aspects, organometallic chemistry : reactions and catalysis, bioinorganic chemistry.

UNIT III: INTRODUCTION TO ORGANIC CHEMISTRY

Generation, Structure, stability & reactivity of carbocation, carbanions, free radicals &carbene.R & S and E –Z nomenclature of Chiral molecules, Aromaticity of benzenoid and non-benzenoid compounds (Huckel rule), Aldol condensation, Knoevenagel, pinacol-Pinacolone rearrangement.

UNIT IV: INTRODUCTION TO PHYSICAL CHEMISTRY

Brief resume of first and second law of thermodynamics. Entropy changes in reversible and irreversible processes; Variation of entropy with temperature, pressure and volume, Entropy concept as a measure of unavailable energy, Free energy functions and their significance, Criteria for spontaneity of a process; Partial molar quantities (Free energy, volume heat content), Gibb`s-Duhem equation; Clausius-Clapyeron equation, Law of mass action and its thermodynamic derivation. Third law of thermodynamics (Nernst heat theorem, determination of absolute entropy, unattainability of absolute zero) and its limitation.

Suggested Readings:

1. G. E. Rodgers, Descriptive Inorganic, Cordination and Solid State Chemistry, 3rd ed., 2009.



2. E. R. Scerri, The Periodic Table: Its Story and its Significance, 2008
3. G. L. Miessler and D. A. Tarr, Inorganic Chemistry, 3rd ed., 2005.



SEMESTER-I

Course Name - Chemistry for Biologists

Course Code - SBS CH 010103 GEC 4004

Credits: 4

Course Objective and Learning Outcomes:

To understand some basic concepts of chemistry important for biologists in addition to acquire the knowledge of UV-vis., IR and ^{1}H-NMR spectroscopy.

At the end of this course, students will understand the basic concepts of chemistry like mole concepts, preparation of solutions, role of H-bonding in biology, stereochemical aspects of organic compounds, thermodynamics, kinetics of reactions, and equilibrium based concepts. They would also learn about the basics of the spectroscopic techniques like UV-vis., IR and ^{1}H-NMR and their application in the characterization of small organic compounds.

UNIT I: SOME BASIC TERMS AND CONCEPTS

Mole concept and Stoichiometry. Solution and different methods of expressing the concentration of a solution. Chemical bonds: Ionic, covalent, coordinate and metallic bonds. Shapes of the molecules, Polarized chemical bonds and polarity in the molecules. Intermolecular forces: Dispersion, dipole-dipole, hydrogen bonds, ion-dipole forces and their effect on the properties of the compounds. Biological implications of hydrogen bonding. Problems based on given topics.

UNIT II: STEREOCHEMISTRY

Isomerism: Introduction, Formula writing, Structural and stereo isomerism, Conformations: analysis of ethane, n-butane, cyclohexane and its derivatives, Configurational isomerism, Geometrical and optical isomerism. Symmetry and chirality in the molecules having one or more than one chiral center, R & S, D & L, threo and erythro nomenclature, enantiotopic and diastereotopic atoms, groups and faces, stereospecific and stereoselective reactions. Problems based on given topics.

UNIT III: CONCEPTS OF PHYSICAL CHEMISTRY

Thermodynamics: Change in Internal energy, enthalpy, free energy and entropy; Endothermic and exothermic processes, Exergonic and endergonic processes, Coupled biological processes,

Chemical Kinetics: Reaction rate and rate constant, Catalysts and catalysis, Enzymes as catalysts, Kinetics of enzyme catalysed reactions, Enzyme inhibition.

Chemical equilibrium: Equilibrium, equilibrium constant, Le Châtelier's principle and factors affecting the principle, Aqueous Equilibria: Introduction, importance in biology, pH and pH control, Buffers and their importance.

UNIT IV: SPECTROSCOPIC TECHNIQUES

Overview of spectroscopy.

Ultraviolet and visible (UV-vis) spectroscopy: Introduction, Principle and selection rules of UV phenomenon, Various electronic transitions, Beer-Lambert law, presentation of spectrum, effect of solvents on electronic transitions, ultraviolet bands for carbonyl compounds and unsaturated carbonyl compounds. Fieser-Woodward rules for conjugated dienes.

Infrared Spectroscopy: Introduction, Principle and selection rules of IR spectroscopy, Hookes law, Characteristic vibrational frequencies of organic compounds. Overtones, combination bands and fermi resonance. Factors affecting the vibrational frequencies.

NMR: Principle, nuclear spin states, nuclear magnetic moments, mechanism of resonance, chemical shifts, diamagnetic shielding, magnetic anisotropy, spin-spin splitting, coupling constant, Discussion on ^{1}H NMR spectra of various simple organic compounds.

Suggested Readings:

1. B. R. Puri, L. R. Sharma and M. S. Pathania, Principles of Physical Chemistry, Vishal Publishing Co.; 47th Edition, 2017.
2. B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Vishal Publishing Co., 33rd Edition, 2017.
3. D. L. Pavia, G. M. Lampman, G. S. Kriz and J. R. Vyvyan, Spectroscopy, Cengage Learning India Private Limited; 5th Edition, 2015.
4. P. S. Kalsi, Stereochemistry: Conformation and Mechanism, New Age International Private Limited, 2015.
5. S. M. Mukherji and S. P. Singh, Reaction Mechanism in Organic Chemistry, Revised Edition. (Revised by S. P. Singh and Om Prakash). TRINITY Press, An Imprint of Laxmi Publications Pvt. Ltd., 2015.
6. P. Atkins and J. Paula, Atkins' Physical Chemistry, Oxford University Press; 10th Edition, 2014.
7. J. Clayden, N. Geeves and S. Warren, Organic Chemistry, Oxford University Press, 2012.
8. Morrison, Boyd and Bhattcharjee, Organic Chemistry, 7th Edition, Pearson, 2010.
9. E. L. Eliel and S. H. Wilen, Stereochemistry of Organic Compounds, Wiley India, 2008.
10. J. Mohan, Organic Spectroscopy: Principles and Applications, 2nd Edition, Narosa Publishing House, 2007.
11. F. A. Carey and R. J. Sundburg, Advanced Organic Chemistry PART A., Springer, 2007.
12. D. Nasipuri, Stereochemistry of Organic Compounds, 2nd Edition, New Age International, 2005.
13. K. J. Laidler, Chemical Kinetics, Pearson Education, 3rd Edition, 1997.
14. W. Kemp, Organic Spectroscopy, Palgrave Macmillan, 1991.
15. P. Sykes, A Guide Book to Mechanism in Organic Chemistry, Longman, 1985.



SEMESTER-II

Course Name - Environmental Chemistry
Course Code - SBS CH 010204 GEC 4004

Credits: 4

Course Objective and Learning Outcomes:

The course is designed to introduce students to the fundamental concepts of analytical techniques environmental chemistry; provide knowledge about various kinds of quantitative techniques; and introduce computation of analytical results, significant figures, concept of error, precision and accuracy, standard deviation, rejection of doubtful values.

UNIT I: FUNDAMENTAL CONCEPTS

Parameters for monitoring**,** Environmental Divisions**,** Natural Cycles

UNIT II: CHEMISTRY OF AIR

- Introduction
- Air Pollutants and their sources
- Toxic effects of Carbon monoxide, Nitrogen Oxide, Sulphur Oxides.
- Acid rain
- Depletion of Ozone Layer
- Particulate matter (PM)
- Smog

UNIT III: CHEMISTRY OF WATER

- Water Pollution
- Oxygen demanding waste
- Disease Causing waste
- Synthetic organic compounds and oil pollutants
- Inorganic Pollutant
- Sediments
- Radioactive Materials
- Thermal Pollution

UNIT IV: WATER AND SOIL POLLUTION

- Domestic water quality,
- Industrial water quality,
- Trace /Heavy elements in water and their removal,
- Waste water treatment.
- Types of rocks,



- Cause of soil pollution,
- Control of soil pollution

Suggested Readings:

1. M. N. Rao, Air pollution, New Delhi: TMH, 2010.
2. G. W. Vanloon, Environmental Chemistry, New York: Oxford, 2010.
3. S. Manahan, Environmental Chemistry, Boca Raton: CRC, 2010.
4. O'Neill, Environmental Chemistry, London: Blackie, 2009.
5. M. Srivastava, Environmental Chemistry, Delhi: Sree, 2009.
6. G. Vanloon, Environmental Chemistry, New York: Oxford, 2009.
7. Levin, Aerosol pollution impact on precipitation. New York Springer, 2009.
8. J. Rogers, Environment and water resources. USA: ASCE, 2007.
9. R. Marcos, Biological waste water treatment in warm climate regions, London: IWA, 2006.
10. J. S. Bali, Bioindustrial Watershed Management, New Delhi: JCS, 2005.
11. S. E. Manahan, "FRONTMATTER" *Environmental Chemistry* Boca Raton: CRC Press LLC, 2000.
12. K. Bucher, Global Climate, Wiley, New York, 1976.
13. J. Heichlen, Atmospheric Chemistry, Academic Press, New York, 1976.
14. A. K. De, Environmental Chemistry, 4th Ed., New Age International (P) Ltd.



SEMESTER-II

Course Name - Chemistry in Everyday Life

Course Code - SBS CH 010205 GEC 4004

Credits: 4

Course Objective and Learning Outcomes:

The course is designed to introduce student about the basic use of chemicals in everyday life. We will make the subject interesting and students can develop his skill towards applied sciences.

UNIT I: POLYMERS

Classification of polymers, mechanism of polymerization, some commonly used polymers and their applications (Synthetic rubber, natural rubber, Teflon, PMMA), High density and low density polymer.

UNIT II: SOAPS & DETERGENTS

Chemical composition, constitution and cleaning action of soaps and detergents. Difference between soaps and detergents.

UNIT III: DYES & PIGMENTS AND FOOD ADDITIVES

An introduction of dyes and pigments. Colour theory of dyes.
Artificial sweeteners, preservatives, colour additives, rancidity.

UNIT IV: ELECTROCHEMISTRY

Cells (primary and secondary), composition of cells, cell reactions, Batteries (Pb-Acid battery), composition of batteries, reactions of the battery, fuel cells, solar cells.

Suggested Readings:

1. I. L. Finar, Organic Chemistry, Vol-1, ELBS, 2017.
2. H. K. Moudgil, A Text Book of Physical Chemistry, PHI Publication House, New Delhi, 2015.
3. F. Wold, Macromolecules: Structure and Function, Prentice Hall, 2015.
4. H. R. Alcock and F. W. Lamb, Contemporary Polymer Chemistry, Prentice Hall, 2011.
5. J. M. G. Cowie, Physics and Chemistry of Polymers, Blackie Academic and Professional, 2009.
6. V. R. Gowariker, N. V. Viswanathan and J. Sreedhar, Polymer Science, Wiley-Eastern, 2008.
7. K. Takemoto, Y. Inaki and R. M Ottanbrite, Functional Monomers and Polymers, 2005.
8. F. W. Billmeyer Jr., Textbook of Polymer Science, Wiley, 1990.
9. V. P. Sharma, Bio-organic Chemistry, Pragati Prakshan, 2004.

SEMESTER-II

Course Name - Nuclear and Magnetochemistry

Course Code - SBS CH 010206 GEC 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide the basic knowledge of nuclear and magnetochemistry to the students of other Departments. At the end of this course, students will learn about the basics of nuclear radiations, radiopharmacy and chelation therapy and magnetism.

UNIT I: NUCLEAR RADIATION

Radioactive decay and growth, naturally occurring and artificially produced radioactive substances, Penetration potential, Nuclear binding energy, nuclear emissions, nuclear transformations, kinetics of radioactive decay, bombardment of nuclei, nuclear fission, nuclear fusion, Nuclear explosives, kinetic isotope effects, radiocarbon dating, chemical separation, Szilard–Chalmer's effect, fuel cycle, radioactive waste and waste management, reactor power control.

UNIT II: RADIOPHARMACY AND CHELATION THERAPY

Ionizing radiation, effects of radiation on life, somatic Effects, genetic effects, isotopes used in medicines, dispensing and protection, therapeutic use of radiopharmaceuticals, therapy for hyperthyroidism, boron neutron capture therapy, radiopharmaceuticals for imaging, positron emission tomography , heavy-metal poisoning, chelation, chelation therapy.

UNIT III: INTRODUCTION TO MAGNETIZATION

Types of magnetism and temperature dependence of magnetic susceptibility, Curie and Curie-Weiss laws, measurement of magnetic susceptibility, types of magnetism in transition metal complexes, spin orbit coupling, quenching of orbital moment in metal complexes, Temperature independent paramagnetism.

UNIT IV: MAGNETIC EXCHANGE

reduced magnetization, magnetic hysteresis, spin paired and spin free equilibria in complexes, mechanism of exchange interaction, spin crossover, calculation of magnetic moment, orbital contribution to the magnetic moment, M-M direct interaction and super exchange through small bridges, long-range magnetic interactions, factors affecting the spin exchange in multinuclear species, magnetic properties of polynuclear complexes, magnetic properties of lanthanides, anomalous magnetic moments.

Suggested Readings:

1. Gary L. Miessler and Donald, A. Tarr, Inorganic Chemistry, 3rd ed. Pearson, 2018.
2. G. Friedlander, J. W. Kennedy, E. S. Macias; Nuclear and Radiochemistry, 3rd ed. Willey, 2013.
3. D. Gatteschi, R. Sessoli and J. Villain, Molecular Nanomagnets, Oxford University Press, Oxford, 2006.
4. O. Kahn, Molecular Magnetism, VCH Publishers, INc., Orsay, France, 1993.



5. H. J. Arnikar, Essentials of Nuclear Chemistry, Wiley Eastern, 1988.



SEMESTER-III

Course Name - Green Chemistry
Course Code - SBS CH 010307 GEC 4004

Credits: 4

Course Objective and Learning Outcomes:

To provide the basic knowledge of Green Chemistry to the Students of other Departments. At the end of this course, students will learn about the sustainable development, catalysis and renewable raw materials and use of alternative solvents towards the development of green technology and alternative energy.

UNIT I: INTRODUCTION TO GREEN CHEMISTRY

Green chemistry history, needs and goals. Limitation/Obstacles in pursuit of the goals of green chemistry. Opportunities for next generation designer materials to create safer future. Twelve principles of Green Chemistry and their illustrations with examples.

UNIT II: GREEN CATALYSIS AND RENEWABLE RAW MATERIALS

Heterogeneous catalysis: Use of zeolites, silica, alumina, clay, polymers, cyclodextrin and supported catalyst; Phase-transfer catalysis; Biocatalysis using enzymes; Biomass conversion to fine chemicals.

UNIT III: GREENER SOLVENTS

Reactions under aqueous medium: Enhancement of selectivity, efficiency and industrial applicability. Ionic liquids; Supercritical fluids; Solvent free reactions in solid and liquid phase; Flourous phase reactions; Alternatives in extraction and chromatography.

UNIT IV: GREEN TECHNOLOGY AND FUTURE TRENDS IN GREEN CHEMISTRY

Microwave and Ultrasound assisted reactions; photochemical reactions using sunlight; Flow techniques; combinatorial green chemistry. Green synthesis of ibuprofen and adipic acid (traditional vs green ones).

Suggested Readings:

1. F. M. Kerton, Alternative Solvents for Green Chemistry. Royal Society of Chemistry, 2013.
2. M. Lancaster, Green Chemistry: Introductory Text. Royal Society of Chemistry, 2010.
3. R. A. Sheldon, I. Arends and U. Hanefeld, Green Chemistry and Catalysis, 1st ed. Wiley-VCH, 2007.
4. M. A. Ryan and M. Tinnesand, Introduction to Green Chemistry. American Chemical Society, 2003.
5. P. T. Anastas and J. C. Warner, Green Chemistry: Theory and Practice. Oxford University Press, 1998.



SEMESTER-III

Course Name - Drug Design and Discovery
Course Code - SBS CH 010308 GEC 4004

Credits: 4

Course Objective and Learning Outcomes:

This course will provide a basic understanding and fundamentals towards drug discovery and development process. At the end of this course, students will learn about the various stages involved in drug discovery & development process and challenges encounter during the course of development of new drug which finally comes into the market, various biological drug targets, mode of actions of antibiotics, cardiovascular, and psychoactive drugs and its chemical synthesis.

UNIT I: INTRODUCTION

***History of drug discovery and targets*:** Introduction, Stages of drug discovery, lead discovery,Recent trends in drug discovery. Validation and diversity of drug targets

***Biological drug targets*:** Drug target identification, Receptors, types, binding and activation, theories of drug receptor interaction, drug receptor interactions, agonists vs antagonists, artificial enzymes, Biopharmaceutical therapies, , Hit to lead, Clinical biomarkers.

UNIT II: DRUG DESIGN

Prodrug design: Basic concept, Carrier linked prodrugs/Bioprecursors, prodrugs of functional group, prodrugs to improve patient acceptability, Drug solubility, drug absorption and distribution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design.

***Combating drug resistance*:** Causes for drug resistance, strategies to combat drug resistance in antibiotics and anticancer therapy, genetic principles of drug resistance.

Analog Design: Introduction, classical & non classical, bioisosteric replacement strategies, rigid analogs, alteration of chain branching, changes in ring size, ring position isomers, design of stereo isomers and geometric isomers, fragments of a lead molecule, variation in inter atomic distance

UNIT III: ANTIBIOTICS AND CARDIOVASCULAR DRUGS

Cell wall biosynthesis, inhibitors, β-lactam rings, antibiotics inhibiting protein synthesis, Synthesis of penicillin G, amoxycillin, cephalosporin, ciprofloxacin. Introductory idea of tetracycline and streptomycin. Introduction and general mode of action. Synthesis of ditiazem, verapamil, methyldopa and atenolol.

UNIT IV: LOCAL ANTIINFECTIVE DRUGS AND PSYCHOACTIVE DRUGS

Introduction and general mode of action. Synthesis of furazolidone, naldixic acid, dapsone, isoniazid, ethambutol, gluconazole, chloroquin and primaquin. Introduction, neurotransmitters, CNS depressants,



general anaesthgetics, mode of action of hypnotics,sedatives, anti-anxiety drugs, benzodiazopines, buspirone. Antipsychotic drugs–theneuroleptics, antidepressants, butyrophenones. Synthesis of diazepam, alprazolam,phenyltoin and glutethimide.

Suggested Readings:

1. R. B. Silverman, The Organic Chemistry of Drug Design and Drug Action, 3rd Ed., Academic Press, 2014.
2. D. M. Brahmankar and S. B. Jaiswal, Biopharmaceutics and Pharmacokinetics, 2nd ed., Vallabh Prakashan, New Delhi, 2014.
3. G. L. Patrick, An Introduction to Medicinal Chemistry, 5th Ed., Oxford University Press, 2013.
4. D. Sriram and P. Yogeshwari, Medicinal Chemistry, 2nd ed., Pearson, 2012.
5. Ed. Robert F. Dorge, Wilson and Gisvold's Text Book of Organic Medicinal and Pharmaceutical Chemistry, 12th Ed., 2010.
6. Ed. M. E. Wolff, Burger's Medicinal Chemistry and Drug Discovery, Vol. 1, 7th Ed., John Wiley, 2010.
7. S. S. Pandeya and J. R. Dmmock, An Introduction to Drug Design, 1st Ed., New Age International, 1999.



SEMESTER-IV

Course Name - Materials and Nuclear Chemistry

Course Code - SBS CH 010409 GEC 4004

Credits: 4

Course Objective and Learning Outcomes:

Students of GEC come from various backgrounds (social science, science and humanities). This course will try to give a very basic understanding of Chemistry of nanomaterials, porous materials, magnetochemistry and nuclear chemistry with focus on energy and environment.

UNIT I: NANOMATERIALS

An Introduction.Nanomaterials and Nanocomposites. Classification of nanomaterials - one dimensional (1D)-two dimensional (2D)-three dimensional (3D) nanomaterials.Gas-Phase Synthesis of Nanoparticles-Physical and Chemical Vapor Synthesis Processes. Characterization of Nanomaterials: X-Ray and Electron Diffraction, Electron Microscopy, Scanning Transmission Electron Microscopy.

Nanotubes, Nanorods, and Nanoplates, One-Dimensional Crystals, Carbon Nanotubes and Graphene, Nanotubes and Nanorods from Materials other than Carbon.

UNIT II: COORDINATION POLYMERS

Introduction, Classification of Coordination Polymers, Design Strategies of Coordination Polymers-Metal Nodes and Linkers, Secondary Building Unit Concept, Topology and Interpenetration, Synthesis of Coordination Polymers- Solvothermal / Hydrothermal, Sonochemical, Microwave, Mechanochemical. Charaterization: X-ray diffraction and Spectroscopic Methods. Applications of Coordination Polymers in Gas Storage, Gas Separation, Catalysis and Drug Delivery. Zeolitic Metal-Organic Frameworks.

UNIT III: MAGNETOCHEMISTRY

Definition, classification of magnetic behaviour; diamagnetic, paramagnetic, ferromagnetic, ferromagnetic, antiferromagnetic compounds, magnetic interactions, mechanism of exchange interaction, spin crossover, spin-orbit coupling, Curie law, Curie-Weiss law, reduced magnetization, magnetic hysteresis, calculation of magnetic moment, orbital contribution to the magnetic moment, anomalous magnetic moments, magnetic susceptibility.

UNIT IV: NUCLEAR CHEMISTRY

Nuclear binding energy, nuclear emissions, nuclear transformations, kinetics of radioactive decay, bombardment of nuclei, nuclear fission, nuclear fusion, kinetic isotope effects, radiocarbon dating, chemical separation, Szilard–Chalmer's effect, effects of radiation on life, radioactivity in medicines.

Suggested Readings:

1. G. L. Miessler and D. A. Tarr, Inorganic Chemistry, 3rd ed. Pearson, 2018.
2. S. Kaskel, The Chemistry of Metal-Organic Frameworks, Vol. 1, Wiley-VCH, 2016.
3. D. Vollath, Nanomaterials: An Introduction to Synthesis, Properties and Applications, 2nd Ed., Wiley-VCH, 2013.
4. D. C. Agarwal, Introduction to Nanoscience and Nanomaterials, World Scientific, 2013.
5. G. Friedlander, J. W. Kennedy, E. S. Macias; Nuclear and Radiochemistry, 3rd ed. Willey, 2013.
6. L. R. Macgillivray, Metal-Organic Frameworks: Design and Applications, Wiley, 2010.
7. D. Gatteschi, R. Sessoli and J. Villain, Molecular Nanomagnets, Oxford University Press, Oxford, 2006.
8. O. Kahn, Molecular Magnetism, VCH Publishers, INc., Orsay, France, 1993.
9. H. J. Arnikar, Essentials of Nuclear Chemistry, Wiley Eastern, 1988.



SEMESTER-IV

Course Name - Medicinal Chemistry
Course Code - SBS CH 010410 GEC 4004

Credits: 4

Course Objective and Learning Outcomes:

This course will provide a basic understanding and fundamentals of Medicinal Chemistry, drug-target actions, process of development of new drugs and regulatory processes of drug approval, intellectual property and drug abuse and misuse. At the end of this course, students from the other Departments will acquire basic knowledge of medicinal chemistry and its importance.

UNIT I: FUNDAMENTALS

Historical development of systems of medicine, Basic chemical and biochemical principles, Key definitions, drug, target, receptors, enzymes, common drugs and their classification, anti-inflammatory drugs, antihistamines, antacids, antibiotics, narcotics, antivirals, and antineoplastics.

UNIT II: DRUG ACTION

Chemistry of drug-target interactions, bioavailability, drug absorption, distribution, metabolism, excretion (ADME), pharmacokinetics and pharmacodynamics, toxicity, side effects, lipophilicity and hydrophilicity, blood-brain barrier and its significance, routes of drug administration

UNIT III: DRUG DESIGN AND SYNTHESIS

Development of new drugs, concept of lead compounds and lead modifications, structure-activity relationship (SAR), isosterism, bio-isosterism, important chemical principles behind design of drugs, natural products and their uses, chemical synthesis of drugs, drug formulation, drug delivery, photodynamic therapy.

UNIT IV: DRUGS AND SOCIETY

Regulatory processes for drug approval, regulatory agencies, intellectual property, patents, drug misuse, drug abuse, abuse of antibiotics, fraud practices in treatment, historically important drugs and vaccines.

Suggested Readings:

1. R. B. Silverman, The Organic Chemistry of Drug Design and Drug Action, 3rd Ed., Academic Press, 2014.
2. G. L. Patrick, An Introduction to Medicinal Chemistry, 5th Ed., Oxford University Press, 2013.
3. D. Sriram and P. Yogeshwari, Medicinal Chemistry, 2nd ed., Pearson, 2012.
4. Ed. Robert F. Dorge, Wilson and Gisvold's TextBook of Organic Medicinal and Pharmaceutical Chemistry, 12th Ed., 2010.
5. Ed. M. E. Wolff, Burger's Medicinal Chemistry and Drug Discovery, Vol. 1, 7th Ed., John Wiley, 2010.
6. S. S. Pandeya and J. R. Dmmock, An Introduction to Drug Design, 1st Ed., New Age International, 1999.



Scheme & Syllabus for Ph.D. in Civil Engineering

Ph.D. Course Work

Department of Civil Engineering
W.e.f. Session 2020-21

School of Engineering & Technology

CENTRAL UNIVERSITY OF HARYANA
MAHENDERGARH-123031
HARYANA

Central University of Haryana, Mahendergarh

Department of Civil Engineering, School of Engineering and Technology

Ph.D. Course Work (w.e.f. session 2020-21)

Programme : Ph.D.
Department : Civil Engineering

Teaching Scheme				Contact Hours /Week		
Sr. No.	**Subject code**	**Course title**	**Credits**	**L**	**T**	**P**
1	SoET- 020101C4206	Research Methodology	6	4	2	0
2	SoET- 020102C2002	Research and Publication Ethics	2	2	0	0
3	SoET – 020103C0022	Seminar	2	0	0	2
Elective Courses (Specialization based – any one subject)						
3	SoET- CE 020101 E4004	Condition Assessment and Retrofitting of Structures	4	4	0	0
4	SoET- CE 020102 E4004	Pavement Materials and Construction Practices	4	4	0	0
5	SoET- CE 020103 E4004	Fluvial Hydraulics and Flood Control	4	4	0	0
Total			**14**	**10**	**2**	**2**

L = Lecture, T = Tutorial, P = Practical, & C = Credits

RESEARCH METHODOLOGY

Course code : SoET- 020101C4206

L	T	P	Credit
4	2	0	6

Unit –I

Introduction of Research Methodology: Concept of research and its applications: characteristics features, objectives, scope, reliability and validity of research, Scientific process: Meaning and Definition, Steps involved in research process, a brief history of scientific process.

Formulation of research problem: Objectives of research problem. Research Design-Meaning, Need and features of good research design, defining problem, preparing research design analysis and interpretation of data, Basic Principles of Experimental Techniques. Importance and relevance of ethics and values in science and technology

Unit II

Scientific Methodology: Meaning, Scope, Primary sources of literature survey- journal, patents etc. Secondary sources of literature survey - books, reference books, text books. Paper Writing and preparation of Dissertation: Basic concepts of paper writing - Steps of paper writing, Methods of presentation, Precautions in preparing the research Dissertation – Concepts of bibliography and annexure, Discussion of results, Drawing conclusions, Giving suggestion and recommendation of concerned persons.

UNIT III

Computer Applications: a. Spreadsheet tool: Introduction to spread-sheet applications, features & functions, using formulae & functions, data storing, features for statistical data analysis, generating charts/graphs & other features. [Tools: Microsoft Excel, Open office and similar or other advanced tools] b. Presentation tool: Introduction to presentation tool, features & functions, creating presentations, customising presentation. [Tools used: Microsoft Power point, Open Office or any other tool] c. Web Search: introduction to internet, Use of Internet & www, using search engines using advanced search tools. d. Thesis writing & Scientific editing tools.

UNIT IV

Measurement Scales and Evaluation: Concepts of Measurement Scales; Primary Levels of Measurement; Classification of Measurement Scales; Validity and Reliability Analysis

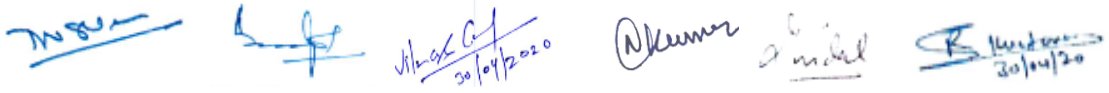
Scholarly Writing Characteristics of Scholarly Writing; Standard Guidelines; Critical Reviews; Research Proposals; Research Reports; Thesis/Dissertations; Research Papers; Impact Factor of Journals; Citation and Acknowledgement; Plagiarism and Self-Plagiarism; Reproducibility and Accountability

Note: Following are to be practiced in Computer Lab.: Spreadsheet application, features and functions, using formulas and functions, data storing, features for statistical data analysis, use of

SPSS generating chart's/graph and other features. Document and Presentation tool: features and functions, Using Latex, Open–office and MS office, creating presentations, master page, adding animation, customizing animation, creating handouts. Web search: introduction to internet, using search engine, relevance of search terminology, Advanced search.

Suggested Readings:

1. Bowen, W. G. and Rudenstine, N. L. *In pursuit of the Ph.D*. Princeton University Press, 1992.
2. Davis, G. B. and Parker, C. A. *Writing the Doctoral Dissertation: A Systematic Approach*. 3rd Edition, Barron's Educational Series, 2012.
3. Gash, S. *Effective Literature Searching for Research*. 2nd Revised ed., Gower, 1989
4. Kothari, C. R. and Garg, G. *Research Methodology: Methods and Techniques*. 4th Multi-Colour Edition, New Age International Publishers, 2019.
5. Kumar, R. *Research Methodology: A Step-by-step Guide for Beginners*. 4th ed., Sage Publications, 2014.
6. Lester, J. D. and Lester, J. D. Jr., *Writing Research Papers: A Complete Guide*. 15th ed., Longman, 2014.
7. Madsen, D. *Successful Dissertations and Theses*. 1st ed., Jossey-Bass, 1983.
8. Mauch, James E. and Park, N. *Guide to the Successful Thesis and Dissertation: A Handbook for Students and Faculty*. 2nd ed., Marcel Dekker, Inc., 1989.
9. Schloss, P. J. and Smith, M. A. *Conducting Research*. Prentice-Hall, 1999.
10. Sternberg, D. *How to Complete and Survive a Doctoral Dissertation*. St. Martin's Press, 1981.
11. Turabian, K. L. *A Manual for Writers of Term Papers, Thesis, and Dissertations*. University of Chicago Press, 1973.



RESEARCH AND PUBLICATION ETHICS

Course code : SoET- 020102C:2002

L	T	P	Credit
2	0	0	2

This course has 6 modules mainly focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands on sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research and p metrics and plagiarism tools introduced in the course

THEORY

RPE 01: PHILOSOPHY AND ETHICS (3 HRS)

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgements and reactions.

RPE 02: SCIENTIFIC CONDUCT (5 HRS)

1. Ethics with respect to science and research
2. Intellectual honest and research integrity
3. Scientific misconducts: falsification, fabrication, and plagiarism.
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data.

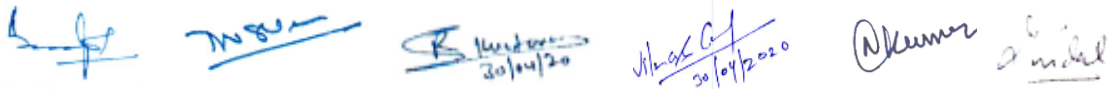
RPE 03: PUBLICATION ETHICS (7 HRS)

1. Publication ethics: definition, introduction and importance
2. Best practices/standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types
5. Violation of publication ethics, authorship and contributor ship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

PRACTICE

RPE 04: OPEN ACCESS PUBLISHING (4 HRS)

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright and self-archiving policies.
3. Software tool to identify predatory publications developed by SPPU



4. Journal finder/ journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

RPE 05: PUBLICATION MISCONDUCT (4 HRS)

A. Group Discussions (2 hrs)

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

B. Software tools (2 hrs)

Use of plagiarism software like Turnitin, Urkund and other open source software tools.

RPE 06: DATABASES AND RESEARCH METRICS (7 HRS)

A Databases (4 hrs)

1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc.

B. Research Metrics (3 hrs)

Impact Factor of journal as per journal citation report, SNIP, SJR, IPP, Cite Score.

Metrics: h-index, g index, i10 index, altmetrics

Suggested Readings:

1. Kimmel, Allan J. *Ethical Issues in Behavioral Research: Basic and Applied Perspectives*. John Wiley & Sons, 2009.
2. Kitchener, K. S. *Foundations of Ethical Practice, Research, and Teaching in Psychology*. Lawrence Erlbaum Associates Publishers, 2000.
3. Oliver, P. *The Student's Guide to Research Ethics.* Open University Press, Philadelphia, 2010.
4. Shamoo, Adil E. and Resnik, David B. *Responsible Conduct of Research.* Oxford University Press, 2009.
5. Stanley, B. Joan Sieber, E. and Nelton, Gary B. *eds. Research ethics: A psychological approach*. U of Nebraska Press, 1996.
6. Todorovich, M., Kurtz, P. & Hook, S. *The Ethics of Teaching and Scientific Research*. Prometheus Books, 1977

SEMINAR

Course code : SoET-020103C0022

L	T	P	Credit
0	0	2	2

This seminar series has two objectives: first, to provide regular opportunity for doctoral students to share their research ideas and progress; and second, to create a low-stake forum in which students can give and take feedback on each other's research. Students will be asked to present, submit early drafts or proposals, and referee or discuss them. Our goals are to – via practice and advice – improve students' presentations and writing, teach how to give constructive criticism, speed research progress, and advise on the academic job market.

The course requirement shall include a seminar presentation before Departmental Research Committee along with a hard copy of the report for the same (submitted prior to seminar).

Grading shall be based on attendance and quality of the seminar presented by the student.

The schedule of seminars will be finalized in consultation with the registered students and their thesis supervisors and will notified at suitable time in the year.

When a student gives a seminar, all Ph.D students registered in that seminar course and the thesis supervisor(s) of the concerned student will be required to be present. The program committee members, other faculty members and Ph.D students in related specializations are also expected to attend the seminar. Other faculty members and students of the department will also be encouraged to attend the same if possible.

CONDITION ASSESSMENT AND RETROFITTING OF STRUCTURES

Course Code: SoET - CE 0201014004

L	T	P	Credit
4	0	0	4

Course Outcome

CO1: Understand the background of repair, strengthening, retrofitting and rehabilitations of reinforced concrete structures.
CO2: Understand the concept of distress mapping in the reinforced concrete structures.
CO3: Understand the strategies of surface repair and retrofitting techniques.
CO4: Attain knowledge of rehabilitation of existing building.

UNIT-I

Deterioration of Concrete Buildings: Embedded Metal Corrosion, Disintegration Mechanisms, Moisture Effects, Thermal Effects, Structural Effects, Faulty Construction.

Evaluation of Concrete Buildings: Visual Investigation, Destructive Testing Systems, Non-Destructive Testing Techniques, Semi-Destructive Testing Techniques, Chemical Testing.

UNIT-II

Surface Repair & Retrofitting Techniques: Strategy & Design, Selection of Repair Materials, Surface Preparation, Bonding repair Materials to Existing concrete, Placement Methods, Epoxy Bonded Replacement Concrete, Preplaced Aggregate Concrete, Shotcrete/Gunite, Grouting, Injection Grouting, Micro concrete.

UNIT-III

Strengthening Techniques: Strengthening Techniques, Beam Shear Capacity Strengthening, Shear Transfer Strengthening between Members, Column Strengthening, Flexural Strengthening, and Crack Stabilization

Seismic Rehabilitation: Guidelines for Seismic Rehabilitation of Existing Buildings, Seismic Vulnerability and Strategies for Seismic Retrofit.

UNIT-IV

Earthquake resistant design: Introduction to IS 1893:2002, Behaviour of buildings and structures during past earthquakes and lessons learnt goals of earthquake resistant design. Linear static procedure for seismic load calculation – IS 1893-2002, Design the 5 storey earthquake resistant structures.

Suggested Readings:

1. *ATC- 40: Seismic Evaluation and Retrofit of Concrete Buildings, Vol. 1 & 2*, 1997.
2. Bohni, H. *Corrosion in Concrete Structures*. CRC Press, 2005.

3. Bungey, S., Lillard, G. and Grantham, M.G., *Testing of Concrete in Structures*. Taylor and Francis, 2006.
4. Emmons, P.H., *Concrete Repair and Maintenance.* Galgotia Publication, 2012.
5. *FEMA 273; NEHRP Guidelines for the Seismic Rehabilitation of Buildings*, 1999.
6. Malhotra, V.M. and Carino, N.J. *Handbook on Non-destructive Testing of Concrete.* CRC Press, 2004.
7. Priestley, M.J.N., Seible, F. and Calvi, G.M, *Seismic Design and Retrofit of Bridges.* John Wiley, 1996.

PAVEMENT MATERIALS AND CONSTRUCTION PRACTICES

Course Code: SoET - CE 0201024004

L	T	P	Credit
4	0	0	4

Course Outcome

CO1: Attain knowledge of different materials used for pavement construction.
CO2: Exhibit knowledge of practices involved in the construction of different pavements.
CO3: Exhibit a theoretical knowledge of various design methods of pavements.
CO4: Understands various aspects of quality control during the construction of pavements.

Unit I

Aggregates, Soil & Bitumen Classification, physical and strength characteristics, Proportioning of aggregates, Aggregate texture and skid resistance, polishing of aggregates. Classification, Structural and Constructional problems in soil subgrade, Identification and strength tests, Soil-moisture movement, Sub-soil drainage, Soil stabilization. Bitumen sources and manufacturing, Bitumen constituents, structure and Rheology, Mechanical and engineering properties of bitumen, Tests on bitumen, Emulsions – Properties, types, modifications, Durability of bitumen, Adhesion of bitumen, Modified bitumen.

Unit II

Bituminous Mixes Desirable properties of mixes, Design of bituminous mixes, Tests on bituminous mixes, Fillers, Theory of fillers and specifications.

Unit III

Cement Concrete Mixes Constituents and their requirements, Physical, plastic and structural properties of concrete, Factors influencing mix design, Design of concrete mixes.

Unit IV

Road Construction Bituminous road construction procedures and specifications, Quality control requirements. Concrete Road construction: Construction methods, Quality control requirements, Joints in cement concrete pavements, Reinforced cement concrete road construction.

Suggested Readings:

1. Khanna, S.K. and Justo, C.E.G. *Highway Engineering*. Nem Chand Jain & Bros, 2005.
2. Krebs, Robert, D. and Walker, R. D. *Highway Materials.* McGraw Hill Book Co., 1971.
3. Read, John, David Whiteoak, and Robert N. Hunter. *The shell bitumen handbook.* Thomas Telford, 2003.
4. Relevant latest IRC and IS code of 2019
5. Yao J., Zhou Z., and Zhou H. *Highway Engineering Composite Material and Its Applications*. Springer Singapore, 2019.

Fluvial Hydraulics and Flood Control

Course code: SoET- CE 020103 E4004

Course Outcome

CO1: To understand the fundamental concepts relevant to river mechanics, regime channels, sediment transport and sediment load.
CO2: To attain the students to understand the processes that governs sediment transport and behaviour of river flow.
CO3: Apply the knowledge in estimation of floods
CO4: To utilize the knowledge of the reservoir and channel flood routing for the reservoir planning and flood management.

UNIT I

Reservoir Sedimentation and Control: Scope and significance of reservoir sedimentation, properties of sediments. Basic concepts of sedimentation, bed load, suspended load sediment inflow, sediment out flow, trap efficiency, retention time.

Incipient motion of sediment particles: Competent velocity, lift concept, tractive force concept; critical tractive force; Shield's analysis, White's analysis.

Unit II

Bed load transport and saltation: Bed load equations- Du-Boy's equation, Shield's equation, general comments on bed load equation; saltation-mechanism of saltation, saltation in air, transport rates in saltation, Regimes of flow: Description of regimes of flow; ripple and dune regime, anti-dune regime; characterization of ripples, dunes and anti-dunes.

Change of stream bed in floods, degradation, aggradation Equilibrium depth of scour in channel connection, scour, types of scour, scour at bridge piers, scour prevention measures.

Unit III

Flood estimation methods: Standard Project Flood and Probable Maximum Flood, Indian standard and CWC guidelines for design flood estimation for different structure, Flood Peak estimation, Rational Method, Empirical Equations, Flood Peak Formulae,, Flood Frequency Analysis, Gumble's Method,

Unit IV

Flood routing: Routing methods, Hydrologic Channel and Reservoir Routing, Muskingham method, the working value method, Hydrologic, Modified Pul's method,

Flood Management: Flood Control measures, Flood protection works.

Suggested Readings:

1. Chang H. Howard, *Fluvial Processes in River Engineering*, John Wiley & Sons, 1988.
2. Chow, V.T., Maidment, D.R., and Mays, L.W., *Applied Hydrology*, McGraw Hill, 2010
3. Garde, R.J. *River Morphology*, New Age International Publishers, 2006

4. Garde, R.J. and Ranga Raju, K.G., *Mechanics of Sediment Transportation and Alluvial Stream Problems*, Wiley Eastern Limited, 2005.
5. K. Subramanya, *Engineering Hydrology*, TMH, New Delhi, India, 2020
6. Mccuen, R.H., *Hydrologic Analysis and Design*, Pearson, 2005
7. Pierre Y. Julien, *River Mechanics*, Cambridge University Press, 2018

Scheme & Syllabus for Ph.D. in Electrical Engineering

Ph.D. Course Work

Department of Electrical Engineering
W.e.f. Session 2020-21

School of Engineering & Technology

CENTRAL UNIVERSITY OF HARYANA
MAHENDERGARH-123031
HARYANA

Central University of Haryana, Mahendergarh
Department of Electrical Engineering, School of Engineering and Technology
Ph.D. Course Work (w.e.f. session 2020-21)

Sl. No.	Course Code	Course Title	Teaching Schedule			Credits
			L	T	P	
Core Courses (Compulsory)						
1	SOET 020101C4206	Research Methodology	4	2	0	6
2	SOET 020102C2002	Research and Publication Ethics	2	0	0	2
3	SOET 020103C0022	Seminar	0	0	2	2
Specialization based Elective Courses (Any two Subjects)						
4	SOET EE 020101E4004	Soft Computing	4	0	0	4
5	SOET EE 020102E4004	Engineering Optimization	4	0	0	4
6	SOET EE 020103E4004	Renewable Energy Generation and Storage	4	0	0	4
Total			**10**	**2**	**2**	**14**

L = Lecture, T = Tutorial, P = Practical, & C = Credits

RESEARCH METHODOLOGY
Course Code: SOET 020101C4206

L	T	P	Credits
4	2	0	6

Unit -I

Introduction of Research Methodology: Concept of research and its applications: characteristics features, objectives, scope, reliability and validity of research, Scientific process: Meaning and Definition, Steps involved in research process, a brief history of scientific process.

Formulation of research problem: Objectives of research problem. Research Design-Meaning, Need and features of good research design, defining problem, preparing research design analysis and interpretation of data, Basic Principles of Experimental Techniques. Importance and relevance of ethics and values in science and technology

Unit -II

Scientific Methodology: Meaning, Scope, Primary sources of literature survey- journal, patents etc. Secondary sources of literature survey - books, reference books, text books. Paper Writing and preparation of Dissertation: Basic concepts of paper writing - Steps of paper writing, Methods of presentation, Precautions in preparing the research Dissertation – Concepts of bibliography and annexure, Discussion of results, Drawing conclusions, Giving suggestion and recommendation of concerned persons.

UNIT -III

Computer Applications: a. Spreadsheet tool: Introduction to spread-sheet applications, features & functions, using formulae & functions, data storing, features for statistical data analysis, generating charts/graphs & other features. [Tools: Microsoft Excel, Open office and similar or other advanced tools] b. Presentation tool: Introduction to presentation tool, features & functions, creating presentations, customising presentation. [Tools used: Microsoft Power point, Open Office or any other tool] c. Web Search: introduction to internet, Use of Internet & www, using search engines using advanced search tools. d. Thesis writing & Scientific editing tools.

UNIT -IV

Measurement Scales and Evaluation: Concepts of Measurement Scales; Primary Levels of Measurement; Classification of Measurement Scales; Validity and Reliability Analysis
Scholarly Writing Characteristics of Scholarly Writing; Standard Guidelines; Critical Reviews; Research Proposals; Research Reports; Thesis/Dissertations; Research Papers; Impact Factor of Journals; Citation and Acknowledgement; Plagiarism and Self-Plagiarism; Reproducibility and Accountability

Following are to be practiced in Computer Lab.: Spreadsheet application, features and functions, using formulas and functions, data storing, features for statistical data analysis, use of SPSS generating chart's/graph and other features. Document and Presentation tool: features and functions, Using Latex, Open–office and MS office, creating presentations, master page, adding animation, customizing animation, creating handouts. Web search: introduction to internet, using search engine, relevance of search terminology, Advanced search.

Suggested Readings:

1. Bowen, William G., and Neil L. Rudenstine. *In pursuit of the PhD*. Princeton University Press, 2014.
2. Davis, G. B., and C. A. Parker. *Writing the doctoral dissertation-a systematic approach Woodbury*. Barron's Educational Series, 3rd Edition, 2012.

3. Gash, Sarah. *Effective literature searching for research*. Gower, 2000.
4. Kothari, C. R., and G. Garg. *Research methodology Methods and Techniques*. New Age International (P) Ltd, 2019.
5. Kumar, Ranjit. *Research methodology: A step-by-step guide for beginners*. Sage Publications Limited, 2019.
6. Lester, James D., and James D. Lester. *Writing research papers: A complete guide*. Pearson, 2015.
7. Madsen, David. *Successful dissertations and theses: A guide to graduate student research from proposal to completion*. Jossey-Bass Inc Pub, 1992.
8. Mauch, James, and Namgi Park. *Guide to the successful thesis and dissertation: A handbook for students and faculty*. CRC Press, 2003.
9. Schloss, Patrick J., and Maureen A. Smith. *Conducting Research.* Prentice-Hall, 1999.
10. Sternberg, D. *How to Complete and Survive a Doctoral Dissertation*. St. Martin's Press, 1981.
11. Turabian, Kate L. *A manual for writers of research papers, theses, and dissertations: Chicago style for students and researchers*. University of Chicago Press, 2013.

RESEARCH AND PUBLICATION ETHICS
Course Code: SOET 020102C2002

L	T	P	Credits
2	0	0	2

This course mainly focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands on sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research and p metrics and plagiarism tools introduced in the course

Unit-I

PHILOSOPHY: Introduction to philosophy: definition, nature and scope, concept, branches
ETHICS: Ethics: definition, moral philosophy, nature of moral judgements and reactions.
SCIENTIFIC CONDUCT: Ethics with respect to science and research, Intellectual honest and research integrity

Unit-II

SCIENTIFIC CONDUCT: Scientific misconducts: falsification, fabrication, and plagiarism, Redundant publications: duplicate and overlapping publications, salami slicing, Selective reporting and misrepresentation of data.
OPEN ACCESS PUBLISHING (Practical): Open access publications and initiatives, SHERPA/RoMEO online resource to check publisher copyright and self-archiving policies, Software tool to identify predatory publications developed by SPPU, Journal finder/ journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

Unit-III

PUBLICATION ETHICS: Publication ethics: definition, introduction and importance, Best practices/standards setting initiatives and guidelines: COPE, WAME, etc., Conflicts of interest, Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types
PUBLICATION MISCONDUCT (Practical)
A. Group Discussions: Subject specific ethical issues, FFP, authorship**,** Conflicts of interest**,** Complaints and appeals: examples and fraud from India and abroad
B. Software tools: Use of plagiarism software like Turnitin, Urkund and other open source software tools.

Unit-IV

PUBLICATION ETHICS: Violation of publication ethics, authorship and contributor ship, Identification of publication misconduct, complaints and appeals, Predatory publishers and journals
DATABASES AND RESEARCH METRICS (Practical)
A. Databases: Indexing databases, Citation databases: Web of Science, Scopus, etc.
B. Research Metrics: Impact Factor of journal as per journal citation report, SNIP, SJR, IPP, Cite Score, Metrics: h-index, g index, i10 index, altmetrics

Suggested Readings:

1. Hook, Sidney, Paul Kurtz, and Miro Todorovich. *The Ethics of Teaching and Scientific Research.* Prometheus Books, 1977.

2. Kimmel, Allan J. *Ethical issues in behavioral research: Basic and applied perspectives*. John Wiley & Sons, 2009.
3. Kitchener, Karen Strohm. *Foundations of ethical practice, research, and teaching in psychology*. Lawrence Erlbaum Associates Publishers, 2000.
4. Oliver, Paul. *The student's guide to research ethics*. McGraw-Hill Education (UK), 2010.
5. Shamoo, Adil E., and David B. Resnik. *Responsible conduct of research*. Oxford University Press, 2009.
6. Stanley, Barbara, Joan E. Sieber, and Gary B. Nelton, eds. *Research ethics: A psychological approach*. U of Nebraska Press, 1996.

SEMINAR

Course code : SoET-020103C0022

L	T	P	Credit
0	0	2	2

This seminar series has two objectives: first, to provide regular opportunity for doctoral students to share their research ideas and progress; and second, to create a low-stake forum in which students can give and take feedback on each other's research. Students will be asked to present, submit early drafts or proposals, and referee or discuss them. Our goals are to – via practice and advice – improve students' presentations and writing, teach how to give constructive criticism, speed research progress, and advise on the academic job market.

The course requirement shall include a seminar presentation before Departmental Research Committee along with a hard copy of the report for the same (submitted prior to seminar).

Grading shall be based on attendance and quality of the seminar presented by the student.

The schedule of seminars will be finalized in consultation with the registered students and their thesis supervisors and will notified at suitable time in the year.

When a student gives a seminar, all Ph.D students registered in that seminar course and the thesis supervisor(s) of the concerned student will be required to be present. The program committee members, other faculty members and Ph.D students in related specializations are also expected to attend the seminar. Other faculty members and students of the department will also be encouraged to attend the same if possible.

SOFT COMPUTING
Course Code: SOET EE 020101E4004

L	T	P	Credits
4	0	0	4

UNIT -I

INTRODUCTION TO SOFT COMPUTING: Evolution of Computing: Soft Computing Constituents, soft computing vs. hard computing, From Conventional AI to Computational Intelligence: Machine Learning Basics

UNIT -II

FUNDAMENTALS OF ARTIFICIAL NEURAL NETWORKS: Introduction to Artificial neural network: characteristics- Model of Artificial Neuron, Architectures, learning methods - Evolution of neural networks- important technologies –Taxonomy of ANN Systems, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks, Applications of ANN in research.

UNIT -III

FUZZY SET THEORY & FUZZY SYSTEMS: Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, introduction & features of membership functions, Extension Principle, Fuzzy If-Then Rules, Fuzzy Inference Systems, Sugeno Fuzzy Models, Fuzzification, Defuzzification, Applications of fuzzy systems.

Neuro-fuzzy hybrid systems - genetic neuro hybrid systems - genetic fuzzy hybrid and fuzzy genetic hybrid systems - simplified fuzzy ARTMAP

UNIT -IV

GENETIC ALGORITHMS: Introduction to Genetic Algorithms (GA), Genetic algorithm and search space - general genetic algorithm – operators - Generational cycle - stopping condition – constraints - classification - genetic programming – multilevel optimization – real life problem- advances in GA.

Other Soft computing Techniques – Simulated Anneling, Ant colony optimization and Particle swarm optimization

Suggested Readings:

1. Freeman, A. J. and David M. Skapura, *Neural Networks Algorithms, Applications, and Programming Techniques*. Pearson Education, 2003
2. Jang, Jyh-Shing Roger, Chuen-Tsai Sun, and Eiji Mizutani. *Neuro-fuzzy and soft computing-a computational approach to learning and machine intelligence*. Prentice-Hall of India, 2003.
3. Klir, George, and Bo Yuan. *Fuzzy sets and fuzzy logic*. Vol. 4. New Jersey: Prentice hall, 1995.
4. Konar, Amit. *Artificial intelligence and soft computing: behavioral and cognitive modeling of the human brain*. CRC press, 2018.
5. Pratihar, Dilip Kumar. *Soft computing: fundamentals and applications*. Alpha Science International, Ltd, 2013.
6. Sivanandam, S. N., and S. N. Deepa. *Principles of soft computing (with CD)*. John Wiley & Sons, 2011.
7. Sanguthevar, Rajasekaran, and GA Vijayalakshmi Pai. Neural networks, fuzzy logic and genetic algorithm: synthesis and applications (with cd). PHI Learning Pvt. Ltd., 2017.

ENGINEERING OPTIMIZATION
Course Code: SOET EE 020102E4004

L	T	P	Credits
4	0	0	4

UNIT -I

Concepts of optimization: Engineering applications, Statement of optimization, Problem, Classification - type and size of the problem, Classical Optimization Techniques: Single and multi-variable problems, Types of Constraints, Semi definite case-saddle point

Linear programming: Standard form-Geometry of LP problems-Theorem of LP, Relation to convexity - formulation of LP problems - simplex method and algorithm, Matrix form- two phase method. Duality, dual simplex method- LU Decomposition

UNIT -II

Sensitivity analysis: Artificial variables and complementary solutions QP, Engineering Applications: Minimum cost flow problem, Network problems-transportation, assignment & allocation, scheduling, Karmarkar method-unbalanced and routing problems.

Nonlinear programming: Non linearity concepts-convex and concave functions, non-linear programming -gradient and Hessian, Unconstrained optimization, First & Second order necessary conditions- Minimisation & Maximisation, Local & Global convergence, Speed of convergence

UNIT -III

Basic decent methods: Fibonacci & Golden section search - Gradient methods – Newton, Method-Lagrange multiplier method - Kuhn-tucker conditions, Quasi-Newton method-separable, convex programming -Frank and Wolfe method, Engineering Applications

Nonlinear programming- Constrained optimization: Characteristics of constraints-Direct methods- SLP,SQP-Indirect, Methods, Transformation techniques-penalty function-Langrange multiplier methods checking convergence- Engineering applications

UNIT -IV

Dynamic programming: Multistage decision process- Concept of sub optimization and principle of optimality, Computational procedure- Engineering applications, Genetic algorithms, Simulated, Annealing Methods - Optimization programming, tools and Software packages

Suggested Readings:

1. Dantzig, George Bernard. *Linear programming and extensions*. Vol. 48. Princeton university press, 1998.
2. Dixon, L., Spedicato, E., Szego, G. (Eds.), *Non Linear Optimisation (Theory and Algorithms)*. Birkhausen, 1980.
3. Grossmann, Ignacio E., ed. *Global Optimization in engineering design*. Vol. 9. Springer Science & Business Media, 2013.
4. Koziel, Slawomir, and Xin-She Yang, eds. *Computational optimization, methods and algorithms*. Vol. 356. Springer, 2011.
5. Luenberger, David G., and Yinyu Ye. *Linear and nonlinear programming*. Springer Science & Business Media, 2008.
6. Rao, S. S. *Engineering optimization: theory and practice*. John Wiley & Sons, 2019.
7. Ravindran, Arunachalam, Gintaras Victor Reklaitis, & K. M. Ragsdell. *Engineering optimization: methods and applications*. John Wiley & Sons, 2006.
8. Yang, Xin-She. *Engineering optimization: an introduction with metaheuristic applications*. John Wiley & Sons, 2010.

RENEWABLE ENERGY AND SMART GRID
Course Code: SOET EE 020103E4004

L	T	P	Credits
4	0	0	4

UNIT -I

Introduction to energy sources: Primary and secondary energy sources, limitations to primary sources, Indian Energy Scene, Conventional and non-conventional energy sources, Prospects of renewable energy sources, MNRE and various schemes for promotion of Renewable Energy utilization.

Photo-voltaic Cell: Distributed generation versus traditional power systems, Basic characteristics of sunlight - solar energy resource - photovoltaic cell - cell efficiency – characteristics - equivalent circuit

UNIT -II

Wind Turbines: Wind Source- Wind statistics- energy in the wind- aerodynamics- rotor types- forces developed by blades- aerodynamic models braking systems- tower- control and monitoring systems- power performance.

Gas turbine powered Distributed generators and other Renewable Sources: Gas turbine types, mini and micro gas turbine generators, micro- hydel electric systems- power potential- scheme layout- generation efficiency and turbine power flow, isolated and parallel operation of generators- tidal and other sources and applications.

UNIT -III

Supercapacitors, Fuel Cells and Hydrogen Storage, Battery Recycling Technologies, Battery Applications for Stationary and Secondary Use, Battery Chargers and Battery Testing Procedures, Battery Management Systems (BMS), Battery Thermal Management, Regulations and Safety Aspects of High Voltage Batteries.

UNIT -IV

Introduction to Smart Grid, Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Concept of Robust &Self-Healing Grid, Present development & International policies in Smart Grid , Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading (AMR), Outage Management System (OMS).

Suggested Readings:

1. Borlase, Stuart, ed. *Smart grids: infrastructure, technology, and solutions*. CRC press, 2016.
2. Ekanayake, Janaka B., Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, and Akihiko Yokoyama. *Smart grid: technology and applications*. John Wiley & Sons, 2012.
3. Gellings, Clark W. *The smart grid: enabling energy efficiency and demand response*. The Fairmont Press, Inc., 2009.
4. Huggins, Robert Alan. *Energy storage:* : *Fundamentals, Materials and Applications.* Springer, 2015.
5. Infield, David, and Leon Freris. *Renewable energy in power systems*. John Wiley & Sons, 2020.
6. Jenkins, Nick, Kithsiri Liyanage, Jianzhong Wu, and Akihiko Yokoyama. *Smart Grid*. Wiley., 2012.
7. Keyhani, Ali. *Design of smart power grid renewable energy systems*. John Wiley & Sons, 2016.
8. Khan, B. H. *Non-conventional energy resources*. Tata McGraw-Hill Education, 2006.

9. Luque, Antonio, and Steven Hegedus, eds. *Handbook of photovoltaic science and engineering*. John Wiley & Sons, 2011.
10. M. S. Imamura, P. Helm, Wolfgang Palz. *Photovoltaic System Technology: A European Handbook.* H.S. Stephens & Associates, 1992
11. Manwell, James F., Jon G. McGowan, and Anthony L. Rogers. *Wind energy explained: theory, design and application*. John Wiley & Sons, 2010.
12. Muyeen, S. M., and Saifur Rahman. *Communication, control and security challenges for the smart grid*. The Institution of Engineering and Technology, 2017.
13. O'hayre, Ryan, Suk-Won Cha, Whitney Colella, and Fritz B. Prinz. *Fuel cell fundamentals*. John Wiley & Sons, 2016.
14. Overstraeten, RJ Van, and R. P. Mertens. *Physics, technology and use of photovoltaics*. Adam Hilger Ltd, Bristol and Boston, 1986.
15. Phadke, Arun G., and James S. Thorp. *Synchronized phasor measurements and their applications*. Vol. 1. New York: Springer, 2008.
16. Rai, G. D. *Non-Conventional Energy Sources*. Khanna Publications, 6th Edition, 2011.

Annexure-XXI

Scheme & Syllabus for Ph.D.
in

Computer Science and Engineering

Ph.D. Course Work

Department of
Computer Science and Engineering
W.e.f. 2020-21

School of Engineering & Technology

CENTRAL UNIVERSITY OF HARYANA
MAHENDERGARH-123031
HARYANA

Ph.D. Course Work

Sl. No.	Course Code	Course Title	Teaching Schedule			Credits
			L	T	P	
Core Courses (Compulsory)						
1	SOET 020101C 4206	Research Methodology	4	2	0	6
2	SOET 020102C 2002	Research and Publication Ethics	2	0	0	2
3	SOET 020103C 0022	Seminar	0	2	0	2
Elective Courses (Any one subject based on specialization)						
3	SOET CS 020101E 4004	Applied Machine Learning	4	0	0	4
4	SOET CS 020102E 4004	Engineering Optimization	4	0	0	4
5	SOET CS 020103E 4004	Advanced Data Structures and Algorithms	4	0	0	4
Total			**14**	**0**	**00**	**14**

L = Lecture, T = Tutorial, P = Practical, & C = Credits

RESEARCH METHODOLOGY
Course Code: SOET 020101C 4206

L T P
4 2 0

Credits: 06

Course Level Learning Outcomes
After successful completion of the course, student will be able to:

1. Formulate the problem statement.
2. Identify the research path to be followed for the identified problem.
3. Design and test a hypothesis.
4. Measure and analyze the data and plan the experiments.
5. Organize and deliver the scientific presentation and look for the commercial aspects of the research output.

Unit-1

Introduction of Research Methodology: Concept of research and its applications: characteristics features, objectives, scope, reliability and validity of research, Scientific process: Meaning and Definition, Steps involved in research process, a brief history of scientific process.
Formulation of research problem: Objectives of research problem. Research Design-Meaning, Need and features of good research design, defining problem, preparing research design analysis and interpretation of data, Basic Principles of Experimental Techniques. Importance and relevance of ethics and values in science and technology

Unit-2

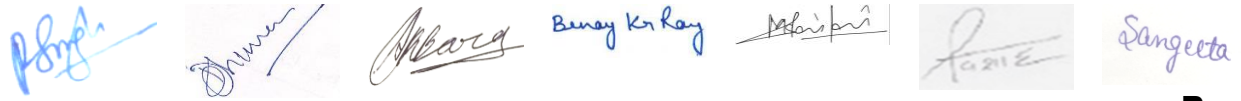
Scientific Methodology: Meaning, Scope, Primary sources of literature survey- journal, patents etc. Secondary sources of literature survey - books, reference books, text books. Paper Writing and preparation of Dissertation: Basic concepts of paper writing - Steps of paper writing, Methods of presentation, Precautions in preparing the research Dissertation – Concepts of bibliography and annexure, Discussion of results, Drawing conclusions, Giving suggestion and recommendation of concerned persons.

Unit-3

Computer Applications: a. Spreadsheet tool: Introduction to spread-sheet applications, features & functions, using formulae & functions, data storing, features for statistical data analysis, generating charts/graphs & other features. [Tools: Microsoft Excel, Open office and similar or other advanced tools] b. Presentation tool: Introduction to presentation tool, features & functions, creating presentations, customising presentation. [Tools used: Microsoft Power point, Open Office or any other tool] c. Web Search: introduction to internet, Use of Internet & www, using search engines using advanced search tools. d. Thesis writing & Scientific editing tools.

Unit-4

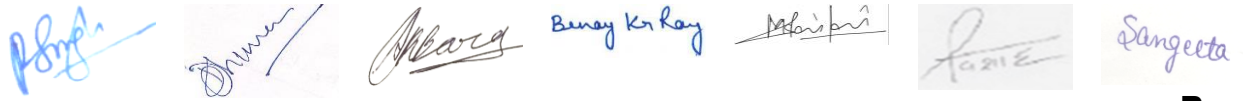
Measurement Scales and Evaluation: Concepts of Measurement Scales; Primary Levels of Measurement; Classification of Measurement Scales; Validity and Reliability Analysis
Scholarly Writing Characteristics of Scholarly Writing; Standard Guidelines; Critical Reviews; Research Proposals; Research Reports; Thesis/Dissertations; Research Papers; Impact Factor of Journals; Citation and Acknowledgement; Plagiarism and Self-Plagiarism; Reproducibility and Accountability



Note: Following are to be practiced in Computer Lab.: Spreadsheet application, features and functions, using formulas and functions, data storing, features for statistical data analysis, use of SPSS generating chart's/graph and other features. Document and Presentation tool: features and functions, Using Latex, Open–office and MS office, creating presentations, master page, adding animation, customizing animation, creating handouts. Web search: introduction to internet, using search engine, relevance of search terminology, Advanced search.

Suggested Readings:

1. Bowen, W.G. and Rudenstine, N.L., *In Pursuit of the PhD,* Princeton University Press, 2014.
2. Davis, G.B., and Parker, C.A., *Writing the Doctoral Dissertation- A Systematic Approach Woodbury,* Barron's Educational Series, 3rd Edition, 2012.
3. Gash, S., *Effective Literature Searching For Research,* Gower, 2000.
4. Kothari, C. R., and Garg G., *Research Methodology Methods and Techniques,* New Age International(P) Ltd., 2019.
5. Kumar, R., *Research Methodology: A Step-by-Step Guide for Beginners,* Sage Publications Limited, 2019.
6. Lester, J.D., *Writing Research Papers: A Complete Guide,* Pearson, 2015.
7. Madsen, D., *Successful Dissertations and Theses: A Guide to Graduate Student Research from Proposal to Completion,* Jossey-Bass Inc. Pub, 1992.
8. Mauch, J., and Park, N., *Guide to the Successful Thesis and Dissertation: A Handbook for Students and Faculty,* CRC Press, 2003.
9. Schloss, Patrick J., and A. Smith, Maureen., *Conducting Research.* Prentice-Hall, 1999.
10. Sternberg, D., *How to Complete and Survive a Doctoral Dissertation,* St. Martin's Press, 1981.
11. Turabian, K.L., *A Manual for Writers of Research Papers, Theses, and Dissertations: Chicago style for Students and Researchers,* University of Chicago Press, 2013.



RESEARCH AND PUBLICATION ETHICS
Course Code: SOET 020102C 2002

L	T	P
2	0	0

Credits: 02

Course Level Learning Outcomes
This course mainly focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands on sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research and p metrics and plagiarism tools introduced in the course.

After successful completion of the course, student will be able to:

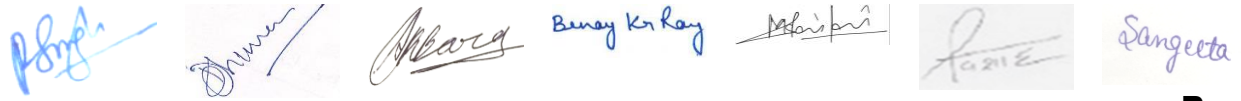
1. Prepare the research/ academic documents keeping in mind the ethics.
2. Provide the authentic and genuine content.
3. Draft policies for government and private institutions.
4. Identify the conflicts, resolve complaints and appeals.

Unit-1
Philosophy: Introduction to philosophy: definition, nature and scope, concept, branches
Ethics: Ethics: definition, moral philosophy, nature of moral judgements and reactions.
Scientific Conduct: Ethics with respect to science and research, Intellectual honest and research integrity

Unit-2
Scientific Conduct: Scientific misconducts: falsification, fabrication, and plagiarism, Redundant publications: duplicate and overlapping publications, salami slicing, Selective reporting and misrepresentation of data.
Open Access Publishing (Practical): Open access publications and initiatives, SHERPA/RoMEO online resource to check publisher copyright and self-archiving policies, Software tool to identify predatory publications developed by SPPU, Journal finder/ journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

Unit-3
Publication Ethics: Publication ethics: definition, introduction and importance, Best practices/standards setting initiatives and guidelines: COPE, WAME, etc., Conflicts of interest, Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types
Publication Misconduct (PRACTICAL)
A. Group Discussions: SUBJECT SPECIFIC ETHICAL ISSUES, FFP, AUTHORSHIP**,** CONFLICTS OF INTEREST**,** COMPLAINTS AND APPEALS: EXAMPLES AND FRAUD FROM INDIA AND ABROAD
B. Software Tools: USE OF PLAGIARISM SOFTWARE LIKE TURNITIN, URKUND AND OTHER OPEN SOURCE SOFTWARE TOOLS.

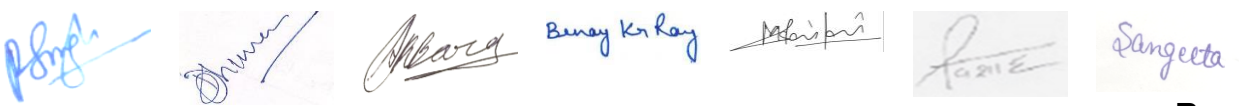
UNIT-4
Publication Ethics: Violation of publication ethics, authorship and contributor ship, Identification of publication misconduct, complaints and appeals, Predatory publishers and journals
Databases and Research Metrics (Practical)



A. Databases: Indexing databases, Citation databases: Web of Science, Scopus, etc.
B. Research Metrics: Impact Factor of journal as per journal citation report, SNIP, SJR, IPP, Cite Score, Metrics: h-index, g index, i10 index, altmetrics

Suggested Readings:

1. Hook, S., Kurtz, P., and Todorovich, M., *The Ethics of Teaching and Scientific Research*, Prometheus Books, 1977.
2. Kimmel, A.J., *Ethical Issues in Behavioral Research: Basic and Applied Perspectives*, John Wiley & Sons, 2009.
3. Kitchener, K.S., *Foundations of Ethical Practice, Research, and Teaching in Psychology*, Lawrence Erlbaum Associates Publishers, 2000.
4. Oliver, P., *The Student's Guide to Research Ethics*, McGraw-Hill Education, 2010.
5. Shamoo, A.E., and David B.R., *Responsible Conduct of Research*, Oxford University Press, 2009.
6. Stanley, B., Sieber, E.J., and Gary, B.N., *Research Ethics: A Psychological Approach*, University of Nebraska Press, 1996.



APPLIED MACHINE LEARNING
Course Code: SOET CS 020101E 4004

L	T	P
4	0	0

Credits: 04

Course Level Learning Outcomes
After successful completion of the course, student will be able to:

1. Describe various techniques mentioned in the syllabus and use them in problem solving
2. Explain the scope, goal and limits of a machine learning algorithm.
3. Compare, contrast and evaluate different machine learning algorithms.
4. Use efficient machine learning algorithms in real world applications.

Unit-I

Introduction to Maths and Probability, Thinking About Data, Naive Bayes, Decision Trees, Generalization and Evaluation, Linear and Logistic regression, Optimization and Regularization.

Unit-2

Support Vector Machines, Nearest Neighbors, K-Means, Gaussian Mixture Models, Principal Components Analysis, Hierarchical Clustering, Neural Networks.

Unit-3

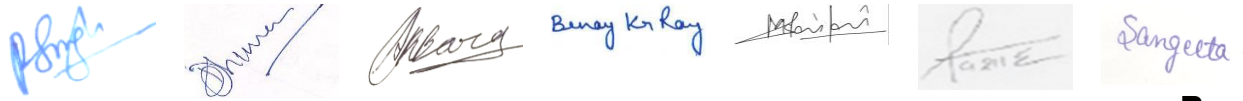
Rule Learning: Propositional and First-Order: Translating decision trees into rules. Heuristic rule induction using separate and conquer and information gain. First-order Horn-clause induction (Inductive Logic Programming) and Foil. Learning recursive rules. Inverse resolution, Golem, and Progol

Unit-4

Artificial Neural Networks: Neurons and biological motivation. Linear threshold units. Perceptrons: representational limitation and gradient descent training. Multilayer networks and backpropagation. Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks.

Suggested Readings:

1. Barber, D., *Machine Learning and Bayesian Reasoning*, Cambridge University Press, 2012.
2. Devroye, L., Gyorfi, L., and Lugosi, G., *A Probabilistic Theory of Pattern Recognition*, Springer, 1996.
3. Hastie, T., Tibshirani, R., and Friedman J., *Elements of Statistical Learning*, Springer, 2001.
4. Mackay, D., *Information Theory, Inference and Learning Algorithms*, Cambridge University Press, 2003.
5. Rasmussen, C.E., and Williams, C.K., *Gaussian Processes for Machine Learning*, The MIT Press, 2006.
6. Smola, A., and Vishwanathan, S.V.N., *Introduction to Machine Learning*, Cambridge University Press, 2008.



ENGINEERING OPTIMIZATION
Course Code: SOET CS 020102E 4004

L	T	P
4	0	0

Credits: 04

Course Level Learning Outcomes
After successful completion of the course, student will be able to:

1. Understand the concepts of optimization.
2. Use non-linear programming in real world problems.
3. Apply the dynamic programming.

Unit -I
Concepts of Optimization: Engineering applications, Statement of optimization, Problem, Classification - type and size of the problem, Classical Optimization Techniques: Single and multi-variable problems, Types of Constraints, Semi definite case-saddle point
Linear Programming: Standard form-Geometry of LP problems-Theorem of LP, Relation to convexity - formulation of LP problems - simplex method and algorithm, Matrix form- two phase method. Duality, dual simplex method- LU Decomposition

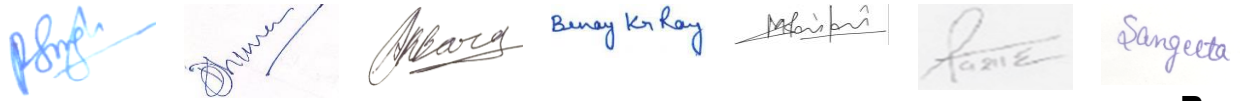
Unit -II
Sensitivity Analysis: Artificial variables and complementary solutions QP, Engineering Applications: Minimum cost flow problem, Network problems-transportation, assignment & allocation, scheduling, Karmarkar method-unbalanced and routing problems.
Nonlinear Programming: Non linearity concepts-convex and concave functions, non-linear programming -gradient and Hessian, Unconstrained optimization, First & Second order necessary conditions- Minimisation & Maximisation, Local & Global convergence, Speed of convergence

Unit -III
Basic Decent Methods: Fibonacci & Golden section search - Gradient methods – Newton, Method-Lagrange multiplier method - Kuhn-tucker conditions, Quasi-Newton method- separable, convex programming -Frank and Wolfe method, Engineering Applications
Nonlinear Programming- Constrained optimization: Characteristics of constraints-Direct methods- SLP,SQP-Indirect, Methods, Transformation techniques-penalty function-Langrange multiplier methods checking convergence- Engineering applications

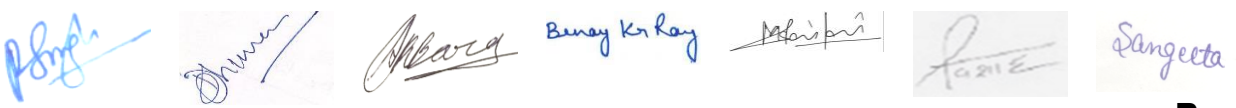
Unit -IV
Dynamic Programming: Multistage decision process- Concept of sub optimization and principle of optimality, Computational procedure- Engineering applications, Genetic algorithms, Simulated, Annealing Methods - Optimization programming, tools and Software packages

Suggested Readings:

1. Dantzig, George Bernard. *Linear programming and extensions*. Vol. 48. Princeton university press, 1998.
2. Dixon, L., Spedicato, E., Szego, G. (Eds.), *Non Linear Optimisation (Theory and Algorithms).* Birkhausen, 1980.
3. Grossmann, Ignacio E., ed. *Global Optimization in engineering design*. Vol. 9. Springer Science & Business Media, 2013.
4. Koziel, Slawomir, and Xin-She Yang, eds. *Computational optimization, methods and*



algorithms. Vol. 356. Springer, 2011.
5. Luenberger, David G., and Yinyu Ye. *Linear and nonlinear programming*. Springer Science & Business Media, 2008.
6. Rao, S. S. *Engineering optimization: theory and practice*. John Wiley & Sons, 2019.
7. Ravindran, Arunachalam, Gintaras Victor Reklaitis, & K. M. Ragsdell. *Engineering optimization: methods and applications*. John Wiley & Sons, 2006.
8. Yang, Xin-She. *Engineering optimization: an introduction with metaheuristic applications*. John Wiley & Sons, 2010.



ADVANCED DATA STRUCTURES AND ALGORITHMS
Course Code: SOET CS 020103E 4004

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4	0	0

Credits: 04

Course Level Learning Outcomes
After successful completion of the course, student will be able to:

1. Design and analyze programming problem statements.
2. Choose appropriate data structures and algorithms and use it to design algorithms for a specific problem.
3. Come up with analysis of efficiency and proofs of correctness
4. Apply advanced data structure to solve real world complex problems

Unit-1

Introduction to Basic Data Structures: Importance and need of good data structures and algorithms, Arrays, Linked lists, Stacks, Queues, Priority queues, Heaps; Strategies for choosing the appropriate data structures.

Advanced Data Structures: AVL Trees, Red-Black Trees, Splay Trees, B-trees, Fibonacci heaps, Data Structures for Disjoint Sets, Augmented Data Structures.

Unit-2

Algorithms Complexity and Analysis: Probabilistic Analysis, Amortized Analysis, Competitive Analysis, Internal and External Sorting algorithms: Linear Search, Binary Search, Bubble Sort, Selection Sort, Insertion Sort, Shell Sort, Quick Sort, Heap Sort, Merge Sort, Counting Sort, Radix Sort.

Graphs & Algorithms: Representation, Type of Graphs, Paths and Circuits: Euler Graphs, Hamiltonian Paths & Circuits; Cut-sets, Connectivity and Separability, Planar Graphs, Isomorphism, Graph Coloring, Covering and Partitioning, , Depth- and breadth-first traversals, Minimum Spanning Tree: Prim's and Kruskal's algorithms, Shortest-path Algorithms: Dijkstra's and Floyd's algorithm, Topological sort, Max flow: Ford-Fulkerson algorithm, max flow – min cut.

Unit-3

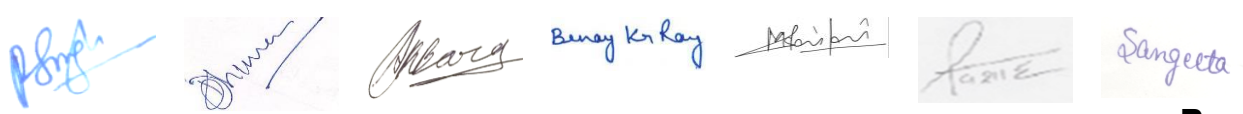
String Matching Algorithms: Suffix arrays, Suffix trees, tries, Rabin-Karp, Knuth-Morris-Pratt, Boyer-Moore algorithm.

Approximation Algorithms: Need of approximation algorithms: Introduction to P, NP, NP-Hard and NP Complete; Deterministic, non-Deterministic Polynomial time algorithms; Knapsack, TSP, Set Cover, Open Problems.

Unit-4

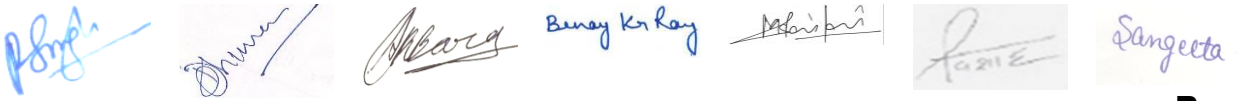
Randomized Algorithms: Introduction, Type of Randomized Algorithms, Quick Sort, Min- Cut, 2-SAT; Game Theoretic Techniques, Random Walks.

Online Algorithms: Introduction, Online Paging Problem, Adversary Models, k-server Problem.



Suggested Readings:

1. Cormen T.H, *Introduction to Algorithms*, Third edition, Prentice Hall of India, 2009.
2. Berg, M.D., Cheong, O., Kreveld, M.V., Overmars, M., *Computational Geometry Algorithms and Applications*, 3rd Edition, Springer, 2008.
3. Kleinberg J., Tardos E., *Algorithm Design*, 1st Edition, Pearson, 2012.
4. Motwani R., Raghavan P., *Randomized Algorithms*, Cambridge University Press, 1995.
5. Vazirani, Vijay V., *Approximation Algorithms*, Springer, 2001.



Scheme and Syllabus

Ph.D. and M.Phil. (Education)

School of Education

w.e.f. Academic Session: 2020-21

Scheme and Syllabus of Ph.D. and M.Phil. Course Work

Programme Objectives:

The aim of the programme is to train highly-skilled scholars to succeed in higher education with academic specializations. The programme applies a practical approach, offering both traditional, research-related training methods, as well as the development of practical skills relevant in the field of education. The programme is designed to prepare students to work in the professional sphere with the research background and trains students in new approaches and methodologies to achieve the goals of new education policy and sustainable development goals.

Programme: Ph.D. Education

Sr. No	Course Title	Course Code	Credits
1	Introduction to Educational Research	SOE 03 01 01 C 4004	4
2	Educational Research and Its Process	SOE 03 01 02 C 4004	4
3	Research and Publication Ethics	SOE 03 01 03 C 1022	2

Paper IV: Elective Course (Choose any one from the following)		
(i) Philosophical and Sociological Bases of Education	SOE 03 01 01 E 4004	4
(ii) Teacher Education	SOE 03 01 02 E 4004	4
(iii) Educational Administration, Management, Planning and Leadership	SOE 03 01 03 E 4004	4

Course Work – 14 Credits

For more details, please see the Central University Ordinance relating to M.Phil. Programme.

Programme: M.Phil. Education

Sr. No	Course Title	Course Code	Credits
1	Introduction to Educational Research	SOE 04 01 01 C 4004	4
2	Educational Research and Its Process	SOE 04 01 02 C 4004	4
3	Research and Publication Ethics	SOE 04 01 03 C 1022	2

Paper IV: Elective Course (Choose any one from the following)		
(i) Philosophical and Sociological Bases of Education	SOE 03 01 01 E 4004	4
(ii) Teacher Education	SOE 03 01 02 E 4004	4
(iii) Educational Administration, Management, Planning and Leadership	SOE 03 01 03 E 4004	4

Course Work – 14 Credits

For more details, please see the Central University Ordinance relating to Ph.D. Programme.

Course Code: Ph.D. – SOE 030101C4004

M.Phil. -SOE040101C4004

Course Title: Introduction to Educational Research

Credit: 4

Learning Outcomes:

- Developing the basic understanding of research methods as applied in disciplinary advances of knowledge;
- Gaining understanding of the research process, its designs and ethical issues involved both in fundamental and applied research;
- Sharpening abilities in analysing information; and
- Critically examine research in education, documentation and articulation of ideas.

Unit I- Research in Education: Conceptual Issues

- Sources of knowledge generation: Historical perspective, the scientific approach to the knowledge generation, scientific methods applied to researches in social science and education.
- Educational Research: Meaning, nature, purposes and areas
- Types of Educational Research: Basic & applied research, evaluation research and action research
- Planning of the research study: Sources of research problems, review of the literature-purpose and resources; conducting the literature search-using databases and internet, internet search tools and quality of internet resources

Unit II- Research Proposal

- Identification and conceptualization of research problem: Statement of problem, purpose, and research questions in qualitative and quantitative research
- Research paradigms in education: Quantitative, qualitative, mixed research and their characteristics
- Hypotheses : Concept, type, sources and formulation
- Preparation of a research proposal: Framework of the research proposal and strategies for writing the research proposals

Unit-III- Quantitative Methods of Educational Research

- Quantitative research: Meaning, steps, characteristics and types (Survey studies, descriptive studies, correlational studies, causal-comparative and correlational research)
- Experimental research: Concept of experimental research, variables in experimental research -independent, dependent and confounding variables, techniques of control, Matching, holding the extraneous variable constant and statistical control
- Experimental research designs: Single-group pre-test & post-test design, pre-test & post-test control-group design, Post-test only control-group design
- Quasi-experimental designs: Non-equivalent comparison group design, and time- series design
- Internal and external validity of results in experimental research

Unit IV. Qualitative Methods of Educational Research

- Qualitative research: Meaning, steps and characteristics
- Qualitative research approaches: Phenomenology, ethno- methodology, naturalistic enquiry: case studies and grounded theory.
- Historical research: Meaning, significance, steps, primary and secondary sources of information, external and internal criticism of the source
- Mixed Research: Meaning, fundamentals principles, strengths and weaknesses, types and limitations

Suggested Readings:

- Alan Agresti, Barbara, Finlay (2018). *Statistical methods for the social sciences*. Delhi: Pearson.
- Brady, Henry E. and David Collier (2010). *Social inquiry: Diverse tools shared standards. United Kingdom:* Rowman and Littlefield.
- Clive Opie (2004). *Doing educational research- A guide for first time researchers.* New Delhi: Vistar Publications.
- Christensen, L. (2007). *Experimental methodology*. Boston: Allyn & Bacon.
- Creswell, J.W.(2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, California: SAGE Publications.
- Flick, Uwe (1996). A*n introduction to qualitative research*. London: Sage publication.
- Harriss, John (2002). The case for cross-disciplinary approaches in international development. DESTIN-London School of Economics Working Paper No. 02-23.
- Geddes, Barbara (2003). *Paradigms and sand castles: Theory building and research design in comparative politics.* Ann Arbor: University of Michigan Press.
- Gomm, Roger, Martyn Hammersley, and Peter Foster (2000). *Key issues, key texts.* London: Sage Publication.
- Geoffrey E. Mills and L. R. Gay (2019). *Educational research: Competencies for analysis and applications*. Delhi: Pearson.
- Healey J.F. (2002). *Statistics: Tool for social research* (Sixth Edition) Australia: Wadsworth. HEA-S27486.
- Kanbur, Ravi (2003). *Q squared: Combining qualitative and quantitative methods in poverty appraisal.* Permanent Black.
- King, Gary, Robert O. Keohane, Sidney Verba (1994). *Designing social inquiry: Scientific inference in qualitative research.* Princeton: Princeton University Press.
- Koul, Lokesh (2011). *Methodology of educational research.* New Delhi: Vikas Publishing House.
- Levin, J. (2011). *Elementary statistics in social research: The essentials.* Boston: Allyn & Bacon.
- Lakatos, Imre (1968-69). *Criticism and the methodology of scientific research programmes. Proceedings of the Aristotelian Society, Volume 69*, 149-186
- Neville Postlethwaite, T. (2005). *Educational research: Some basic concepts and terminology. Quantitative Research Methods in Educational Planning*, Module I. Paris: IIEP.
- Patton. M.Q. (2002). Q*ualitative research and evaluation methods*. Thousand Oaks: C.A: Sage.
- Ragin, Charles C. (1989). *The comparative method: Moving beyond the qualitative and quantitative strategies.* USA: University of California Press.

- Shaffer, Paul (2013). *Q squared: Combining qualitative and quantitative methods in poverty analysis.* U.K.: Oxford University Press.
- Travers, R. M. (1978). *An introduction to educational research.* New York: Macmillan.
- William Wiersma and Stephen G. Jurs (2009). *Research methods in education: An introduction* (9th Edition). Wiersma & Jurs: Pearson.

Course Code: Ph.D.– SOE 030102C4004

M.Phil. - SOE040102C4004

Course Title: Educational Research and Its Process

Credit: 4

Learning Outcomes:

- To acquaint the basic applications of different types of advanced statistics in Educational Research.
- To acquaint the knowledge and skill towards the applications of statistical software.
- To acquaint with group projects in different areas.

Unit I- Sampling in Qualitative, Quantitative and Mixed Research

- Concept of population and its type, and sample, sampling unit, sampling frame, sample size, sampling error, representative and biased samples
- Random sampling techniques: Simple random sampling, systematic sampling stratified random sampling, cluster sampling, and multi-stage sampling
- Non- Random Sampling Techniques, convenience sampling, purposive sampling, quota sampling, snowball sampling, theoretical sampling, incidental and critical case
- Determining the sample size when using random sampling

Unit II- Data Collection & Analysis of Data

- Tests, inventories and scales: Types and construction and uses identifying a tool using reliability and validity information
- Questionnaire: Forms, principles of construction and their scope in educational research, administration of questionnaires
- Interview: Types, characteristics and applicability, guidelines for conducting interviews
- Qualitative process and quantitative process, Observation: Use of the checklist and schedules, time sampling, field notes, role of researcher during observation, focus group discussion

Unit-III Statistical Analysis

(i) Statistical Analysis

- Parametric, Non-parametric statistics
- Simple statistical application such as t, F, ANOVA
- Non-Parametric Statistics such as x2, Mann Whitney u test, Ks test

(ii) Use and Approach of Advanced Statistical Problem

- ANCOVA with two, three or more covariate
- Factorial Analysis
- Canonical Analysis
- And Multilevel Analysis

Unit IV: Applications of ICT in Research

- Role of UGC, MHRD, NCTE, NIEPA and NCERT in Research
- Academic and research content available as e- resources, databases and exploring professional forums
- Data organization and analysis in Excel SPSS
- Uses of Statistical Software (SPSS & R software) for data analysis
- Use of ICT tools in writing and publishing, online research publishing, plagiarism

Suggested Readings

- Alan Agresti, Barbara, Finlay (2018). *Statistical methods for the social sciences*. Delhi: Pearson Publisher.
- Aggarwal, Y. P. (1998). *Statistical methods.* New Delhi: Sterling Publishe
- Best, J. W. and Kahn, J. V. (1995). *Research in education.* Delhi: Prentice Hall.
- Burns, R. B. (1991). *Introduction to research in education.* New Delhi: Prentice Hall.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, California: SAGE Publications.
- Edward, A. L. (1968). *Experimental designs in psychological research.* New York: Holt, Rinehart and Winston.
- Ferguson, G. A. (1976). *Statistical analysis in psychology and education.* New York: McGraw Hill.
- Fox, D. J. (1969). *The research process in education.* New York: Holt, Rinchart and Winston Inc.
- Garrett, H. E. (1973). *Statistics in psychology and education.* Bombay: Vakils, Feiffer and Simon.
- Geoffrey E. Mills and L. R. Gay (2019). *Educational research: Competencies for analysis and applications*. Delhi: Pearson Publication.
- Guilford, J. P. and Benjamin, F. (1973). *Fundamental statistics in psychology and education.* New York: McGraw Hill.
- Gupta, S. P. (2017). *Statistical methods.* New Delhi: Sultan Chand and Sons.
- Kerlinger, F. N. (1973). *Foundation of behavioural research.* New York: Holt, Rinehart and Winston.
- Koul, Lokesh (2011). *Methodology of educational research.* New Delhi: Vikas Publishing House.
- Kurtz, A. K. and Mayo, S. T. (1980). *Statistical methods in psychology and education.* New Delhi: Narela Publication.
- Mangal, S. K. (2002). *Statistics in psychology and education.* New Delhi: Prentice Hall of India.
- Neuman, W. L. (1997). *An introduction to educational research methods: Qualitative and quantitative approaches.* Boston: Allyn and
- Bac
- Salkind, N. J. (2014). *Statistics for people who (think they) hate statistics* (5th ed.). Thousand Oaks, CA: SAGE Publications, Inc.
- Springer, K. (2010). *Educational research: A contextual approach.* Hoboken, NJ: Wiley.
- Travers, R. M. (1978). *An introduction to educational research.* New York: Macmillan.

Course Code: Ph.D. – SOE 030103C1022

M.Phil. - SOE040103C1022

Course Title: Research and Publication Ethics

Credit: 2

Learning Outcomes:

To know on basics of philosophy of science and ethics, research integrity, publication ethics.

To identify research misconduct and predatory publication.

To acquaint the students with indexing and citation databases, open access publication, research metrics (citations, h-index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Unit I: Philosophy and Ethics

1. Introduction to Philosophy: Definition, nature and scope, concept, branches
2. Ethics: Definition, moral philosophy, nature of moral judgments and reactions

Scientific Conduct

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, fabrication, and plagiarism (FFP)
4. Redundant publications: Duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

Publication Ethics

1. Publication ethics: Definition, introduction and importance
2. Best practices/ standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: Definition, concept, problems that lead to unethical behaviour and vice versa, types
5. Violation of publication ethics, authorship and contributor ship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

Unit II: Practice

a. Open Access Publishing

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder/ journal suggestion tools viz. JANE, Elsevier Finder, Springer Journal Suggested, etc

b. Publication Misconduct

Group Discussions

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

Software tools

Use of plagiarism software like Turnitin, Urkund and other open source software tools

Databases and Research Metrics

A. **Databases**

1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc.

B. Research Metrics

1. Impact Factor of Journal as per Journal Citation Report. SNIP, SJR, IPP, Cite Score
2. Metrics: h-index, g index, i10 index, altmetrics

Suggested Readings:

- Bird, A. (2006). *Philosophy of Science*. Routledge.
- Mac Intyre, Alasdair (1967). *A short history of ethics*. London.
- P. Chaddah (2018). Ethics in competitive research: Do not get scooped; do not get plagiarized, ISBN:9789387480865
- National Academy of Science, National Academy of Engineering and Institute of Medicine (2009). On being a scientist: A guide to responsible conduct in research: Third edition. National Academies Press.
- Resnik, D.B. (2011). What is ethics in research & why is it important. National Institute of Environmental Health Science, 1-10. Retrieved from htt://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm Bell, J. (2012). Predatory Publishers are corrupting open access. Nature, 489(7415), 179-179. http//doi.org/10.1038/489179a
- Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN: 978-81-939482-1-7. http://www.insaindia.in /pdf/Ethics_Book.pdf

Course Code: Ph.D.– SOE030101E4004

M.Phil. - SOE040101E4004

Course Title : Philosophical and Sociological Bases of Education

Credit: 04

Learning Objectives

On completion of this course the students will be able:

- To acquaint the researcher with new knowledge pedagogies and approaches for teaching.
- To understand the indispensable role of Philosophy and Sociology in Education.
- To initiate scholars to the process of critical reflection of texts pertaining to the Philosophy of Education.
- To acquaint them about the ideas of thinkers in the realm of Education.
- To develop a critical understanding of the relationship between Philosophy and Education and Sociology and Education in the context of interdisciplinary in research.

Course Content

Unit I- Theoretical Perspectives of Education as a Discipline

- Critical analysis of concepts, principles, theories, assumptions and contexts related to issues that are unique to education discipline, such as, schooling, curriculum, syllabus, assessment, teaching-learning process etc and their linkage to pedagogy and practices.
- Procedure of linking of Content knowledge with Pedagogy knowledge, School knowledge with life outside the school, School knowledge with community knowledge, Experiential knowledge with empirical knowledge, Theoretical knowledge and practical knowledge, Universal knowledge and contextual knowledge.
- Philosophical Foundations of Research
- Sociological Foundations of Research

Unit –II Critical Reflection on the writings of the following thinkers:

a) Learning without Burden: Prof. Yashpal
b) What is Worth Teaching: Prof. Krishna Kumar
c) Pedagogy of the Oppressed: Paul Freire
d) Deschooling Society: Ivan Illich
e) Role of following social thinkers on Society and Education - Jyotiba Phule, Savitri Bai Phule, Raja Ram Mohan Roy, Dr. B.R. Ambedkar, Gopal Krishna Gokhale, Mohan Das Karmchand Gandhi, Mother Teresa.

Unit-III Western and Indian Thinkers on Education

- Thomas Kuhn, Emile Durkheim, Talcott Parsons, Martin Buber, Francis Bacon, Jean Paul Sartre,

- Rabindranath Tagore, Swami Vivekananda, Sri Aurobindo, Jiddu krishnamurti, B.R. Ambedkar, Zakir Hussain, S. Radhakrishnan

Unit IV- Legal Provisions, Trends and Issues in Inclusive Education

- International Initiatives: The World Declaration on Education for all and its Framework for Action to meet basic –Learning needs (1990), The World Declaration on the Survival, Protection and Development of Children and the Plans of action (Outcome of the UNICEF World Summit for Children (1990), The Asian and Pacific decade of Disabled Persons (1993-2002) and The World Conference on Special needs Education and the Salamanca Statement and framework for action on Special Needs Education.
- National Policy Framework & Programmers: Legal Provisions: Policies and Legislations (National Policy of Education (1986), Programme of Action (1992) Persons with Disabilities Act (1995), National Policy of Disabilities (2006), National Curriculum Framework (2005), Rehabilitation Council of India Act (1992)**,** Inclusive Education under Sarva Shiksha Abhiyan (SSA), The National Trust for the welfare of Persons with autism, cerebral palsy, mental retardation and Multiple Disabilities Act, 1999, RPWD Act 2016 and various amendments made time to time.

Recommended Books

- Ahuja. A and Jangira, N.K. (2002). *Effective teacher training: Cooperative learning based approach*. New Delhi: National Publishing House.
- Ainscow, M. and Booth. T. (2003). *The index for inclusion: Developing learning and participation in schools.* Bristol: Center for Studies in Inclusive Education.
- Broudy, H.S. (1977). *Types of knowledge and purposes of education*. In Anderson, R.C., Spiro Rand and Montaque, W.E. (1977). Schooling and the acquisition of knowledge. N. J.: Lawrence Erlbaum Associates, Publishers.
- Bartlett, L. D. and Weisentein, G. R. (2003). *Successful inclusion for educational leaders*. New Jersey: Prentice Hall.
- Brubacher, J.S. (1950). *Modern Philosophies of Education*. New York: McGraw Hill Book Co.
- Bruner, J.S. (1996). *The culture of education.* Cambridge, M.A.: Harward University Press.
- Butchvarov, P. (1970). *The Concept of knowledge*. Evanston, Illinois, North Western University Press.
- Daniels, H. (1999). *Inclusive education*. London: Koegan.
- Dearden R. F. (1984). *Theory and practice in education*. Routledge.
- Deiner, P. L. (1993). *Resource for teaching children with diverse abilities.* Florida: Harcourt Brace and Company.
- Dewey, J. (1916/1977): *Democracy and education: An introduction to the philosophy of education.* New York: Macmillan.
- Gandhi M.K. (1956). *Basic Education*. Ahmedabad: Navjivan Publication.
- Gore, M. C. (2004). *Successful inclusion strategies for secondary and middle school teachers*. Crowin Press: Sage Publications.

- Govt. of India (1952). *Report of the Secondary Education Commission*, New Delhi
- Govt. of India, MHRD (1986, Revised 1992). *National Policy of Education,* New
- Hegarthy, S. and Alur, M. (2002). *Education of children with special needs: From segregation to inclusion.* Corwin Press: Sage Publishers.
- Mani R.S. (1964). *Educational ideas and ideals of Gandhi and Tagore.* New Delhi: New Book Society.
- Naik, J.P. (1975). *Equality, quality and quantity: The elusive triangle of Indian education*. Bombay: Allied Publications.
- NCERT (2005). National Curriculum Framework, New Delhi.
- NCTE (2009). National Curriculum Framework for Teacher Education, New Delhi.
- Noddings, Nel (2012). *Philosophy of Education*. Boulder, Colo: Westview Press.
- Palmer, Joy A, (2001). *Fifty modern thinkers on education: From Piaget to the present day*. London, USA, Canada: Routledge Flamer.
- Paulo Freire (1996) Pedagogy of the Oppressed, Penguin Books.
- Peters, R.S. (1967), The Concept of education, Routledge, United Kingdom.
- Peters, R.S. (ed), (1975). The Philosophy of education. Oxford University Press, London.

Course Code: Ph.D. – SOE030102E4004

M.Phil.- SOE040102E4004

Course Title: Teacher Education

Credits 4

Learning Outcomes

- To reflect on the changing context and concerns in teacher education in India and abroad.
- To develop understanding of the concept and objectives of teacher education,
- To develop the insight regarding new policies and understand the role of various agencies.
- To differentiate the concerns and issues of in-service and pre-service teacher education
- To get acquainted with teaching and training techniques including IT enabled training
- To acquaint with the innovative practices in teacher education both in context of India and other countries.
- To critically analyze the contemporary practices in teacher education

UNIT - I: Introduction of Teacher Education

- Teacher Education: meaning, scope and need of teacher education in modern era
- Context, concerns and Vision; aims and objectives of teacher-education at different stages-elementary, secondary and higher education
- Development of teacher education in India during post-independence period with special reference to Kothari Commission (1964-66), NPE 1986, NCFTE-2009, Justice Verma Commission (JVC), Draft New Education Policy-2019

UNIT – II: Teacher Education: Programmes and Agencies

- Programmes: Sarva Shiksha Abhiyan (SSA), Rashhtriya Madhaymik Shiksha Abhyan (RMSA), Right to Education (RTE) and Samagar Siksha Abhiyan
- Role of agencies in Teacher Education: UNESCO, NAAC, UGC, MHRD, NCTE, and NCERT

UNIT – III: Professional Development and Innovation Approaches in Teacher Education

- Organization of pre-service teacher education programmes
- Continuous professional development and support for In-service teachers
- Issues and concerns in professional preparation and development of teachers
- Constructivist approach, reflective practitioner and blended learning
- Case studies of international perspectives, innovative pedagogies and programmes of teacher education in UK and USA

UNIT – IV: Recent Trends in Teacher Education

- ICT in teacher education: Interactive smart board, google classroom, presentation tools, mobile learning, e-learning and technological pedagogical content knowledge (TPCK)
- Trends and challenges in ICT integrated teacher education
- Digital Initiatives of Government: e-pathshala, e-PG pathshala, Massive Open Online Course (MOOC**)** through SWAYAM, Online Educational Resources (OERs), and Leaning Management System.
- Quality of teacher education programmes in India
- Academic performance indicators (API), and performance appraisal

- **Suggested Readings:**

- Ahluwalia, S.P. (1974). *Development of a teacher attitude inventory and a study* of change *in professional attitude of student teachers. Department of Education,* BHU, (NCERT financed) as referred in second survey of Research in Education, M. B. Buch, 1972-1978.
- Anderson, LM & Ching, M. (1987). *Affective teacher education international encyclopaedia of teaching and teacher education.* New York: Pergamon Press.
- Beck, Clive & Clark Kosnik Albany (2006). *Innovations in teacher education: A social constructivist approach.* New York: Sunny Press.
- Taggart, G. L., & Wilson, A. P. (2005). *Promoting reflective thinking in teachers*. Thousand Oak, CA: Corwin Press.
- Cohen Louis, Minion Lawrence & Morrison, Keith (2004). *A guide to teaching practice (5th edition)*. London and New York: Routledge Falmer.
- Canon, L. & Monin, L. (1978). *A guide to teaching fanciness*. London: Mtehner & Co. Ltd.
- Coomb, A.W. et. al. (1974). *The profession education of teachers: A humanistic approach to teacher training*. Boston: Allyaon & Becon Inc.
- Conzemius, A., & O'Neill, J. (2001). *Building shared responsibility for student learning*. Alexandria, VA: Association for supervision and curriculum development.
- Day, C. & J. Sachs, J. (Ed.) (2004): *International Handbook on the Continuing Professional Development of Teachers.* Maidenhead: Brinks Open University Press.
- Herne Steve, Jessel John & Griffith, Jenny (2000). *Study to teach: A guide to studying in teacher education*. London and New York: Routledge Falmer.
- Irvine, J.J. (2003). *Educating teachers for diversity: Seeing with a cultural eye*. New York: Teachers College Press.
- Joyce, B., and Weal, M. (2003). *Modals of teaching (7th Edn.).* Boston: Allyn & Bacon.
- Korthagen, Fred A.J. et al. (2001). *Linking practice and theory: The pedagogy of realistic teacher education*. Lawrence Erlbaum Associates.
- Lampert, M. (2001). *Teaching problems and the problems of teaching*. New Haven: Yale University Press.
- Linda Darling Hammond & John Bransford (ed) (2005). *Preparing teachers for a changing world*. San Francisco: Jossey-Bass.
- Martin, D. J. & Kimberly S. Loomis (2006). *Building teachers: A constructivist approach to introducing education*. USA: Wadsworth Publishing.
- MHRD (1986). *National policy on education-1986, Government of India,* New Delhi.
- MHRD (1983-95).*The teacher and society.* Chattopadhyaya Committee Report. Government of India, New Delhi

- Mohammad Miyan (2004). *Professionalization of teacher education*. New Delhi: Mittal Publications.
- National Curriculum Framework (2005), NCERT, New Delhi.
- National Curriculum Frameworks for Teacher Education (2009). Towards preparing professional and humane teachers, NCTE, New Delhi. Retrieved from https://ncte.gov.in/Website/PDF/NCFTE_2009.pdf.
- National Policy on Education (1986), Govt. of India, Department of Education, MHRD, New Delhi retrieved from https://mhrd.gov.in/sites/upload_files/mhrd/files/document-reports/NPE86-mod92.pdf.
- NCERT (2006). The reflective teacher: Organisation of in-service training of the teachers of elementary schools under SSA, Guidelines.
- NCTE (1998). Competency based and commitment oriented teacher education for quality school education: Pre-service education. NCTE, New Delhi.
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- Rao, Digumarti Bhaskara (1998). *Teacher education in India*. New Delhi: Discovery Publishing House.
- Report of the Delor's Commission (1996). Learning: The treasure within, UNESCO, France.
- Report of the Education Commission (1964-66). Education and national Development, NCERT, New Delhi. Retrieved from http://dise.in/Downloads/KothariCommissionVol.1pp.1-287.pdf.
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- Schon, D. (1987). Educating the reflective practioner : Towards a new design for teaching and learning in the professions. New York; Basic Books.
- Sharma, P. (2019). *We Need Teachers With Exceptional Substance.* Retrieved from https://www.oercommons.org/courses/we-need-teachers-with- exceptional-substance/view
- Siddiqui, M.A. (1993). *In-service education of teachers*. New Delhi: NCERT.
- UNESCO (2006). *Teachers and educational quality: Monitoring global needs for 2015*. UNESCO Institute for Statistics, Montreal. Retrieved from http://uis.unesco.org/sites/default/files/documents/teachers-and-educational-quality-monitoring-global-needs-for-2015-en_0.pdf
- Yadav, M.S. & Lakshmi, T.K.S. (2003). *Conceptual inputs for secondary teacher education*: The instructional role. India, NCTE.

Course Code: Ph.D. – SOE 030103E4004

M.Phil. - SOE040103E4004

Course Title: Educational Administration, Management, Planning and Leadership

Credits: 04

Learning Outcomes:

On completion of the course, the students will be able:

- To identify the need, scope and purpose of educational planning understand principles and approaches of educational planning.
- To develop the skills in planning and using a variety of administrative strategies,
- To explain the role and contribution of different agencies educational planning,
- To study the educational planning system in India with reference to national, state, district and sub-district level structures.
- To develop an insight into the perspectives of management theories in the light of practices in education,
- To study the educational management system in India with specific reference to national, state, district and village levels structures.
- To recognize the importance of Educational Resources and their effective management for quality education,
- To understand the issues and challenges in educational management and administration in India.
- To identify the trends of research in educational management.
- To acquaint the students with the relationship between the financial support of education and quality of education,
- To develop familiarities with various sources of financing in India;
- To develop in them the understanding of school accounting and developing skill in school budgeting;
- To enable the students to locate human and material resources and utilize them to the maximum benefit for education
- To understand issues related to planning and management of education,
- To reflect on the conflict and stresses in school organization and techniques of managing these, discuss the linkages of various state, district and local level functionaries

UNIT-I: Meaning and Nature of Educational Administration and Management

- Meaning and Scope
- Basic Principles
- Concepts, Administration V/s Management
- Administrative Hierarchy

Unit-II: Performance and Resource Management in educational institutions

- Monitoring of school performance
- Performance appraisal of teachers
- Scientific principles of management-PERT, CPM, PPBS system approach
- Financial and administrative management of educational institutions
- Nature and characteristics of resource in education
- Need for resource management in education

- Material resources, Human resource, Financial resource
- Procurement, utilization and maintenance of resources
- Roles of state, central and local governments in resource mobilization
- Quality assurance in material and human resources

UNIT-III: Administrative processes with special references to Educational Organizations:

- Communication
- Decision making
- Organization Development and Compliance
- Management By Objectives (MBO)
- Organizational Change

Principles, Techniques and approaches of Educational Planning

- Guiding principles of educational planning
- Methods and techniques of educational planning
- Approaches to educational planning
- Social demand approach:
    - Man-power approach
    - Return of Investment approach
    - Types of educational planning; process of district level planning including micro level planning exercise; institutional planning.
    - Critical Analysis of educational planning in India.

UNIT-IV: Leadership in Educational Organizations:

- Meaning and Nature
- Theories of Leadership & Their Relevance in Education
- Styles of Leadership
- Leadership Traits & Skills

Suggested Readings:

- Chand, J. & Prakash, R. (2006). *Advance educational administration*. New Delhi: Kanishk publishers.
- Chandrasekaran, P. (1994). *Educational planning and management.* New Delhi: Sterling Publisher.
- Dutt, P. (2017). *A Textbook of educational administration.* New Delhi: Wisdom Press.
- Jha, J., Saxena, K., B. & Baxi, C., V. (2001). *Management processes in elementary education: A study of existing practices in selected states in India.* New Delhi: the European Commission.
- Lulla B. P., & Murthy. S., K. (1976). *Essential of educational administration.* Mohindra Capital Publisher Chandigarh.
- Mathur, S. P. (2001). *Financial management in Indian Universities.* Ganga Kaveri Publishing House, Varanasi.
- Mukhopadadyay, Mamar & Tyagi, R.S. (2005). *Governance of school education in India.* New Delhi: NIEPA.
- Coombs, Philip, H. (1985). *The World crisis in education*. New York: Oxford University Press.
- Raviparkash & Tara Chand. (2008). *Advanced educational administration*. Delhi: Kanishka Publishers.

- Tara Chand & Ravi Prakash (1996). *Advanced educational administration*. Delhi: Kanishka Publishers.
- Thakur, D. & Thakur, D., N. (1996). *Educational planning and administration*. New Delhi: Deep & Deep Publications.
- Thamarasseri, I., and Patteti, A, Paul. (2018). *Educational planning: Administration and management*. New Delhi: Wisdom Press.
- Thomas I. Sergiovanni (1980). Education governance and administration. America: Prentice Hall.
- Trivedi, P.R., & Sudershan, K.N. (1996). *Management education.* New Delhi: Discovery Publishing House.

Annexure-XXIII

Scheme and Syllabus

M.Ed.
(Master of Education)

School of Education

w.e.f. Academic Session 2020-21

Programme Outcomes:

- Demonstrate a critical engagement with educational discourse in theories and practice.
- Identify and engage with various nuances of inter/multidisciplinary perspectives in education.
- Situate education practices in historical, political and socio-cultural contexts, both locally and globally.
- Critically think, reflect, and analyse arguments, claims, evidences and problems in the Indian education context.
- Pursue guided and ethical research study and demonstrate the ability to analyse and synthesize information to address research questions.
- Engage with educational practice at both school and non-school sites
- Demonstrate analytical and professional skills related to teaching-learning, teacher education, curriculum and material development, education policies and programmes across different levels of education.
- Reflect on the educational processes and experiences of self and others while engaging with the psycho-social underpinnings of education.

M.Ed. Semester- I

S. No.	Course Credit	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits (Practical)	Class Teaching / Field Based Activity Hours per week
1	**4**	SOE 01 01 01 C3104	Psychology of Learning and Development	3	1	0	4
2	**4**	SOE 01 01 02 C3104	Historical, Political and Economic Foundations of Education	3	1	0	4
3	**4**	SOE 01 01 03 C3104	Introduction to Educational Research	3	1	0	4
4	**2**	SOE01 01 04 C0022	ICT in Education	0	0	2	4
5	**2**	SOE 01 01 05 C0022	Development of Self: Yoga Education	0	0	2	4

Elective Courses							
6	**4**	SOE 01 01 01 DCEC 3104	Personality Development and Communication Skills	3	1	0	4
7	**4**	SOE 01 01 02 DCEC 3104	Educational Administration, Management and Leadership	3	1	0	4
8	**4**	SOE 01 01 03 DCEC 3104	Distance and Open Learning	3	1	0	4
9	**4**		**Taken from other Department/ MOOC**				
Total	**24**						

M.Ed. Semester- II

S. No.	Course Credit	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits (Practical)	Class Teaching / Field Based Activity Hours per week
10	**4**	SOE 01 02 06 C3104	Philosophical Foundations of Education	3	1	0	4
11	**4**	SOE 01 02 07 C3104	Sociological Foundations of Education	3	1	0	4
12	**4**	SOE 01 02 08 C3104	Advance Research Methodology	3	1	0	4
13	**4**	SOE 01 02 09 C3104	Curriculum Studies	3	1	0	4
14	**2**	SOE 01 02 10 C0022	Academic Writing	0	0	2	4
15	**2**	SOE 01 02 11 C0022	Internship and Field Attachment	0	0	2	4
16	**2**	SOE 01 02 12 C0022	Dissertation (Part-I)	0	0	2	4
Elective Courses							
17	**4**	SOE 01 01 04 DCEC 3104	Guidance and counselling	3	1	0	4
18	**4**	SOE 01 01 05 DCEC 3104	Gender, School and Society	3	1	0	4
19	**4**	SOE 01 01 06 DCEC 3104	Education of the Disadvantaged Groups	3	1	0	4
20	**4**	SOE 01 01 07 DCEC 3104	Comparative Education	3	1	0	4
Total	**26**						

M.Ed. Semester- III

S. No.	Course Credit	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits (Tutorial/ Practicum Practical)	Class Teaching / Field Based Activity Hours per week
21	**4**	SOE 01 03 12 C3104	Teacher Education	3	1	0	4
22	**4**	SOE 01 03 13 C3104	Inclusive Education	3	1	0	4
23	**4**	SOE 01 03 14 C0044	Internship in Specialized Area	0	0	4	8
24	**4**	SOE 01 03 15 C0044	Dissertation Part-II	0	0	4	8
Elective Courses							
25	**2**	SOE 01 01 08 DCEC 2002	Institutions, Systems and Structures at Elementary Stage	2	0	0	2
26	**2**	SOE 01 01 09 DCEC 2002	Institutions, Systems and Structures at Secondary Stage	2	0	0	2
27	**2**	SOE 01 01 10 DCEC 3104	Stage Specific Status, Issues and Concerns at Elementary Stage	2	0	0	2
28	**2**	SOE 01 01 11 DCEC 3104	Stage Specific Status, Issues and Concerns at Secondary Stage	2	0	0	2
29	4*		**Taken from other Department/ MOOC**				
Total	**24**						

M. Ed. Semester- IV

S. No.	Course Credit	Course Code	Course Title	Credits (Theory)	Credit (Tutorial/ Practicum)	Credit (Practical)	Class Teaching / Field Based Activity Hours per week
30	**4**	SOE 01 04 16 C3104	Recent Trends in Teacher Education	3	1	0	4
31	**4**	SOE 01 04 17 C3104	Educational Studies	3	1	0	4
32	**4**	SOE 01 04 19 C3104	Educational Technology	3	1	0	4
33	**2**	SOE 01 04 20 C2002	Environmental Education	2	0	0	2
34	**4**	SOE 01 04 21 C0044	Dissertation	4	0	4	8
Elective Courses							
35	**2**	SOE 01 01 12 DCEC 2002	Practice Relating to Curriculum, Pedagogy and Assessment at Elementary Stage	2	0	0	2
36	**2**	SOE 01 01 13 DCEC 2002	Practice Relating to Curriculum, Pedagogy and Assessment at Secondary Stage	2	0	0	2
37	**2**	SOE 01 01 14 DCEC 2002	Educational Policy, Economics and Planning at Elementary Level	2	0	0	2
38	**2**	SOE 01 01 15 DCEC 2002	Educational Policy, Economics and Planning at Secondary Level	2	0	0	2
Total	**22**						

List of Generic Elective Courses (GEC)

Sr. No.	Semester	Course Code	Course Title	Credits
1	**First**	**SOE 01 01 01 GEC 3014**	Life Skills in Education	4
2	**Second**	**SOE 01 02 02 GEC 3014**	Introduction to Academic Writing	4
3	**Second**	**SOE 01 02 03 GEC 3014**	Educational Leadership and Management	4
4	**Third**	**SOE 01 03 04 GEC 3014**	Art of Teaching	4
5	**Forth**	**SOE 01 04 05 GEC 3014**	Introduction to Counselling	4
6	**Forth**	**SOE 01 04 06 GEC 3014**	Inclusive Education and Practices	4

Year	I	PSYCHOLOGY OF LEARNING AND DEVELOPMENT	Credits	4
Semester	I		Course code	SOE 01 01 01 C3104

Learning Outcomes	At the end of the course, the students will be able to: ● Identify the biological and the cultural processes of development and explain how the two are dynamically intertwined. ● Describe the major theories of child development and critically examine the theories as they apply to the lives of culturally diverse children and their families. ● Select appropriate design and methods for carrying out research with children ● Observe children in their natural environments and describe their development in the social, emotional, physical, language, and cognitive domain.
Course Content	
Unit -1	**Developmental Aspects of the Learner**
	● Concept of growth and development and principles' of development and its implication to the teaching and learning process ● Stages of growth and development across various stages from infancy to adolescence ● Piaget's theory of cognitive development ● Erikson's psycho-social development theory
Unit -2	**Theoretical Frameworks of Learning**
	● Learning: concept, characteristics, learning process and factors affecting ● Theories of learning: Vygotsky, Bandura ● Motivation: Concept, Types, motivational cycle, Educational implications
Unit -3	**Creativity and Intelligence**
	● Creativity: Meaning, characteristics, role of teacher in developing creativity ● Problem solving and critical thinking ● Intelligence: Concept and factors affecting intelligence ● Emotional intelligence ● Theories of intelligence: Sternberg, & Gardner ● Assessment of intelligence

Unit -4	**Personality and Mental Health**
	• Personality: meaning, concept, and nature • Theories of personality: Freud, Carl Rogers, Allport • Mental health • Mental Hygiene • Defense Mechanisms
Transaction Strategies	Lecture cum discussion, , PowerPoint presentations, assignments, school observation and report, case study, and problem solving, brainstorming

Practicum :

- Identify and prepare a case study of underachieving students.
- Identify five students showing maladjustment behaviour. List the adjustment problems from which they are suffering and explain their causes
- Visit a school, observe X class students and prepare a report on it.
- Any other task and assignment given by the institution

Suggested Readings:

- Alexander, R. (2009). Pedagogy, culture and power of comparison. In H. D. (Eds.), *Educational Theories, Culture and Learning: A Critical Perspective* (pp. 10-26). New York: Routledge.
- Anastasi, A. (1990). *Psychological testing.* New York: MacMillan Co.
- Atkinson, R. C. (1983). *Introduction to psychology.* New York: Harcount Brace Joranovich Inc.
- Balagopalan, S. (2011). Introduction: Children's lives and the Indian context. *Childhood, 18*(3), 291-297.
- Bandura, A. (1986). *Social foundations of thought and action.* Englewood Cliffs, NJ: Prentice Hall.
- Beilin, H. & Pufull, P. (1992). *Piaget's theory: Prospects and possibilities.* Hillsdale, NJ: Erlbaum. .
- Bose, P. (1995). Sons of the nation: Childrearing in the new family. In P. Chatterjee, *Texts of power: Emerging Disciplines in Colonial Bengal.* (pp. 118-144). Minneapolis: University of Minnesota Press.
- Brysbaert, M. & Rastle, K. (2013). *Historical and conceptual issues in psychology* (2nd ed.). Harlow: Pearson.

- Corr, P. & Gerald, G. (2009). *The Cambridge handbook of personality psychology.* Cambridge: Cambridge University Press.
- Dalal, A. & Misra, G. (2010). The core and context of Indian psychology. *Psychology and Developing Societies, 22*(1), 121-155.
- Dandapani, S. (2004). *Advanced educational psychology.* New Delhi: Anmol Publications Pvt. Ltd.
- Dowling, M. (2018). *Young children's personal, social and emotional development.* New Delhi: Sage publications.
- Driscoll, M. (2004). *Psychology of learning for instruction* (3rd ed.). MA: Pearson Education.
- Engler, B. (2006). *Personality theories: An introduction.* Boston: Houghton and Mifflin.
- Folk, A. W. (2004). *Educational psychology. MA:* Pearson Education.
- Gardner, H. E. (2006). *Multiple intelligences.* New Horizons, NY: Basic Books.
- Gopnik, A. (2012). What's wrong with the teenage mind. Retrieved from http://online.wsj.com/article/SB10001424052970203806504577181351486558984.html
- Gottlieb, A. (2012). Promoting an anthropology of infants: Some personal reflections. Retrieved, from Anthopo Children, 2012, 1, Gottlieb: http://popups.ulg.ac.be/AnthropoChildren/document.php?id=926
- Kellogg, R. (2007). *Fundamentals of Cognitive Psychology.* New Delhi: Sage Publications.
- Newman, B. M. (2007). *Theories of Human Development,* Lawrence: Erlbaum Associates, Inc.
- Paul, C. (2018). *Psychology for teachers.* New Delhi: Sage publications.
- Sharma, D. (2003). *Childhood, family and socio-cultural change in India.* Reinterpreting the inner world. New Delhi: Oxford University Press.
- Whitebread, D. (2009). *The SAGE handbook of developmental psychology and early childhood education.* New Delhi: Sage publications.
- Verma, S. & D. (2003). Cultural continuity amid social change: Adolescents' use of free time in India. In S. Verma and R. W. Larson (Eds.), *Examining adolescent leisure time across cultures.* (pp. 37 – 51). San Francisco: Jossey-Bass.

Year	I	HISTORICAL, POLITICAL AND ECONOMIC FOUNDATIONS OF EDUCATION	Credits	4
Semester	I		Course code	SOE 01 01 02 C3104
Learning Outcomes	At the end of the course, the students will be able to: ● To reflect on education during Vedic, Budhist and Medieval period. ● To know about the historical political and economic perspectives of education. ● To critically analyse the system of Education during pre and post-Independence Period. ● To identify the best practices in education.			

Course Content	
Unit -1	**Historical Foundations of Education: Pre-Independence Period**
	• Development of education in India during Vedic, Buddhist and Medieval period. • Development of education in India during British period: Lord Macaulay Minutes (1834) , Wood's Dispatch (1854), Hunter Commission (1882), Sadler Commission Report (1919),Wardha Scheme of Education, Abbott-Wood Report, Sargent Report.
Unit -2	**Historical Foundations of Education: Post-Independence Period**
	• Secondary Education Commission (1953) • Indian Education Commission (1964-66) • National Policy on Education (1986) • Programme of Action (1992) • National Curriculum Framework (2005) • National Knowledge Commission (2007) • Yashpal Committee Report (2009) • Draft National Education Policy (2019)

Unit -3	**Political Foundations of Education**
	• Meaning, concept and need of political ideology & its relation with education • Perspectives of politics of education: Liberal, conservative and critical • Approaches to understanding politics: Behaviouralism, theory of systems analysis and theory of rational choice • Education for political development and socialization • Constitutional provisions for education in India • Political motives behind various policies of education: NPE-1986, RTE Act, 2009 and NCTE, 2014.
Unit -4	**Economic Foundations of Education**
	• Concept of economics of education • Relationship between policies and education • Linkage between educational policy and national development • Determinants of educational policy and process of policy formulation • Contribution of education in the economic development of a country. • Education and employment: investment in education, skill based education. • Youth unemployment & education. • Concept of educational finance and budgeting
Transaction Strategies	Lectures, Discussions, Presentations, Problem based learning, School Observation and Report.

Practicum :

- Critique of any one :NCF-2005 / RTE Act,2009 / Draft/Policy of NPE 2016
- Visit to a school, observation of implementation of RTE Act,2009 in school and prepare a report on it.
- Any other task and assignment given by the institution

Suggested Readings:

- Altekar, A. S. (1944). *Education - In Ancient India.* Benaras: Nand Kishore & Bros.
- Ghosh S. C. (2007). *History of Education in India.* New Delhi: Eastern Book Corporation.
- Education & National Development (n.d.). *Report of the Kothari commission on Education* (1964-66). New Delhi.
- Govt. of India (n.d.). *Programme of Action-National policy on Education*. New Delhi: Ministry of Human Resources Development, 1986.
- GOI. (1966). *Report of the education commission: Education and national development*. New Delhi: Ministry of Education.

- GOI. (1986). National policy of education. GOI. (1992, 1998). *National policy on education, 1986 (As modified in 1992)*. Retrieved from http://mhrd.gov.in/sites/upload_files/mhrd/files/NPE86-mod92.pdf

a. NCERT (2005). *National Curriculum Framework-200.* Sri AurobindoMarg, New Delhi: NCERT.

- GOI. (2009). *The right of children to free and compulsory education act, 2009.* Retrieved from http://mhrd.gov.in/sites/upload_files/mhrd/files/rte.pdf
- GOI. (2011). *Sarva shiksha abhiyan- Framework for implementation based on the right of children to free and compulsory education act, 2009.* GOI. Retrieved from http://www.upefa.com/upefaweb/admin/myuploads/SSA_Frame_work_(revised)_ 9-6- 2011.pdf
- Joshi, K. L. (1977). *Problems of higher Education in India.* Bombay: Popular Prakashan.
- Kaul, J. N. (1975). *Higher Education , Social change & National Development.* Shimla: Indian Institute of Advanced Study.
- Kneller, G. F. (1993). *Foundation of Education.* New York: John Wiley & Sons, Inc.
- Lall, M. (2005). *The Challenges for India's Education System.* London: Chatham House.
- Ministry of Education (1978). *Report of the Education Commission* (1964-66). New Delhi: Govt. of India.
- Taneja, V. R. (2005). *Foundation of Education.* Chandigarh: Abhishek Publishers.

Year	I	INTRODUCTION TO EDUCATIONAL RESEARCH	Credits	4
Semester	I		Course Code	SOE 01 01 03 C3104
Learning Outcomes	After the completion of the course, the students will be able to: ● Understand the meaning, nature and scope of educational research ● Explain various types of educational research ● Identify, explain and apply the basic concepts of research in the field of education ● Identify the research problem and construct a coherent research proposal ● Formulate the research questions, objectives and hypotheses ● Uses of various types of research methods and tools of educational researches ● Perform basic statistical techniques for data analysis and interpret their results			
Course Content				
Unit-I	**Conceptual understanding of Educational Research** ● Educational research: Meaning, nature, scope, and types (fundamental, applied and action) ● Scientific method: meaning, steps, characteristics (replicability, precision, falsifiability and parsimony), methods of acquiring knowledge ● Types of scientific method: Exploratory, explanatory and descriptive ● Aims of research as a scientific activity: Problem solving, theory building and prediction ● Approaches to educational research: Quantitative and qualitative			
Unit -2	**Identification and Formulation of Research Problem** ● Sources of research problems ● Review of the literature- meaning, purpose, sources (primary and secondary) and resources used for searching latest review of literature ● Identification, specification and evaluation of a research problem ● Variables: meaning of concepts, constructs, and variables ● Types of variables- independent, dependent, extraneous, intervening and moderator ● Formulation of research questions, objectives and hypotheses ● Hypothesis: concept, types, sources, characteristics and formulation ● Steps of writing a research proposal			

Unit-3	**Methodology of Educational Research** ● Methods of educational research: Descriptive, historical and experimental (meaning, significance, steps) ● Concept and types of universe/population in educational research ● Sample: Meaning, types, and characteristics of a good sample ● Techniques of sampling- probability (simple random sampling, systematic sampling, stratified random sampling, cluster sampling, and multi-stage sampling) and non-probability (convenience, purposive, quota and snowball sampling) ● Tools of research- validity, reliability, and standardization of a tool ● Types of tools- rating scale, attitude scale, questionnaire, aptitude test and achievement test and inventory ● Techniques of research- observation, interview, and projective techniques
Unit-IV	**Basic Statistical Techniques** ● Types of measurement scale: Nominal, ordinal, interval, and ratio ● Types and graphical representation of data ● Measures of Central Tendency: Mean, median and mode ● Measures of dispersion: Range, quartile deviation, mean deviation and standard deviation ● Normal probability curve (NPC): Meaning, characteristics and applications ● Meaning, assumptions, computation and uses of: **a.** Rank difference correlation **b.** Product Moment Correlation **c.** Partial and Multiple Correlations
Transaction Strategies	Lecture-cum-discussion, brain storming, group discussion, presentations, panel discussions, seminar presentations, demonstration and practical exercise of statistical problems, research based activities, and case studies.
Practicum	□ Preparation of a Research Proposal □ Review 5 Research Articles related to selected topic of research

Suggested Readings:

- Alan Agresti, Barbara, Finlay (2018). *Statistical methods for the social sciences*. Delhi: Pearson Publisher.
- Aggarwal, Y. P. (1998). *Statistical methods.* New Delhi: Sterling Publisher.
- Best, J. W. and Kahn, J. V. (1995). *Research in education.* Delhi: Prentice Hall.

- Burns, R. B. (1991). *Introduction to research in education.* New Delhi: Prentice Hall.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, California: SAGE Publications.
- Edward, A. L. (1968). *Experimental designs in psychological research.* New York: Holt, Rinehart and Winston.
- Ferguson, G. A. (1976). *Statistical analysis in psychology and education.* New York: McGraw Hill.
- Fox, D. J. (1969). *The research process in education.* New York: Holt, Rinchart and Winston Inc.
- Garrett, H. E. (1973). *Statistics in psychology and education.* Bombay: Vakils, Feiffer and Simon.
- Geoffrey E. Mills and L. R. Gay (2019). *Educational research: Competencies for analysis and applications*. Delhi: Pearson Publication.
- Guilford, J. P. and Benjamin, F. (1973). *Fundamental statistics in psychology and education.* New York: McGraw Hill.
- Gupta, S. P. (2017). *Statistical methods.* New Delhi: Sultan Chand and Sons.
- Kerlinger, F. N. (1973). *Foundation of behavioural research.* New York: Holt, Rinehart and Winston.
- Koul, Lokesh (2011). *Methodology of educational research.* New Delhi: Vikas Publishing House.
- Kurtz, A. K. and Mayo, S. T. (1980). *Statistical methods in psychology and education.* New Delhi: Narela Publication.
- Mangal, S. K. (2002). *Statistics in psychology and education.* New Delhi: Prentice Hall of India.
- Neuman, W. L. (1997). *An introduction to educational research methods: Qualitative and quantitative approaches.* Boston: Allyn and Bac
- Salkind, N. J. (2014). *Statistics for people who (think they) hate statistics* (5th ed.). Thousand Oaks, CA: SAGE Publications, Inc.
- Springer, K. (2010). *Educational research: A contextual approach.* Hoboken, NJ: Wiley.
- Travers, R. M. (1978). *An introduction to educational research.* New York: Macmillan.

Year	I	ICT IN EDUCATION (Practical)	Credits	2
Semester	I		Course Code	SOE01 01 04 C0022
Learning Outcomes	After completion of the course, students will be able to: • Reflect on the role of digital initiatives of GOI in contemporary educational scenarios. • Demonstrate effective use of ICT tools, software applications and digital resources. • Identify the relevant learning resources and their effective use in teaching learning processes . • Integrate technology in to classroom teaching learning strategies • Create online learning content and assessment using online tools.			
Course Content				
Unit-I	• MS WINDOWS: Basic concept of an operating system and its functions; introduction of windows & basic components of a window • MS Office: MS word, introduction to a word processor, basic components of ms word and its operation. • MS Excel: Introduction to spreadsheets, concept of worksheets and their operations, spreadsheet operations-entering numbers ,text, dates & time, formulae; preparation of worksheets • MS PowerPoint and Google Slides: Basic features of ms powerpoint and google slides , creation and online presentation of the slides, preparation of different types of slides, slide design, colour and background, slide transition and custom animation.			
Unit -2	• Critically examine the digital learning initiatives by MHRD, GOI like NMEICT, SWAYAM, national repository of open educational resources, swayam prabha, e-shodhsindhu etc. • Technologies for creating new resources. Examples include videos, interactive content, collaborative learning tools like padlet, Jam board, google Docs etc., multimedia, animations and simulations. • Searching for relevant information and exchanging information on the internet. • Web as a space for continuous/lifelong learning: exploring use of OER and MOOCs.			
Task and Assignment	**Any two of the following:** • Preparing of a research proposal in MS Word. • Preparation of presentation using MS PowerPoint and sharing on google slides.			

	• Making of progress report-card and annual results in MS Excel. • Critical review of any three digital initiatives of MHRD. • Preparation of e content using free tools and OER's. • Any other project/assignment given by the institution.
Note	(i) The student will maintain a file of the record related to activities performed. (ii) Mode of transaction of this course will be a workshop.

Suggested Readings:

- Cox, J. & Urban, P. (1999). *Quick courses in microsoft office.* New Delhi: Galgotia Publications.
- Hahn, H.(1998). *The internet-complete reference.* New Delhi: Tata McGraw Hill Publication.
- Intel Education, NCTE. (2007). *Hand book for teacher educators.* Bangalore.
- James, K. L. (2003). *The internet: A user's guide.* New Delhi: Prentice Hall of India Pvt. Ltd.
- Jain, S. (1990). *Introduction to computer science and basic programming.* New Delhi: Prentice Hall of India.
- Leao, A. M. (2001). *Computer for everyone.* New Delhi: Vikas Publishing house.
- Saxena, S. (1998). *A first course in computer.* New Delhi: Vikas Publications.
- Sinha, P. K. (1990). *Computer fundamentals.* New Delhi: BPB Publications.
- Srinivasam, T. M.(2002). *Use of computers and multimedia in education.* Jaipur: Aavisakar Publication.
- Tanenbaum, A. S. (1998). *Computer networks.* New Delhi: Prentice-Hall of India.
- Intel (2003). *Intel innovation in education.* New Delhi: Student Work Book.

Web resources:

- **https://en.unesco.org/themes/building-knowledge-societies/oer**
- https://www.oercommons.org/
- **https://www.cccoer.org/learn/find-oer/**
- **https://hewlett.org/strategy/open-education/**
- **https://h5p.org/node/add/h5p-content**
- **https://www.col.org/news/news/online-course-open-educational-resources**
- **https://tacomacc.libguides.com/oer_computers/starting_points**
- **https://educationblog.microsoft.com/en-us/2017/10/introducing-education-resources-a-source-of-open-educational-resources-within-office-365-2/**
- **https://swayam.gov.in/nd2_cec20_cs11/preview**

Year	I	DEVELOPMENT OF SELF: YOGA EDUCATION (Practical)	Credits	2
Semester	I		Course code	SOE 01 01 05 C0022
Learning Outcomes	After completion of the course, students will be able to: ● To know the understanding of self ● Explain the meaning of the self-concept ● Know the strength, weakness, opportunity and threats ● To gain understanding of historical development of yoga education ● To perform various Yogasans and also explain their uses			

Unit -1	**Introduction: Self**
	● Self: Meaning, nature, and functional model of the self ● Components of Self-Concept ● SWOT analysis: Strength, weakness, opportunity and threats ● Human values in relation to self, society, nation & world ● Spirituality and its roles in self-development.
Unit -2	**Yoga Education**
	• Yoga Education: Historical perspective, concept, aims, scope, and importance of yoga education. • Yogasans: Meaning, importance, and advantages. Types of Yogasans: **Yoga Education** • (Sukhasan, Siddhasan, Padmasan, Yoga Mudra, Matsyasan, Gomukhasan, ArdhMatsyendrasan, Bajrasan, Supta Vajrasan, Sinhasan, Ustrasan, etc.); • **Standing posture asans** (Tadasan, Trikonasan, Vrikshasan, Urdhva Hastotanasan, Kati Chakrasan, Garudasan, etc.); • **Lying posture asans** (Uttan Padasan, Halasan, Karn Pidasan, Bhujangasan, Salabhasan, Dhanurasan, Paschimotanasan, Chakarasan, Mayurasan, Shavasan, etc.) and Upside posture Asans (Sarvangasan, Sirsasan, etc.). • Pranayam: Meaning, process, and types of pranayama • Yoga education and stress management
Transaction Strategies	Mode of transaction of this course will be Lecture-cum-Discussion and demonstration of various Yogasans.

Practicum :

1. The students shall prepare a file related to various yogasans, highlighting the usefulness and importance of yogasans.

2. Practical examination will be conducted by external examiner at the end of the Semester including Viva-Voce and performance /demonstration of various yogasans.

Suggested Readings:

- Agochiya, D. (2010). *Life competencies for adolescents-training manual for facilitators, teachers and parents.* New Delhi: Sage Publications Pvt. Limited.
- Bahadur, K. P. (1977). *The wisdom of yoga*. Delhi: Sterling Publishers.
- Basavaraddi, I. V., Dagar, B. S., and Nagarajan, K. (2015). *Yoga education (Master of education-M.Ed.)*. New Delhi: National Council for Teacher Education.
- Dalal, A. S. (2001). *A greater psychology – an introduction to the psychological thoughts of Sri Aurobindo.* Puducherry: Sri Aurobindo Ashram Pub.
- Delors, J. (1996). *Learning the treasure within –Twenty first century education.* UNESCO Education Commission Report.
- Iyengar, B. K. S. (1977). *Light on yoga*. London: Allen & Unwin.
- Joseph & Lilian, L. P. (2013). *Mudras for healing and transformation.* USA: Integrative Yoga Therapy.
- Krishna, G. (1981). *The secret of yoga*. London: Turnstone press.
- Krishnamurti, J. (1998). *On Self- knowledge.* ChennaiP: Krishnamurti Foundation India.
- Krishnamurti, J. (2000). *Education and significance of life.* Chennai: Krishnamurti Foundation India.
- Palmer, J. A. (ed) (2001). *Fifty modern thinkers of education.* UK:Routledge Publishers.
- Rukmani T. S. (1999). *Yoga vrttika of vijnanabhiksu*. Delhi: Mushiram Manohar.
- Santrock, John W. (2007). *A topical approach to life span development.* New Delhi: Tata McGraw- Hill Publishing Company Limited.
- Saraswati, Y. (1981). *Science of soul*. Rishikesh:Yoga Niketan trust.
- Stephens, M. (2010). *Teaching yoga: Essential foundations and techniques*. California: North Atlantic Books.

- Swami Ramdev (2016). *Yog- Its philosophy & practice.* Hardwar: Divya Prakashan.
- Schneider, F. W., Gruman, J. A. & Coutts, L. M. (Eds.) (2012). *Applied social psychology-understanding and addressing social and practical problems* (2nd ed.). : New Delhi: Sage Publications Pvt. Limited.
- Swami Vivekananda (1988). *Selections from the complete works of Swami Vivekananda.* Mayavathi: Advaita Ashrama.
- UNICEF (2006). *Life skills modules-adolescence education program.* New Delhi: UNICEF House.
- Venkateshamurthy, C. G. & Govinda Rao, A.V. (2005). *Life skills education training package.* R.I.E.: Mysore.
- Wood, E. (1988). *Great system of yoga.* Mumbai: D.B.Taraporevala Sons & Co.

Web resources

- https://www.annualreviews.org/doi/pdf/10.1146/annurev.ps.38.020187.001503
- https://www.oercommons.org/courseware/lesson/57475
- https://www.oercommons.org/courseware/lesson/23043
- https://www.oercommons.org/courseware/lesson/68128
- https://www.oercommons.org/authoring/48444-foundations-of-physical-education-fitness-beginner
- https://www.oercommons.org/courses/yoga-minds-writing-bodies-contemplative-writing-pedagogy

Elective Courses (DCEC)

Year	**I**	**PROFESSIONAL DEVELOPMENT AND COMMUNICATION SKILLS**	**Credits**	**4**
Semester	**I**		**Course code**	SOE 01 01 01 DCEC 3104
Learning Outcomes	After completion of the course, students will be able to: ● Gain Self Competency and Confidence ● Practice Emotional Competency ● Gain Intellectual Competency ● Gain an edge through Professional Competency ● Aim for high sense of Social Competency ● Be an integral Human Being			
Course Content				
Unit-1	**Communication Skills** ● Listening ● Speaking ● Reading ● Effective use of Social Media ● Non-verbal communication			
Unit-2	**Professional Skills: Career Skills** ● Resume Skills ● Interview Skills ● Group Discussion Skills ● Time Management ● Personality and Career choice (Teaching)			
Unit-3	**Professional Skills: Team Skills** ● Presentation Skills ● Trust and Collaboration			

	● Listening as a Team Skill ● Brainstorming ● Social and Cultural Etiquettes ● Internal Communication
Unit-4	**Ethics and Integrity** ● Ethics of teaching as a profession ● Learning through biographies ● Ethics and conduct ● Importance of ethics ● Ethical decision making ● Personal and professional moral codes of conduct ● Creating a harmonious life
Transaction Strategies	Discussions, debates, research trends analysis, case studies, flipped classroom approach that leverages project- based learning, demonstration, group discussion, simulations etc.
Practicum	● Case study of one student with adjustment problems ● Studying the personality characteristics of some successful individuals. ● Visiting institutes dealing with mental health problems of individuals, interaction with faculty and preparation of report ● Project work on identified themes. ● Visit to schools and classroom located in rural/urban/tribal contexts- exposure, observation, critical analysis of events and presentation before a small group

Suggested Readings:

- Ashokan, M. S. (2015). *Karmayogi: A biography of E. Sreedharan*. UK: Penguin.
- Brown, R. (2000). *Group processes: Dynamics within and between groups* (2nd ed.). New York: Blackwell Publishers.
- Brown, T. (2012). *Change by design.* Harper Business
- Elkington, J., & Hartigan, P. (2008). *The power of unreasonable people: how social entrepreneurs create markets that change the world*. Harvard Business Press.
- Goleman, D. (1995). *Emotional intelligence*. Bloomsbury Publishing India Private Limited
- Kalam, A. A. (2003). *Ignited minds: Unleashing the power within India*. Penguin Books India
- Kelly, T., & Kelly, D. (2014). *Creative confidence: Unleashing the creative potential within us all.* William Collins
- Kurien, V., & Salve, G. (2012). *I too had a dream*. Roli Books Private Limited

- Livermore, D. A. (2010). *Leading with cultural intelligence: The new secret to success*. New York: American Management Association
- McCormack, M. H. (1986). *What they don't teach you at Harvard business school: notes from a street-smart executive*. RHUS
- O'Toole, J.(2019).*The enlightened capitalists: Cautionary tales of business pioneers who tried to do well by doing good.* Harpercollins
- Sinek, S. (2009). *Start with why: How great leaders inspire everyone to take action*. Penguin
- Sternberg, R. J., & Baltes, P. B. (Eds.). (2004). *International handbook of intelligence*. Cambridge University Press
- Sen, M. (2010). *An Introduction to critical thinking*. Delhi: Pearson.
- Silvia, P. J. (2007). *How to read a lot.* Washington DC: American Psychological Association.

E-Resources

a. Fries, K. (2019). 8 Essential Qualities That Define Great Leadership. *Forbes*. Retrieved 2019- 02-15 from https://www.forbes.com/sites/kimberlyfries/2018/02/08/8-essential- qualities-that-define-great-leadership/#452ecc963b63.
How to Build Your Creative Confidence, Ted Talk by David Kelly - https://www.ted.com/talks/david_kelley_how_to_build_your_creative_confidence

a. India's Hidden Hot Beds of Invention Ted Talk by Anil Gupta - https://www.ted.com/ talks/anil_gupta_india_s_hidden_hotbeds_of_invention

b. Knowledge@Wharton Interviews Former Indian President APJ Abdul Kalam - . "A Leader Should Know How to Manage Failure" https://www.youtube.com/ watch?v=laGZaS4sdeU

c. Martin, R. (2007). How Successful Leaders Think. *Harvard Business Review, 85*(6): 60.

d. NPTEL Course on Leadership - https://nptel.ac.in/courses/122105021/9

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Year	I	Educational Administration, Management and Leadership	Credits	4
Semester	I		Course code	SOE 01 01 02 DCEC 3104
Learning Outcomes	After completion of the course, students will be able to: ● Know and understand the concepts of educational management, administration and leadership ● Understand various styles of leadership ● Develop some leadership qualities in themselves ● Understand educational administration in India at local, state and central level			
Course Content				
Unit-1	**Educational Management & Educational Planning and Supervision** ● Concept, Needs, Objectives and Scope of Educational Management ● Approaches and Principles of Educational Management ● Concept of Educational Management Human Beings as inputs, Process & Product inputs ● Educational Manager: Functions, Roles, Skills & Competencies ● Managerial Creativity, Managerial Ethics ● Role and functions of Headmaster/ Principal/ Teacher: Basic functions of Administration, Planning, Organizing, Directing and Controlling in School Management & Administration ● Meaning, Nature and Approaches of Educational Planning ● Institutional Planning and Perspective Planning at Elementary Level ● Meaning , Nature and Scope of Educational Supervision ● Educational Supervision as : Service Activity, Process, Functions, Planning, Organizing and Implementing Supervisory Programmes			
Unit-2	**Introduction to Educational Administration & Communication in Educational Management &Administration** ● Concept, Scope, Principles of Educational Administration ● Educational Administration Approaches and Emerging Trends			

	● Development of Modern Concept of Educational Administration from 1900 to Present Day: Taylorism, Administration as a Process, Human Relations Approach to Administration. ● Types of Communication ● Methods and Devices of Communication ● Selection of Appropriate Communication Strategies ● Barriers of Communication
Unit-3	**Leadership in Education & Theories of Leadership** ● Concept of Leadership, Leader and Manager, ● Leadership Traits and Skills ● Functions and Styles of Leadership ● Measurements of Leadership ● Approaches of Leadership: Trait, Transformational, Transactional, Value-Based, Cultural, Psychodynamic, Charismatic, Community based and Social. ● Blake and Mouton's Managerial Grid, Fiedler's Contingency Model, Tridimensional Model ● Hersey and Blanchard's Situational Theory
Unit-4	**Educational Administrative Bodies in India at State & Local Level : Role & Functions** ● State Bodies: State Council of Educational Research & Training (SCERT), ● State Institute of Education Technology (SIET), ● District Institute of Education& Training (DIET), ● Institute of Advance Studies in Education(IASE) ● Local Bodies: Municipal Councils/Corporation, ZillaParishads, Panchayats.
Transaction Strategies	Lectures, field visits to various educational institutions, case studies, assignments, discussions
Practicum	● Compile articles from newspapers, magazines, and internet discussing present policies and operational strategies of central & state Govt. for Elementary Education. Prepare a report of entire activity. ● Review research on educational management or management of elementary schools ● Evaluation of management of SSA activities in a district. ● Collect data from relevant sources on student & teachers ratio at elementary level. Is it according to provision of RTE act? Prepare a report on it.

	• Examine the effectiveness of any one programme run by central Govt. for elementary students. Present the report in a classroom seminar. • Analyze quality & quantity of Mid-day meal in any rural school.

Suggested Readings:

- Altrichter, H. & Elliot, J. (2000). *Images of educational change. England*: Buckingham Open University.
- Bhattacharya, D.K. (2001). *Managing people*, New Delhi: Excel Books.
- Bush T., L. B. (2003). The *principles and practice of educational management*, (Eds.). New Delhi: Sage Publications.
- Bush, T. (2013). *Educational management, administration & leadership*. New Delhi: Sage Publications.
- Chauhan,S.(2012). *Educational management.* New Delhi: Pearson Publication.
- Dawra, S. (2003). *Management thought*. New Delhi: Mohit Publication.
- Dhillan, S.S. (2019). *Educational administration: management and leadership*. New Delhi: Gyan Geeta Publications.
- Harigopal, K. (2001). *Management of organizational change*. New Delhi: Response Books.
- Lunenburg, F.C. & Orenstein, A.C. (2012).*Educational administration- Concept & practices*. Canada, USA: Wadsworth, Cengage Learning Solutions.
- Luthans, F. (2005). *Organisational behavior*. New York: McGraw-Hills Inc.
- McCaffery, P. (2004). *The higher education manager's handbook*. New York and Canada: Routledge.
- Nair, S.R. (2004).*Organizational behaviour- Texts and cases*. Mumbai: Himalaya Publication.
- Nangia, S.B. (2009). *Educational administration*. New Delhi: APH Publishing Corporation Publishing House.
- Northouse, P. (2018). *Leadership theory and practice*. New Delhi: Sage Publications.
- Owens, R.C. (2001). *Organizational behaviour in education*, Boston: Allyn and Bacon.
- Prasad, A. (2007). *University education administration and the law.* New Delhi: Deep& Deep Publications.
- Punia,V. (2004). *Managerial skills in educational administration*. New Delhi: Deep& Deep Publications Pvt. Ltd.
- Rita, S. (2004). *Assessment and accreditation in higher education*. New Delhi: Association of Indian Universities.
- Sayeed, O. B. and Pareek, U. (2000). *Actualizing managerial roles*. New Delhi: Tata McGraw-Hill Publishing Company Limited.
- Sharma, R. A. (2009). *Educational administration & management*. Meerut: R Lal Book Depot.
- Sindhu, I.S. (2012). *Educational administration & management*. New Delhi: Pearson Publications.
- Srivastav, A.K. (2009). *Educational administration policy, planning and survey*. New Delhi: Kunal Books.

<table>
<tr><td>Year</td><td>I</td><td colspan="2" rowspan="2">DISTANCE AND OPEN LEARNING</td><td>Credits</td><td>4</td></tr>
<tr><td>Semester</td><td>I</td><td>Course code</td><td>SOE 01 01 03
DCEC 3104</td></tr>
<tr><td>Learning Outcomes</td><td colspan="5">After completion of the course, students will be able to:
● Understand the philosophy of open and distance learning.
● Understand the distance and open modes of learning
● Differentiate different modes of learning.
● Understand the need and importance of distance and open learning.
● Understand the role of mass media and various other technologies in distance and open learning.
● Understand the procedure of self-instructional material development and student support services for open and distance learning.
● Develop the understanding of management of open and distance learning.
● Know various evaluation techniques in distance education.</td></tr>
<tr><td colspan="6">Course Content</td></tr>
<tr><td>Unit-1</td><td colspan="5">Growth & Philosophy of Distance Education
● Concept, meaning, nature of distance and open learning.
● Growth and philosophy of distance education and open learning – International and National.
● Need, importance, scope, advantages and limitations of distance and open learning.
● Correspondence and open education: Development, objectives and modes.
● Param Inter University: An Indian Perspective of open learning.</td></tr>
<tr><td>Unit-2</td><td colspan="5">Communication aspects of Distance & Open Learning
● Communication Technology for Distance Education
● Audio Technology, Video Technology, satellite based communication system, Mobile Technology
● Role of Mass Media</td></tr>
</table>

	● Computer Technology
Unit-3	**Instructional Process of Distance & Open Learning** ● Research for distance education. ● Curriculum Development for distance education. ● Distance Education: Economic perspective. ● Staff training and Development in Distance Education, Professional Training in Distance Education.
Unit-4	**Evaluation Procedure in Distance Education** ● Learner Support Services. ● Management of Distance Education. ● Recommendations of NPE (1986) and NKC (2005) regarding distance education and recent developments in Distance Education. ● Evaluation techniques in Distance Education. ● Comprehensive and continuous evaluation in Distance Education & Open Learning.
Transaction Strategies	Web based learning, Lectures, Debates, Assignments, Projects, PowerPoint Presentations, and Demonstration.
Practicum	● Review of a book on distance education. · Assignment on the need and relevance of distance education system, in India at elementary/secondary/higher levels. · Review of CIET/UGC/IGNOU TV Programmes, and preparation of report.

Suggested Readings:

- Crompton, H. (2018). *Mobile learning and higher education: challenges and context*. India: Routledge.
- Criscito Pat (2004). *Barron's guide to distance learning.* London: Barron's E. Publisher.
- Garrison, D. R. (1989).*Understanding distance education framework for future*. Chapman and Hall, London: Routledge.
- Holmberg, B. (1985).*Status and structure of distance education* (2nd Ed.). Lector Publishing.

- IGNOU (1988). *Growth and philosophy of distance education, (*Block 1, 2 & 3*).* New Delhi: IGNOU.
- Mohanty, J. (2001). *Studies in distance education*. New Delhi: Deep & Deep Publication.
- Nandra, I.S. (2010): *Distance and open education*; Patiala: Century Publication.
- Pandey, U. (2017). Optimizing open and distance learning in higher education institutions. New Delhi. IPI Global.
- Prarad D. Chandra (2007). *Distance education*. New Delhi: K.S.K. Publishers.
- Race, Phil (1994).*The open learning handbook,* Second Edition. London: Kogan Page.
- Rathore, H.C.S. (1993).*Management of distance education in India*. New Delhi: Ashish Publishing House.
- Sharma S. (2002).*Modern methods of lifelong learning and distance education*. Meerut: International Publishing House.
- Sharma, R.A. (2008). *Distance Education.* Meerut: International Publishing House.

Generic Elective Course (GEC)

Year	I	LIFE SKILLS IN EDUCATION	Credits	4
Semester	I		Course code	SOE 01 01 01 GEC 3014
Learning Outcomes	After completion of the course, students will be able to: ● Explain the concept of life skills and its evolution. ● Recognize and analyse the importance of life skills education by studying the reports of international organizations and committees. ● Describe the concept of thinking skills; coping skills; social skills. ● Design activities to develop thinking skills, coping skills and social skills with the help of strategies discussed in the course.			
Course Content				
Unit-1	**Introduction and Evolution of the Concept of Life Skills** ● Concept, definition and importance of life skills ● Genesis of the concept ● UN inter-agency meeting ● Hamburg declaration ● Quality education and life skills ● Dakar Framework ● Introduction to 21st century skills			
Unit-2	**Thinking Skills** **2.1 Thinking** ● Nature, elements of thought ● Types of thinking, creative and critical thinking **2.2 Problem Solving** ● Definition, steps in problem solving ● Factors influencing problem solving **2.3 Decision Making** ● Consequences, models of decision making, goal setting			

Unit-3	**Coping Skills** **3.1 Coping with Emotions** • Definition, characteristics, types of emotions - causes and effects of different emotions • Strategies of coping with emotions • Strategies to develop skills of managing emotions: Classroom discussion; brainstorming; role-plays, audio and visual activities e.g arts, music, theatre, dance; case studies, storytelling, debates **3.2 Coping with Stress** • Definition, stressors- sources of stress • The general adaptive syndrome model of stress • Coping strategies
Unit-4	**Social Skills** **4.1 Self-Awareness** - definition, types of self – self-concept, body image, self-esteem - techniques used for self-awareness: Johari Window, SWOT Analysis **4.2 Empathy** - Sympathy, Empathy & Altruism **4.3 Effective Communication** – Definition, Functions, Models, Barriers · Interpersonal Relationship – Definition, Factors affecting Relationships
Practicum	Under the Life Skills Project, the students are expected to design activities to develop the following ten life skills. 1. Self-Awareness 2. Empathy 3. Problem Solving 4. Decision Making 5. Effective Communication 6. Interpersonal Relationships / Friendships 7. Creative Thinking 8. Critical Thinking 9. Coping with Emotions and 10. Coping with Stress. The Thinking skills and coping skills will be demonstrated through Role-plays, Arts, Music, Theatre, Dance, Storytelling, Debates etc. on diverse issues in the form of workshops.
Transaction Mode	Lecture Method, Activity based Method, Survey Method, Cooperative Learning, Blended Learning

Suggested Readings :

- Braisby, N., & Gellatly, A. (2012). *Cognitive psychology*. Oxford:Oxford University Press
- Dahama O.P., Bhatnagar O.P, (2005). *Education and Communication for Development, (2nd Edn.)*.New Delhi: Oxford& IBH Publishing Co. Pvt. Ltd. Debra McGregor, (2007).*Developing Thinking; Developing Learning - A guide to thinking skills in education*.New York, USA: Open University Press .
- Delors, Jacques. (1997). *Learning: The Treasure Within*, Paris:UNESCO
- Duffy Grover Karen & Atwater Eastwood, (2008). (8th Edn.), *Psychology for LivingAdjustment, Growth and Behaviour Today.* New Delhi: Pearson Education Inc.
- Hockenbury (2010). *Discovering Psychology*. New York : Worth Publishers.
- Jane S Halonen, John W. Santrock, (2009). *Psychology: Context & Application.* USA: McGraw-Hill Companies Inc., Third Edition.
- Moore, B. N., & Parker, R. (2016). *Critical thinking*. Dubuque, IA : McGraw-Hill Education.
- Nair .V. Rajasenan, (2010). *Life Skills, Personality and Leadership*. TamilNadu:Rajiv Gandhi National Institute of Youth Development.
- Stella Cottrell, (2005). *Critical Thinking Skills: Developing Effective Analysis and Argument*.New York: Palgrave Macmillan Ltd.
- Sternberg, R. J., & Mio, J. S. (2009). *Cognitive psychology*. Belmont (CA): Wadsworth.
- UNESCO (1999). *Adult Education: The Hamburg Declaration*. Paris:UNESCO.
- UNESCO (2005). *Quality Education and Life Skills: Darkar Goals*. Paris:UNESCO.
- WHO (1999). *Partners in Life Skills Education: Conclusions from a United Nations Inter-Agency Meeting*.Geneva: WHO.
- Santrock W.John. (2006). *Educational Psychology*. (2nd Edn.)New Delhi: Tata McGraw-Hill Publishing Company Ltd
- Dakar Framework for Action. (2000). *Education for All: Meeting our Collective Commitments*. Dakar, Senegal.
- Life Skills Resource Manual, Schools Total Health Program. (2006). Chennai:Health Education and Promotion International Inc.
- Kumar .J. Keval. (2008).*Mass Communication in India.* JAICO Publication India Pvt. Ltd.
- Morgan and King. (1993). *Introduction to Psychology*. New Delhi. Tata McGraw-Hill Publishing Company Ltd.
- Rao. P.L. (2008). *Enriching Human Capital through Training and Development.* Delhi: Excel Books.
- Singh Madhu. (2003). *Understanding Life Skills*. Background paper prepared for Education for All: The Leap to Equality

- UNESCO and Indian National Commission for Cooperation with UNESCO (2001). *Life Skills in Non-formal Education: A Review.*
- *YUVA School Life Skills Programme: Handbook for Teachers,* Vol. I – IV, (2008).Delhi: Department of Education and State Council of Educational Research and Training.
- Tull, M., Post Traumatic Stress (PTSD), *How to Monitor Your Emotions and Increase Emotional Awareness.* http://ptsd.about. com/ Accessed 30/01/2010.
- A Life Skills Program for Learners in Senior Phase. (2002). University of Pretoria. Chapter in Thesis. Retrieved from: http://www2.ed.gov/offices/OVAE/AdultEd/OCE/SuccessStories/success.pdf ·
- Life Skills Based Education. (2011). Wikipedia. Retrieved from: http://en.wikipedia.org/wiki/Life_skills-based_educaion ·
- Life Skills Based Education CCE. (2009). CBSE. Retrieved from: *http://www.cbse.nic.in/cce/life_skills_cce.pdf* ·
- Ministry of Education. (2006). *Senior Secondary Phase*. Republic of Namibia. Retrieved from: http://www.nied.edu.na/publications
- https://canvas.instructure.com/courses/1879941
- https://www.unicef.org/india/media/2571/file/Comprehensive-lifeskills-framework.pdf
- https://www.unodc.org/pdf/youthnet/action/message/escap_peers_07.pdf

Scheme and Syllabus

B.Ed.
(Bachelor of Education)

School of Education

Academic Session: 2020-21

Programme Objectives:

- To enable student-teachers to engage with studies on Indian society and education.
- To acquire conceptual understanding of Philosophy sociological analysis and hands-on experience of engaging with diverse communities, children and schools.
- To develop conceptual understanding about issues of diversity, inequality and marginalization in Indian society
- To critically analyse the significant policy debates in Indian Education.
- To recognise the importance of the social and emotional development, self and identity, and cognition and learning of children to develop better learning experiences.
- To develop critical understanding of the school curriculum; pedagogy as the integration of knowledge about the learner, the discipline and the social context of learning, and research relating to different aspects of learning.
- To enable student-teachers to recognise the nature of knowledge in various subject areas (Science-Biological/ Physical/Mathematics/Social Science/ Languages–Hindi /English /Urdu /other region-specific languages), and pursue efforts to keep themselves abreast with advancements in their areas of specialisation
- To apply perspectives and theoretical frameworks studied in a teacher education classroom with field-based experiences.
- To enhance professional capacities of a student-teacher such as communication skills, use of arts in education, maintaining healthy body, mind and soul, self-development and ICT skills.
- To enhance the competencies of teachers they need for working as professionals i.e., working as reflective practitioners, researchers and generators of knowledge in the field of education and pedagogy.

Scheme/Course Structure of Bachelor of Education (B.Ed.) w.e.f. the Academic Session 2020-2021

B.Ed. Semester-I

Sl. No.	Course Code	Total Credits	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits Practical	Class Teaching Hours per week
Core Courses							
1	SOE 02 01 01 C3104	4	Childhood and Growing Up	3	1	0	4
2	SOE 02 01 02 C3104	4	Contemporary India and Education	3	1	0	4
3	SOE 02 01 03 C3104	4	Learning and Teaching	3	1	0	4
4	SOE 02 01 04 C2002	2	Understanding Discipline and Subjects	2	0	0	4
5	SOE 02 01 05 C0042	2	Reading and Reflection on Text	0	0	2	4
6	SOE 02 01 06 C0042	2	Understanding the Self	0	0	2	4
Elective Courses							
7	SOE 02 01 01 DCEC3104	4	School Administration and Management	3	1	0	4
8	SOE 02 01 02 DCEC2044	4	Art in Education (Visual & Performing Arts)	2	0	2	6
9	SOE 02 01 03 DCEC3104	4	Health & Physical Education	3	1	0	4
10		**4**	**To be taken from other Department/MOOC**	4	0	0	4
	Total	**26**					

Generic Electric Courses (GECs)- Semester I

Sl. No.	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits Practical	Class Teaching Hours per week
1	SOE 02 01 01 GEC 3104	Value Based Education	04	01	00	04
2	SOE 02 01 02 GEC 2044	Art in Education	02	00	02	06

B.Ed. Semester-II

Sl. No.	Course Code	Total Credits	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits Practical	Class Teaching Hours per week
Core Courses							
11	SOE 02 02 07 C3104	4	Foundation of Education	3	1	0	4
12	SOE 02 02 08 C3104	4	Creating an Inclusive School	3	1	0	4
13	SOE 02 02 09 C3104	4	Value and Peace Education	3	1	0	4
14	SOE 02 02 10 C2002	2	Language across the Curriculum	2	0	0	2
15	SOE 02 02 11 C0022	2	Critical Understanding of ICT	0	0	0	4
16	SOE 02 02 12 C0022	2	School Internship (Part-I)	0	0	2	4
Discipline Courses Elective Courses (Any Two)							
17	SOE 02 02 04 DCEC3104	4	Pedagogy of Hindi	3	1	0	4
18	SOE 02 02 05 DCEC3104	4	Pedagogy of English	3	1	0	4
19	SOE 02 02 06 DCEC3104	4	Pedagogy of Social Sciences	3	1	0	4
20	SOE 02 02 07 DCEC3104	4	Pedagogy of Mathematics	3	1	0	4
21	SOE 02 02 08 DCEC3104	4	Pedagogy of Life Science	3	1	0	4
22	SOE 02 02 09 DCEC3104	4	Pedagogy of Physical Science	3	1	0	4
23	SOE 02 02 10 DCEC3104	4	Pedagogy of Economics	3	1	0	4
24	SOE 02 02 11 DCEC3104	4	Pedagogy of Commerce	3	1	0	4

Generic Electric Courses (GECs)- Semester II

Sl. No.	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits Practical	Class Teaching Hours per week
3	SOE 02 02 03 GEC 2024	Essentials of Guidance and Counselling	02	00	02	06
4	SOE 02 02 04 GEC 2024	Performing and Visual Arts	02	00	02	06

B.Ed. Semester-III

Sl. No.	Course Code	Total Credits	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum/ Practical)	Class Teaching Hours per week
25	SOE 02 03 13 C 003216	16	**School Internship (Part-II)**	0	16	32
26		**04**	**To be taken from other Department/MOOC**	4	0	04

B.Ed. Semester-IV

S.No.	Course Code	Total Credits	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits Practical	Class Teaching Hours per week
Core Courses							
27	SOE 02 04 14 C3104	4	Gender, School and Society	3	1	0	4
28	SOE 02 04 15 C3104	4	Assessment for Learning	3	1	0	4
29	SOE 02 04 16 C3104	4	Curriculum Transaction	3	1	0	4
30	SOE 02 04 17 C0042	2	Yoga Education	0	0	0	4
31	SOE 02 04 18 C2002	2	Environmental Education	2	0	0	2
32	SOE 02 04 19 C0042	2	Art, Craft and Aesthetics	0	0	2	4
Discipline Centre Elective Courses (Any Two)							
33	SOE020412 DCEC2044	4	Guidance and Counselling	2	0	0	4
34	SOE020413 DCEC3104	4	Comparative Education	3	1	0	4
35	SOE020414 DCEC3104	4	Life Skills Education	3	1	0	4
36	SOE020415 DCEC2044	4	Web Technologies in Education	2	0	2	2
37	SOE020416 DCEC3104	4	Human Rights in Education	3	1	0	4
38	SOE020417 DCEC3104	4	Education for Mental Health	3	1	0	4

Generic Electric Courses (GECs)- Semester IV

Sl. No.	Course Code	Course Title	Credits (Theory)	Credits (Tutorial/ Practicum)	Credits Practical	Class Teaching Hours per week
6	SOE 02 04 05 GEC 3104	Educational Management and Leadership	04	00	00	04
7	SOE 02 04 06 GEC 3104	Peace Education	04	00	00	04

SEMESTER-I

Course Tittle: CHILDHOOD AND GROWING UP
Course Code: SOE 02 01 01 C3104

Semester- I **Credits: 4**

Learning Outcomes: The student teacher will be able to:

- Explain the various stages of growth and development
- Identify the characteristics of childhood stage
- Define the salient features and problems of during childhood
- Conceptualize the theories of child development and their educational implications
- Analyze the process of learning and factors influencing learning
- Analyze the learning process and organize teaching for effective learning
- Identify the educational needs of special group of pupils and design teaching strategies
- Elaborate the role of family, school, and society in child development
- Identify the various kind of classroom issues and construct strategies to deal with those

Course Content

Unit -1 Growth and Development

- Growth and development: Concept, Meaning and definition
- Differences between growth and development
- Principles of growth and development
- Role of Heredity and Environment in growth and development
- Individual Differences: Concept of intra and inter individual differences. Implications of individual differences for organizing educational programmes

Unit- 2: Theories of Child Development

- Theory of Cognitive Development by Piaget: Concept, Stages and Implications
- Theory of Social & Emotional Development by Erickson: Concept, Stages and Implications
- Kohlberg theory of Moral Development: Concept, Stages and Implications

Unit- 3: Childhood and adolescent

- Emerging Issues of Childhood and Adolescent:
- Social issues
- Emotional issues
- Health issues
- Need and Importance of Adolescence Education Programme

Unit- 4: Socialization of children

- Meaning and definition of Socialization
- Aims and objectives of socialization process
- Types of socialization process
- Agents of socialization process
- Parents and Family
- Peer group
- Classroom & School Climate
- Community

Transactional Strategies: E-learning, Lecture cum discussion, power-point presentations, assignments on various topics, presentation and discussion, lecture cum demonstration, debate on various factors influencing the learner, in-depth analysis of various emerging Issues of childhood and adolescence by the student teachers and presentations will be encouraged.

Suggested Readings:

- Aggarwal, J. C. (2014). *Essentials of educational psychology (3rd Edition)*. New Delhi: Vikas Publishing House Pvt. Ltd.
- Ballantine., J. H. & Spade, J.Z. (2015). *Schools and society: A sociological approach to education.* New Delhi: Sage Publications, Inc.
- Bhatia, P.R. (2005). *Psychology of teaching learning process*. New Delhi: Anmol Publication Pvt Ltd.
- Chatterjee, S.K. (2002). *Advanced educational psychology*. Calcutta: Books and Allied Pvt Ltd.
- Dandapani, S. (2001). *A textbook of advanced educational psychology*. New Delhi: Anmol Publications.
- Dash, M. (1988). *Educational psychology*. Delhi: Deep and Deep Publication.
- Fontana, D. (1995). *Psychology for teachers (3rd edition)*. The British Psychological Society, London: McMillan in association with BPS Books.
- Hill, D. & Cole, M. (Ed.). (2001). *Schooling and equality – fact, concept and policy*. London: Kogan page.
- James, A. & James, A. (2008). *Key concepts in childhood studies*. UK: Sage.
- Kakkar, S.B.(2005). *Educational psychology.* New Delhi: Prentice Hall of India Pvt. Ltd.
- Kumar, S. (2014). *Child development and pedagogy*. New Delhi: Pearson.
- Kundu C.L. and Tutoo, D.N. (1988). *Educational psychology.* New Delhi: Sterling Publishers Pvt. Ltd.
- Mahapatra, D. (2015). *Ubiquity of porn leading India to social crisis: CBI*. Times of India. Retrieved from http://timesofindia.indiatimes.com/india/Ubiquityof- porn-leading-India-to-social-crisis-CBI/articleshow/49306899.cms.
- Mangal, S.K. (2007). *Essentials of educational psychology.* New Delhi: Prentice Hall of India Pvt. Ltd.
- Mangal, S.K.(2019). *Psychology of learning and development*. New Delhi: Prentice Hall of India Pvt. Ltd.
- Mathur, S.S (1994). Educational psychology. Meerut: Loyal Book Depot.
- Nagaraju M. T. V., Manivannan M. & Patteti A. P. (2015). *Psychology of teaching and learning.* Hyderabad: Neelkamal Publications Pvt. Ltd.
- Newman,D.M, (2014). *Sociology: Exploring the architecture of everyday life*. New Delhi : Sage Publications.
- Nirmala J.(2014). *Psychology of learning and human development*. Hyderabad: Neelkamal Publications Pvt. Ltd.
- Oza, D.J. and Ronak, R.P. (2011). *Management of behavioural problems of children with mental retardation*. Germany: VDM publication.
- Phens, J.M., and Evans, E.D. (1973). *Development and classroom learning: An introduction to educational psychology.* New York: Holt Rinehart and Winston Inc.
- Pruthi, R. K (2006). *Educational psychology*. New Delhi: Discovery Publishing House.
- Santrock, John W. (2007). *Adolescence (11th ed.).* New Delhi: Tata McGraw-Hill Publishing Company Limited.
- Skinner, E.C. (1984). *Educational Psychology (4th Edition)*. New Delhi: Prentice Hall of India Pvt. Ltd.
- Spinthall, N., and Spinthall, R.C. (1990). *Educational psychology (5th Edition).* Delhi: McGraw Hill Publishing Company.

Course Title: CONTEMPORARY INDIA AND EDUCATION
Course Code: SOE 02 01 02 C3104

Semester- I **Credits: 4**

Learning Outcomes: After the completion of this course students will be able to

- Define the concept of education in contemporary India.
- Critical analyse the development of different forms and nature of education.
- Develop insight for the importance of education in one's life.
- Evaluate the contribution of education in bringing varied forms of social change in society, country and world.
- Get sensitized about traffic rules and road safety measures.
- Train themselves in providing emergency first aid services.
- Appreciate the foundational function of various educational philosophies of prominent educational thinkers.
- Review and evaluate contributions of varied educational committees and commissions in transforming the structure and form of Indian education system.

Course Content

Unit -1: Meaning and Nature of Education

- Meaning of Education – Broader and Narrow in the context of great Indian educators
- Formal, non-formal and informal education
- Agencies of Education
- Aims and purposes of education drawn from constitutional provision.

Unit 2: Social Stratification, Social Change,Road Safety and First Aid

- Social Stratification: Meaning, Factors, Characteristics and Types.
- Social Change: Meaning, Forms ,Nature and Role of education in the process of social change
- Road Safety: Rules and importance
- First Aid: Meaning, definition and basic first aid procedures

Unit 3: Indian Thinkers and their Contribution to Education

- Mahatma Gandhi
- Swami Vivekananda
- Pandit Madan Mohan Malviya
- Sri Aurobindo
- Rabindranath Tagore
- J. KrishanaMurti

Unit 4: Important Commissions and Policies for Public Education in India (Secondary Education)

- Kothari Commission (1964-66):Aims and recommendations
- New Education Policy (1986): Aims and recommendations
- Revised Education Policy (1992): Ram Murti Committee (1990-91) and Janardhan Reddy Committee Report
  :Major recommendations
- Justice Verma Commission 2012: Aims and recommendations

Transactional Strategies: E-learning, Lecture cum discussion, Tutorials, Brainstorming Session, Recorded/ live Video and Audio lectures, Use of PPT, Film Shows (selected films), assignments on different key areas given in syllabus through Google Group, Google Classroom and other appropriate online apps. Workshop on Road Safety and First Aid, Setting up a road safety group

Suggested Readings:

- Bhattacharya, S. (2006). *Sociological Foundation of Education.* Atlantic Publishers. New Delhi.
- Chand, B. (2017). *Education in Contemporary Indian Society*. Neel Kamal Publications. New Delhi.
- Dhankar, N. (2010). *Education in Emerging Indian Society*. New Delhi: APH Publishing Corporation.
- Fagerling, I., and Saha, L.J.O. (1989). *Education and National Development (2nd Ed.)*. England: Pergamon Press.
- Kakkar, S.B. (1995). *Changing Perspectives in Education*. New Delhi: Vikas Publishing House Pvt. Ltd.
- Mehta, D. D. (2009). *Indian Education.* Ludhiana: Tondan Publications, Books Market.
- Mehta, D. D. (2009). *Education in Emerging Indian Education*. Ludhiana: Tondan Publications, Books Market.
- Murthy, S. K. (2009). *Philosophical and Sociological Foundation of Education*. Ludhiana: Tondan Publication, Books Market.
- Narulla, S. & Naik, J.P. (1964). *Student History of Education in India*. McMillian & Co., of India Pvt. Ltd.
- National Policy and Education (1986) revised 1992. MHRD. New Delhi: Govt. of India.
- Pathak, K.R. (2007). *Education in the Emerging India*. New Delhi: Atlantic Publishers.
- Pathak, R.P. (2009). *Philosophical and Sociological Foundations of Education.* New Delhi: Kanishka Publishers.
- Rao, D. B. (1996). *Global's Perception on Peace Education*. Vol. I, II & III. New Delhi: Discovery Publishing House.
- Rassekh, S., and Vaideanu, G. (1987). *The contents of education*. UNESCO, Paris: Richard Clay Ltd., Bungay, Suffolk, England.
- Siddiqui, M.H. (2009). *Philosophical and Sociological foundation of Education*. New Delhi: APH Publishing Corporation.
- Govt. of India. (1966). Ministry of Education. Report of the Education Commission. New Delhi.
- Govt. of India. (1986). Ministry of Human Resource Development. The National Policy of Education. New Delhi.
- Govt. of India. (1992). Ministry of Human Resource Development. The Revised Policy Formulation. New Delhi.
- Siddiqui, M.H. (2009). *Philosophical and Sociological foundation of Education*. APH Publishing Corporation, New Delhi.
- Singh Y.K. (2007). *Philosophical Foundation of Education.* New Delhi: APH Publication Corporation.
- Singh, Y.K. (2005). *Education in Emerging Indian Society*. New Delhi: APH Publishing.

- Thakur, A.S., and Berwal, S. (2007). *Education in Emerging Indian Society*. New Delhi: National Publishing House.
- Toffler, A. (1971). *Future Shock*. London: HazellWatron and Viney Ltd.
- National Policy on Education, 1986,http://mhrd.gov.in/sites/upload_files/mhrd/files/document-reports/NPE86-mod92.pdf
- Kothari, D. S. (1964). Education and national development: Report of the Education
- National policy on Education (1986). Available at www.ncert.ac.in
- Acharya Ramamurthy Report (Programme of Action) (1990). Available at www.ncert.ac.in

Course Title: LEARNING AND TEACHING
Course Code -SOE020103C3104

Semester- I **Credits: 4**

Learning outcomes: After completing this course, the pupil-teachers will be able to:

- relate variables of teaching process with the concept of teaching
- identify the relationship between teaching style & learning styles
- apply the maxims of teaching and approaches to teaching
- estimate the use of Phases of Teaching and Levels of Teaching
- explain the educational implications of different theories of learning
- identify the creative potentiality of learners
- comprehend the concept, nature and various theories of intelligence
- identify and suggest various skills & competencies in classroom teaching & management
- critically evaluate the role of a teacher as transmitter and facilitator of knowledge

Course Content:

Unit I: Understanding the Teaching

- Teaching: Concept, Nature & Characteristics
- Phases and Levels of Teaching
- Maxims of Teaching
- Learning Styles**:** Concept & Implications for classroom environment **(**VARK Model & Kolb's Model of Learning style)

Unit II: Learning and It's Theories

- Learning: Concept, Characteristics and Factors affecting learning
- Learning Theories and their Educational Implications
- Behaviorist Theories: Classical & Operant Conditioning
- Learning by Trial and Error (Thorndike)
- Gestalt theory – Learning by insight
- Cognitive theories -Bruner and Ausubel
- Social Cognitive theory – Vygotsky

Unit III: Creativity & Intelligence

- Creativity: Concept, nature, process
- Identification & Techniques of fostering creativity in classroom
- Intelligence: concept, meaning and nature
- Theories of Intelligence
  - Spearman's Two Factor Theory
  - Thurston's Group Factor Theory
  - Gardner's Theory of Multiple Intelligence

Unit IV: Teaching as a Profession

- Teaching as Profession
- Role of a teacher in teaching-learning process (as Transmitter of knowledge and Facilitator of Knowledge)
- Professional Ethics of Teachers
- Skills & Competencies of 21st century teachers

Transactional Strategies:

Interactive development of concerned topics and theories with the help of various multimedia applications like; Google Classroom, Google Group, Google Drive, related Articles and other materials from various reputed online resources, Lecture cum discussion, Use of PPT, Assignments on various topics. Debate on various factors affecting teaching learning process & panel discussion, Brainstorming Session and in-depth analysis of various theories of learning by the pupil teachers.

Suggested Readings:

- Bigge, M. L. (1982). *Learning theories for teachers* (4th edition). New York: Harper and Row Publishers.
- Chauhan, S.S. (2007). *Advanced educational psychology*(7th edition). New Delhi: Vikas Publishing House Pvt. Ltd.
- Chauhan, S.S. (2014). *Innovations in teaching learning process*. Noida: Vikas Publishing House Pvt. Ltd.
- Dececco, J.P. (1988). *The psychology of learning and instruction*. New Delhi: Prentice Hall.
- Wheldall, K. (2006). *Developments in educational psychology*. New York: Routledge.
- Hergerhahn, B.R. (1976). *An introduction to theories of learning*. Englewood Cliffs, NJ: Prentice Hall.
- Kumar, S. (2016). *Child development and pedagogy*. Delhi: Pearson Education (Singapore) Pvt. Ltd.
- Lefrancois, G.R. (1999). *Psychology for teaching (10th edition).* London: Woodsworth Publishing.
- Ohles, J.F. (1970). *Introduction to teaching*. New York: Random House, INC.
- Ormrod. J.E. (2000).E*ducational psychology*: *Developing learners* (3rd edition). New Jersey: Prentice Hall.
- Pandey, K.P.(1983). *Dynamics of teaching behaviour.* Ghaziabad: Amitash Parkashan.
- Rinehart, Winston, & Bhatia, K.K. (2008). *Basis of educational psychology.* Ludhiana: Kalyani Publishers.
- Santrock, J.W. (2018). *Educational psychology*(6th Edition). McGraw Hill Education.
- Siddiqui, M. H. (2005). *Techniques of classroom teaching.* Delhi:APH Publishing Corporation.
- Skinner, E.C. (1984).*Educational psychology (4th edition).*New Delhi: Prentice Hall of India Pvt. Ltd.
- Snowman & Baihler (2006). *Psychology applied to teaching.* Boston: Houghton Mifflin Company.
- Snowman., J., & Biehler, R. (2002). *Psychology applied to teaching*. New York: Houghton Mifflin.
- Stephens, L.M., & Evans, E.D. (1973). *Development and classroom learning: An introduction to educational psychology*. New York: Holt, Rinehart and Winston, Inc.
- Tanner, L.N., & Lindgren, H.C. (1971). *Classroom teaching and learning*. New York: Holt, Rinehart and Winston, Inc.
- UpadhyaB.,& Singh Y.K.(2011). *Encyclopaedia of education psychology* (Vol. I to II).Delhi: APH Publishing Corporation.
- Woolfolk, A. (2017). *Educational psychology* (13th edition). Delhi: Pearson Education (Singapore) Pvt. Ltd., Indian Br

Course Title: UNDERSTANDING DISCIPLINE AND SUBJECTS
Course Code: **SOE 02 01 04 C2002**

Semester- I **Credits: 2**

Learning Outcomes:

After completion of the course, student teachers will be able to:

- Describe the characteristics and nature of Academic discipline
- Understand the characteristics of School subjects
- Understand the relationship and differences between the Subject and Academic Discipline.
- Explain the nature of education as a discipline
- Examine issues related to education as interdisciplinary knowledge
- Understand the multiple perspectives of Disciplines

Course Content

Unit 1: **The Doctrine of Discipline & its Relationship with subjects**

- Meaning, Concept, Characteristics and Classification of Academic disciplines.
- Interdisciplinary, Cross disciplinary, Multidisciplinary
- Meaning, Definition, Characteristics of School Subjects.
- Need and Importance of Studying School Subjects
- Relationship between School Subjects and Academic discipline
- Teacher's Subject matter knowledge

Unit 2: **Nature & Perspectives of Disciplines**

- Historical, Philosophical, Sociological Perspective of Discipline.
- Interdisciplinary Subjects: Concept, General Objective design and and their Assessment
- Interdisciplinary Nature of Education and its relation with other subject
- Education as a Discipline and its critical Analysis.

Transactional Strategies: Use of online mode, Lecture cum discussion, Use of PPT, Assignments on various types of knowledge, presentation and discussion, use of audio and video materials.

Suggested Readings:

- Stengel, B. S. (1997). Academic discipline and school subject: Contestable curricular Concepts. *Journal of Curriculum Studies*, 29(5), 585–602.
- Holbrook, J. (2000). *Interdisciplinary Education- Challenge of 21st Century*. Guide book, Jagiellonian University
- Del Favero, Marietta (2002). Academic disciplines, Encyclopaedia of Education.
- Aram, John (2004). Concepts of Interdisciplinary: Configurations of knowledge and action, Human Relations. Vol. (4)57, pp. 379-412.
- Goodson, I.F., and Marsh, C.J. (2005). *Studying school subjects: A guide*. Routledge
- Golding, G. (2009). Integrating the disciplines: Successful interdisciplinary subjects. University of Melbourne.
- Krishnan, A. (2009). What are academic disciplines? University of Southampton, NCRM E Prints Repository eprints.ncrm.ac.uk/783/1/what_are_academic_disciplines.pdf.
- Gandhi, N. (2016). An Approach to Academic Discipline and subjects. *Indian Journal of Applied Research.* pp. 576-578
- Del Favero, Marietta (2002). Academic disciplines. Encyclopaedia of Education.

Course Title: READING AND REFLECTING ON TEXTS
Course Code: SOE 02 01 05C0022

Semester- I **Credits: 2(Practical)**

Learning outcomes

The student-teacher should be able to:

- Understand the meaning, process, importance and characteristics of Reading.
- Understand and apply different levels, types, techniques and methods of Reading.
- Be acquainted with the skills of reading different types of texts.
- Develop different types of reading skills through various activities and meta cognition
- Learn the skills of reading comprehension and to enhance vocabulary.

Course Content

Unit 1: (Theoretical underpinning) Introduction to Reading and Harnessing Reading Skills

- Reading – Meaning, Process and Methodology.
- Levels of Reading – literal, interpretative, critical and creative.
- Types of Reading – intensive and extensive reading, reading aloud and silent reading
- Reading Techniques – skimming and scanning
- Types of Texts – Narrative, expository, descriptive, empirical, ethnography, policy documents, field notes etc. Developing Reflective Reading Skills- Meta-cognition, Class-room activities and role of teacher.
- Role of libraries, peer group and book-clubs in promoting reading habits

Unit 2 : Practicum

- Read a book, a journal Article, or a chapter and write a critical appreciation along with personal responses and summarize.
- Prepare presentations on literary text – Autobiography / ethnographic text.
- Beyond the textbook: reading comprehension and questions –answers.
- Prepare a Vocabulary Book 100 words with Meanings, Usage (and also pictures wherever possible)
- Write a book review and critically analyze the Language and the ideas ingrained in the text.
- Carry out content analysis of a non-fiction book.
- Any other project/assignment given by the institution.

Transactional Strategies:

Unit 1:

Audio and Video Lecture, Discussion, Discussion-cum-Demonstration, Power-point presentations, Games, Exercises, use of audio-visual materials, Exposition, Field visit, Reading demonstration, Games, Exercise, short and long lecture, e-learning, Reading practice etc.

Unit 2:

- Divide the class in small groups and provide different kinds of texts and instruct them to read and reflect according to the nature of the text.
- Divide the group and provide one text and suggest students to make different interpretations.
- Design vocabulary games to enhance vocabulary.
- Read the text and provide a five words summary to each paragraph.
- Reading and comprehension exercises.
- Skim through the text and give a suitable title to the text.
- Complete given text in stipulated time and summarize it in 6/7 lines with a suitable title, Writing and maintaining reflective journals

***** In addition, school and community-based activities may be organized with provisions for visits to innovative centres of pedagogy and learning, innovative schools, educational resource centres, etc. Action research based on teaching learning and school and community could be conducted.

Suggested Readings:

- Beaumount, M. (1996). *The Teaching of Reading Skills in Second/Foreign Language*. Patras: The Hellenic Open University.
- Bright, J. A., & McGregor, G. P. (1970). *Teaching English as a Second Language.* ELBS: Longman.
- Browne, A. (1998). *A practical guide to teaching reading in the early years*. London: Chapman.
- Chall, J. (1967). *Learning to read: The great debate.* New York: McGraw Hill.
- Doff, A. (1988). *Teach English: Training Course for Teachers.* Cambridge: Cambridge University Press.
- Goodman, K.S. (1996). On reading. Portsmouth, NH: Heinemann.
- Hill, L.A., and Dobbyn, M.A. (1979). *Training Course, Trainer's Book.* London: Cassell.
- Hubbard, P., and Hywel, J. et al (1983). *A Training Course for TEFL.* Oxford University Press.
- Joseph, K. S. (2004). *Self-Instruction in English Grammar and Figures of Speech*. Vadodara: Gold Rock Publications.
- Krashen, S. (1989). We acquire vocabulary and spelling by reading: Additional evidence for the input hypothesis. *Modern Language Journal*, 73:4. pp. 440-64.
- Mukalel, J. C. (1998). *Approaches to English Language Teaching*. New Delhi: Discovery Publishing house.
- Mukalel, J. C. (1998). *Creative Approaches to Classroom Teaching*. New Delhi: Discovery Publishing house.
- Mukalel, J. C. (1998). *Psychology of Language Teaching.* New Delhi: Discovery Publishing House.
- Mukalel, J. C., and Ahmed, S. B. (1984). *Teaching English in India. New Delhi*: Arya Book Depot.
- Nagaraj, G. (1996). *English Language Teaching Approaches, Methods and Techniques*. Calcutta: Orient Longman.
- Richard, J., Theodore, S. & Rodgers, T.S. (1968). *Approaches and Methods in Language*. Cambridge University Press.

- Richards, J., & Lockhart, C. (1994). *Reflective Teaching in Second Language Classrooms*. Cambridge: Cambridge University Press.
- Roberts, G. R. (1999). *Learning to teach reading. London*: Chapman.
- Underwood, G., & Batt, V. (1996). Reading and understanding. Oxford: Blackwell.
- Venkateswaran, S. (1995). *Principles of Teaching English. New Delhi:* Vikas Publishing House.
- West, M. (1941). *Learning to Read a Foreign Language. Longmans*: UK. (Learning to read a foreign language, and other essays on language teaching. [New ed.]. London, New York, Longmans, Green [1955]
- Wilkins, D. A. (1982). *Linguistics in Language Teaching.* London: Edward Arnold.
- Willis, J. (1981). *Teaching English through English ELBS*. England: Longman Ltd.
- Yule, G. (1985). *The Study of Language.* Cambridge: Cambridge University Press.
- My Experiments with Truth – Autobiography of Mahatma Gandhi
- The Little Prince – Antain de Saint – Exupery
- Cultural Heritage – Dr. S. Radhakrishnan
- Periodicals Like – Outlook, India Today, Economic and Political Weekly, Business Today, Journals of Education, Frontline. Language and language Teaching.

Course Title: UNDERSTANDING THE SELF
Course Code -SOE020106C0022

Semester: **I** **Credit: 2 (Practical)**

Learning Outcomes:

After completion of the course Understanding the Self, student teachers will develop the capacity to:

- identify their own potential and give conscious direction to their lives to take responsibility for their actions
- develop a holistic and integrated understanding of the self and aspects of personality
- explain the meaning and importance of self-concept and self-esteem
- develop the capacity for perspective taking and appreciating different points of view and develop sensitivity towards needs of children by connecting with one's own childhood experiences
- develop the capacity to establish peace within oneself
- develop the capacity to establish harmony within a group and methods of conflict resolution
- manage conflict effectively

Course Content

Unit 1: Exploring the Self

- Fundamentals of self-exploration: Self-concept, Self-Identity, Self-Image, Self-Esteem, Self-motivation
- Factors affecting exploration of self: Heredity and environment
- Personality: Understanding the concept of Personality and its various types: Jung's Classification, Sheldon's Classification, Kretschmer's classification
- Personality: Determining a Distinctive Personality, Dynamic Approaches of Personality

Unit 2: Development of Self

- Techniques of Self Reflection (Introspection, Reflective Diary, Reflective Dialogue and discussion & Social media)
- Techniques of Stress Management
- Group & Social Harmony
- Development of resilience
- SWOC Analysis

Transactional Strategies

- Audio and Video Lecture, PowerPoint presentations.
- Group Discussions
- Review of various literature available
- Workshops
- Collaborative activities
- Field Visits
- Movie screening

Practicum:

- Write a self-reflective journal (approx.600-800 words).
- Elaborate your own values towards self and society.
- Conduct any two activities for stress management on school students or peers.
- Review of movies with social messages.

- SWOC analysis of one's own.
- Any other as prescribed by the institution

Suggested Readings:

- Adair, J., and Allen, M. (2018). *Time management and personal development*. London: Hawksmere.
- Farrell, T. S. C. (2019). *Reflective practice in action.* Thousand Oaks, CA: Corwin Press, Inc.
- Feldonan, R. S. (2019). *Essentials of understanding psychology*. (7th edition). New Delhi: Tata McGraw Hill.
- Gurol, A (2010) *Determining the reflective thinking skills of pre-service teachers in learning and teaching process.* Turkey: Firat University.
- Hadfield, J. A. (2016). *Psychology and morals. London*: Methuen & Co.
- Kubalker, R. (2015). *Know your stress-manage your stress*. New Delhi: Neel Kamal Publishers.
- Lewis, M. & Brooks-Gunn, J. (2009). *Self-knowledge and emotional development*. In M. Lewis & L. Rosenblum, (Eds.), The development of affect: The genesis of behavior, (pp. 205-226). New York: Plenum Press.
- Luft J and Ingham H. (2017). *The Johari window: A graphic model for interpersonal relations.* University of California Western Training Lab.
- Rohrer, J. (2008). *ABC of awareness*. Oberurnen: UTD Media.
- Sheorron, B. (2008). *The presentation skills workshop*. New Delhi: Prentice Hall of India.
- Simanowitz, V., and Pearce, P. (2003). *Personality development*. Beckshire: Open University Press.
- Snyder, C. R. (2011). *Positive psychology: The scientific and practical explorations of human strengths.* New Delhi: Sage Publishers.

Course Title: SCHOOL ADMINISTRATION AND MANAGEMENT

Course Code: SOE 02 01 01 DCEC3104

Semester: **I** **Credit:4**

Learning Outcomes:

At the completion of course, students will be able to: ·

- Explain the concept of educational administration and school management
- Develop a comprehensive understanding of context-specific notions of school organization.
- Reflect on the various roles played by school personnel in smooth organisation of school activities.
- Make overt connections between field-based project work, educational leadership and change awareness.
- Develop an understanding of the system of school education, its relationship with school administration and management process.

Course Content:

Unit I: Basic Concepts

· Meaning, Nature and Scope of Educational Administration
· Development of Modern Concept of Educational Administration
· Types of schools within different administration bodies
· Roles and responsibilities of education functionaries
· Concepts of school culture, organization, leadership and management
· Role of school activities such as assemblies, annual days etc., in the creation of school culture.

Unit II: School as an Organisation

· The School - its functions and relationship with the society
· School building: Design and Components (including Hostels)
· School Personnel-Roles and Responsibilities: Headmaster, Teachers, Non-Teaching Staff
· School finance - Sources of Income and Items of Expenditure, School Budget

Unit III Dynamics of Supervision

· Supervision: Concept, Need, Functions and Scope
· Role of the Head and Teachers of the Institution in Supervision
· Role of School Management Committees (SMCs), Mother Teacher Associations (MTAs), Parent Teacher Associations (PTAs) in School Development
· Democratic Decision Making: Concept and Procedure with respect to functioning of a School

Unit IV: Elements of School Management

· School Climate: Meaning and Types
· Timetable: Principles and Techniques of Time -table preparation ·
· Preparation of a Calendar of Activities of Co-curricular Activities
· School Discipline: Concept and Approaches, Self-Discipline: Concept and Relevance in a School
· Problems Faced in School Management: Issues of Security and Disaster Management
· Juvenile Delinquency: Concept and Steps to Deal Effectively in a School

Transactional Strategies:

- E-learning, Lecture discussion on concept and objectives.
- Organization of debates quiz on issues related to Educational Administration and Management.
- Sharing experiences of educational administration.
- Review of existing role & functions of educational administrative bodies.
- Content analysis of various reports and other significant documents related to school administration and management.
- Field Visits

Suggested Readings:

· Agarwal, J. C. (2006). *School administration.* New Delhi: Arya Book Depot.
· Aggarwal, D. D. (2007). *Educational Administration in India.* ISBN: 8176257729.
· ANTRIEP, NUEPA (2012). *Why Teachers Must Become Change Agents in Educational Leadership.* 50 (6).
· Batra, S. (2003). From School Inspection to School Support.
· Bhatnagar, R. P., & Verma, I. B. (2000). *Educational Administration*. Meerut: Loyal Book Depot.
· Bush T. L. B. (2003). *The principles and practice of educational management (ETD).* New Delhi: Sage Publications.
· Bush, T. (2013). *Educational management, administration & leadership.* New Delhi: Sage Publications.
· Cambolell, R. F. & Gregg, R. T. (1957). *Administrative behaviour in education*. Harpar.
· Early, P., & Weindling, D. (2004). *A changing discourse: From management to leadership.*
· Fullan, M. (1993). Making schools successful, synthesis of case studies of schools in Asian countries.
· Govinda, R. (2001). Capacity Building for Educational Governance at Local Levels. Paper presented at the International Consultation on Educational Governance at Local Levels, Held at UNESCO, Paris 27-28 February 2001.
· Kimbrough, R. B., & Nunnery, M.Y.(1983). *Educational Administration : An Introduction.* New York: MacMillan Publishing Co. Inc.
· Owens, R. G. (1970). *Organizational Behaviour in Schools*. N.J. :Prentice Hall Inc., Englewood Cliffs.
· Prasad, A. (2007). *University education administration and the law.* New Delhi: Deep & Deep Publications.
· Punia,V. (2004). *Managerial skills in educational administration*. New Delhi: Deep & Deep Publications Pvt. Ltd.
· Rita, S. (2004). *Assessment and accreditation in higher education*. New Delhi: Association of Indian Univesities.
· Safaya, R. N., & Shaida, B. D.(2000). *School Administration and Organization*. New Delhi: Dhanpat Rai and Sons.
· Chauhan,S.(2012). *Educational management.* New Delhi: Pearson Publication.
· Dhillan, S.S. (2019). *Educational administration: management and leadership*. New Delhi: Gyan Geeta Publications.
· Lunenburg, F. C., & Orenstein, A. C. (2012). *Educational administration- Concept & Practices.* Canada, USA: Wadsworth, Cengage Learning Solutions.
· Luthans, F. (2005). *Organisational Behaviour.* New York: McGraw – Hills Inc.
· Mohan, M. (2002). *School without Walls*. Heinemann. New Delhi pp 24- 40; 128
McCaffery, P. (2004). *The higher education manager's handbook.* NewYork and Canada: Routledge.

- Nair, S. R. (2004).*Organizational behaviour- Texts and cases*. Mumbai: Himalaya Publication.
- Nangia, S. B. (2009). *Educational administration*. New Delhi: APH Publishing Corporation Publishing House.
- Nangia, S. B. (2009). *Educational administration*. New Delhi: APH Publishing Corporation Publishing House.
- Northouse, P. G. (2018). *Leadership theory and practice.* New Delhi: Sage Publications.
- Sayeed, O. B., & Pareek, U. (2000). *Actualizing managerial roles.* New Delhi: Tata McGraw-Hill Publishing Company Limited.
- Sharma, R. A. (2009). *Educational administration & management*. Meerut: R Lal Book Depot.
- Sindhu, I. S. (2012). *Educational administration & management*. New Delhi: Pearson Publications.
- Srivastav, A. K. (2009). *Educational administration policy, planning and survey*. New Delhi: Kunal Books.

Course Title: ART IN EDUCATION (VISUAL & PERFORMING ARTS)
Course Code -SOE020102DCEC2044

Semester: **I** **Credit: 4(2Theory+ 2 Practical)**

Learning Outcomes: After completing this course, the student teachers will be able to :

- familiar with the concept of art and its importance in daily life and education.
- develop competencies and skills for teaching of Art.
- acquire skills for integrating different art forms across school curriculum for better learning and developing.
- develop the artistic and aesthetic sensibilities among students to enable them to respond to the beauty in different art forms.
- develop imagination and sense of art and creative interest in art in teaching learning process.
- develop and understanding of drama and art, the scope and purpose of art education and art as the basis of education.
- acquaint about drama as a critical pedagogy and develop consciousness & awareness towards society.
- aware of forms of art, performing and visual and their significant role in human life.
- explore various dance forms and their integration in education practices.
- learn to identify areas that are best suited for drama exploration.
- recognize the role of drama as education in elementary school and will learn about different dance styles driven in India.

Course Content

Unit -1: Concept of Art and Education (Theory)

- Concept of Art and meaning of types.
- Importance of colours in human life.
- Art in daily life.
- Art as an Educational/Pedagogy tool.
- Art and other Subjects- Languages, Mathematics, Science, Social Studies.
- Folk Art- Madhubani, Warli.

Unit 2 : Aesthetic Sense and Performing Art (Theory)

- Importance of Aesthetic sense in human life.
- Transformation of art and Aesthetic sense through Education.
- Introduction of Drama and its types, social and educational relevance of performing art and its place in contemporary Indian society.
- General introductionof seven classical Dance styles, knowledge of Indian Dance & Drama traditions both in classical and Folk Song.
- Drama as pedagogy of learning and development.
- Exposure to selective Basic skills required for Drama and Art.

Unit 3 : Methods and Materials of Art and Performing Art(Practical)

- ●Making of Object Drawing, Portrait Painting, Clay Model, Rangoli and Glass Painting.
- ● Free Handwriting and Calligraphy.
- ●Stage craft & design, technology and direction of performance.
- ●Acting for production, play production process.

Unit 4 : Printing, Painting & Crafting(Practical)

- ●Making Show-Pieces by Paper-cutting and folding.
- ●Waste Utilization.
- ●Arrangement Painting with Ladyfinger, Potato, Onion etc.
- ●Poster Making.
- ●Collage Making.

Transactional Strategies

Hand on experience of working in different medium and materials, preparation and presentation of teaching learning materials, workshop, exhibition, slid/film show, project work, group work planning of a stage-setting, visit, role play, celebrations of Indian festivals and fairs brain-storming, interaction with artists, lectures and demonstration.

Practical Work:

1) Linear Diagrams
2) Designs
3) Calligraphy
4) Object Drawing
5) Portrait Painting
6) Clay Model
7) Bloc Painting
8) Glass Painting
9) Rangoli Art
10) Crafts
11) Products making out of Waste material
12) Poster Making
13) Collage making
14) Folk arts
15) Paper folding and cutting
16) Music
17) Dance
18) Magic
19) Theatre

Suggested Readings:

- ● Devi, P. (1998). *Art as the basis of Education*. New Delhi: NBT.
- ● Kakkar, R. & Makkhar, R. (2018). *Drama, art and aesthetics in education*. Agra: Rakhi Prakashan.
- ● Ravikant, R. K., & Ananad, K. P. (2019). *Drama and Art in Education*. Neelkamal Publications.

●CCRT official website.
●Chandok, A. (2016). *Art and education*. Delhi: Bookman.
●Chaturvedi, S. (2016). *Art education.* Delhi: Bookman.
●Chauhan, R. (2016). *Drama, Art and Education.* Agra: Agrawal Publications, Sanjay Place.
●Chawla, S. S. (1986). *Teacher of Art*. Patiala: Publication Bureau, Punjabi University.
●Chetan, B. (2016). *Drama and art in education*, Kalyani Publishers.
●Esther, S. M. & Anand, K. P. (2019). *Art in Education.* Hyderabad: Neelkamal Publications.
●Gill, R. (2017). *A textbook of art education*. New Delhi: Paragon International Publishers.
●Gill, R. (2018). *Art Education*. New Delhi: Paragon International Publishers.
●Jain, R. (2016). *Art education*. Delhi: Bookman.
●Kumar, R. (2016). *Drama and art in education*. Rajasthan: Jain Prakashan Mandir.
●NCERT (2006). *Position paper national focus group on Arts. Music, Dance and Theatre*. New Delhi: NCERT.
●Roy, R. (2017). *Perfect art education*. Arya: Publisher Company.
●Saxena, A., Sirth, S. (2016). *Drama, art and aesthetics in education*. Agra:Rakhi Prakashan Raman Tower, Sanjay Place.
●Sharma, R. P., Sharma, R. K. (2016*). Drama and art in education.* Agra: Radha Prakashan Mandir.
●Sharma, S. & Singh, K. (2016). *Art Education.* Delhi: Bookman.
●Singh, C. (2016). *Drama and art in education*. Agra: Publisher.Vinod Pustak Mandir.
●Vatsyayan, K. (1977). *Classical India Dance in Literature and the Arts*. New Delhi: Sangeet Natak Akademi.

Web Resources:

- कुमारअखिलेश(2014),*नाट्य एवंकलाशिक्षा*]वर्धमानमहावीरखुलाविश्वविद्यालयकोटा]राजस्थानhttps://www.researchgate.net/profile/Dr_Akhilesh_Kumar2/publication/281834157_natya_evam_kala_siksa/links/55fa617208ae07629dfe648c/natya-evam-kala-siksa.pdf
- जैनअनिलकुमार(2015),*शिक्षामेंअभिनयएवंकला*]वर्धमानमहावीरखुलाविश्वविद्यालयकोटा]राजस्थान http://assets.vmou.ac.in/BED114.pdf
- डोगराभारती (2018),*शिक्षामें नाट्य एवंकला*]इंदिरा गांधी राष्ट्रीय मुक्त विश्वविद्यालय]नई दिल्लीfile:///C:/Users/faith/Downloads/BESL-123%20B1%20H.pdf
- वर्माआर. के., चक्रवर्ती यू.के., वर्माडेकेश्वरप्रसाद (2013),*कला एवंकलाशिक्षण,* राज्य शैक्षिकअनुसंधानऔरप्रशिक्षणपरिषद् रायपुर, छत्तीसगढ http://www.scert.cg.gov.in/pdf/dedfirst2013/kalashikshan.pdf

Course Title: HEALTH AND PHYSICAL EDUCATION
Course Code - SOE020103DCEC3014

Semester: **I** **Credit: 4**

Learning Outcomes:

The course will enable the pupil teachers to:

- be conscious towards the development of holistic health by understanding its various dimensions and determinants.
- develop understanding about fundamentals of physical and health education.
- adopt preventive measures from common communicable diseases by acquiring knowledge about these.
- identify the nature of injuries and to provide first aid.
- create awareness on different aspects of health and fitness.
- develop a positive attitude towards health and physical education.
- comprehend various policies and programmes related to health & physical education.
- help them to understand the process of assessment of health and physical fitness.
- to acquaint them to school health program and its importance.

Course Content

UNIT 1: Health and Areas of Concern

- Health: Concept, definition, dimensions and determinants
- Health Education: Definition, aims and objectives
- Communicable Diseases: Mode of Transmission, Methods of Prevention and Control
- Nutrition: Elements of Balanced Diet, Food habits, Functions of food and Malnutrition

UNIT 2: Physical Education and Integrated Personality

- Physical Education: Concept, definition, aims and objectives
- Need, scope and Importance of Physical Education Programs at different school levels
- Rules, Regulations and skills of any one of the Games/events: Hockey, Badminton, Volleyball, Football
- Concept of integrated personality and its realization through physical education program

Unit-3: Health and Wellness

- Concept of Wellness and measures to ensure wellness
- Postures: Importance of Good Posture, Common Postural Defects and Remedial Exercises.
- Meaning of mental health - factors of mental health - mental health problem of college students, principles of mental health
- Communicable Diseases: Mode of Transmission, Methods of Prevention and control
- Sex Education and concerns for HIV/AIDS

Unit – IV School Education and Health Services

- Recreation: Meaning, Significance and Recreational Programs in Schools
- Personal and Environmental Hygiene for schools
- Objective of school health service, Role of health education in schools, policies related to health and physical education
- Health Services – Care of skin, Nails, Eye health service, Nutritional service, Health appraisal, Health record, Healthful school environment, first- aid and emergency care etc.

Transactional Strategies:

The following methods may be adopted:

- Interactive discussion, group-work, sharing of experiences, organizing various activities, analyzing various topics by using charts, photographs and other materials on aspects of health-related issues.
- Organizing school health check-ups, practical classes for first aid, blood donation, self-defence, awareness rally in nearby areas.
- Lecture, PowerPoint presentations, MOOCs and e-platforms.
- Lecture cum discussion, Group Discussions, use of audio and video materials
- Review of various literature available

Practical Work:

- Prepare a Project Report on: Three types of Sports Ground.
- Write a detailed account of your participation in any team game (hockey, Volleyball and Football) or individual game.
- Write a detailed account of your participation in any Self-defence training camp.
- Write a detailed account of your participation in any Blood donation camp.
- Write a detailed account of your participation in Health Check-up camp.
- Write a Project Report on Awareness rally for prevention from communicable diseases.
- Any other, as decided by the institution.

Suggested Readings:

- Ajmer, S. (2003). *Essentials of physical education*. New Delhi: Kalyani Publishers.
- Chandra, S., Sothi, & Krishnan P. (2005). *Health education and physical education*. Delhi: Surjeet Publications.
- Charles, B. A. (1992). *Foundation of physical education and sport*. New Delhi: B1 Publication.
- John E, Nixon, Ann E. Jewett (9th Ed) (1980). "*An Introduction to Physical Education*. London: Thomson Learning.
- Kanele, B. S., & Kumar, C. P. (1996). *Text book on health and physical education*. Ludhiana: Kalyana Publishers.
- Mangal, S. K. (2005). *Health and physical education*. Ludhiana: Tandon Publication book market.
- Nash T.N. (2006). *Health and physical education.* Hyderabad: Nilkamal Publishers.
- Prasad, Y. V. (2006). *Method of teaching physical education*. New Delhi: Discovery Publishing house.
- Ramachandran, L.T., & Dharmalingam. (1993). Health education. *A new approach*. New Delhi: Vikas Publishers Ltd.
- Reema, K. (1996). *Physical fitness*. New Delhi: Khel Sahitya Sports Publication.

Course Title: VALUE BASED EDUCATION (GEC)

Course Code: SOE 02 01 01 GEC 3104

Semester: **I** **Credit: 4**

Learning Outcomes:

The students will be able to do the following by the end of the course;

- Describe the need and importance of education for values.
- Understand the nature, characteristics and types of human values.
- Recognize the five core values of Truth, Righteous conduct, Peace, Love and Non-Violence.
- Understand various techniques and approaches of value development.
- Appreciate the preamble to the constitution and values inherent in it.
- Appreciate the importance of living together and imbibe in their attitude and behavior.

Course Content

Unit -1 : Value Education

- Definition, Meaning and Classification of Values
- The Need for Values in India
- Challenges of Values Adoption
- Religions & Secularism

Unit 2 : Personal Development & Values in Life

- The Principles of Integrity
- Character Development Values in Everyday Life
- Values, Virtues, & Qualities

Unit 3 : Values in Society

- Positive Thinking (Meaning, tips to achieve Mindset and tips for Developing a Positive Attitude**)**
- Emotional Maturity (Meaning, characteristics and Level**)**
- Women's Empowerment (Meaning, Principle and Importance**)**
- Environmental Awareness (Meaning, Needs and Importance**)**

Unit 4 : Value-based Education

- Concept of Value Based Education with Special Reference to Peace to Indian View of Life
- Need and Importance of Value Based Education in the Present Scenario.
- Values Prevalent In Contemporary Society.

Transactional Strategies: Lecture cum discussion, Tutorials, Brainstorming Session, Use of PPTs, Assignments on different key areas of Value related issues.

Suggested Readings:

- Anchukandam, T. and J. Kuttalnimathathll (1995). *Grow free live free*. Balgalore: Krisitujyoti Publications,
- Arulsamy, S. (2016). *Peace and value education.* New Delhi: Neel Kamal Publication.
- Barash, P. David (2000). *Approaches to Peace*. New York:Oxford University Press
- Behra, S.K., Duarah, Mouchumi and Mohakud, Lalit Lalitav (2018). *Value Education in the 21st Century*. New Delhi: New Delhi Publishers.
- Charles, K. (2016). *Value education*. New Delhi: Neel Kamal Publication.

- Charles, K., & Selvi, A. (2016). *Peace and value education,* New Delhi: Neel Kamal Publication.
- Danial & Selvamony (1990). *Value education today*. New Delhi: Madras Christian College, Tambaram and ALACHE,
- Govt of India (1983). *Report on education in human values in teacher training programmes*, New Delhi, and Ministry of Human Resource Development.
- Jacob, M. (2002). *Resource book for value education*. New Delhi: Institute for Value Education
- Kapani, Madhu (2000). *Education in human values – concept and practical implications*, New Delhi: Sterling Publishers.
- Krishnamurti, J.(nd). *Total freedom.* Krishnamurti Foundation Chennai.
- S. Ignacimuthu(1991). *Values for life* – Better Yourself Books, Mumbai,
- Sri Sathya Sai Bal Vikas Education Trust (1985). *Curriculum and methodology for integrating human values education,* Prashanthi Nilayam (International Education).
- Sri Sathya Sai International Center for Human Values (2009). *Education in human values.* Course Book for Training of Master Trainers, New Delhi.
- *The curriculum framework for quality teacher education* (1998) NCTE, New Delhi.

Course Title: Art in Education (GEC)
Course Code: SOE 02 01 02 GEC 2044

Semester: **I** **Credit: 4(2Theory+ 2 Practical)**

Learning outcome: After completion of the course, student teachers will be able to:

- Understand the concept of arts and its importance in daily life and education.
- Explore how Theatre & Art can enhance learning.
- Develop the artistic and aesthetic sensibilities through theatre and arts.
- Develop the Personality of students with artistic environment.
- Develop imagination and sense of art and creative interest in art in teaching learning process.
- Present and describe their art & acting work in a creative and expressive manner.
- To develop the aesthetic quality of the prospective teachers through Art Education.

Course Content

Unit I: Nature & need of Art Education (Theory)

- Meaning and Concept of Art Education.
- Elements of Art.
- Colour in life.
- Importance of Art in life and Education.
- Regional Arts and Craft and their relevance in Education.

Unit II: Aesthetic Sense and Art Education (Theory)

- Importance of Aesthetic sense in human life.
- Aesthetics in Education.
- Importance of Aesthetic in Education.
- Folk Indian of Arts.

Unit III: Methods and Materials of Art (Practical)

- Drawing and Painting.
- Clay Art.
- Making of Rangoli
- Poster Making.
- Design and Calligraphy.

Unit IV: Painting & Crafting (Practical)

- Paper cutting and folding.
- Waste Utilization.
- Collage Making.
- Block Paintings

Transactional Strategies: Hand on experience of working in different medium and materials, preparation and presentation of teaching learning materials, workshop, exhibition, slid/film show, project work, group work planning of a stage-setting, visit, role play, celebrations of Indian festivals and fairs brain-storming, interaction with artists, lectures and demonstration.

Practical Work:

1) Drawing and Painting.
2) Clay Art.
3) Rangoli.
4) Poster Making.
5) Design.
6) Calligraphy.

7) Products making out of Waste material.
8) Folk arts.
9) Paper folding and cutting.
10) Collage Making.
11) Block Paintings

Suggested Readings:

- Chandok, Amargeet (2016). *Art and education*. Delhi: Bookman.
- Chaturvedi Snehlata (2016).*Art education.* Delhi: Bookman.
- Gill Rajesh (2017).*A Text book of art education.* New Delhi: Paragon International Publishers 5 Ansari Road, Daryaganj.
- Gill Rajesh (2018).*Art education*. New Delhi: Paragon International Publishers.
- Jain Ritu (2016).*Art education*, Delhi: Bookman.
- Kakkar Rehha & Makkhar Ragini (2018).*Drama, art and aesthetics in education*. Agra: Rakhi Prakashan.
- Kaur Jas Raj & Pandey Satish Kumar (2016).*Drama and art in education.*
- Kumar Rajender (2016).*Drama and art in education*. Jaipur: Jain Prakashan Mandir.
- NCERT (2006).*Position paper national focus group on arts. music, dance and theatre*. New Delhi: NCERT.
- Prasad Devi (1998). *Art as the basis of education*. New Delhi: NBT.
- Raw K. Ravikant &P. Ananad Kumar (2019). *Drama and art in education.* Hyderabad: Neelkamal.Publications.
- Roy Reeta (2017).*Perfect art education.* New Delhi: Arya Publisher Company.
- Saxena Avnish & Sirth Sushil (2016).*Drama, art and aesthetics in education*. Agra-2: Rakhi Prakashan Raman Tower, Sanjay place.
- Sharma R.K(2018*). Drama and art in education.* New Delhi: Radha Publications.
- Sharma Sudhir& Singh Kuljeet (2016). *Art education*. Delhi: Bookman.
- Suneela M. Esther&Kumar P. Anand (2019).*Art in education.* Hyderabad: Neelkamal Publications.

Web Resources:

- कुमारअखिलेश(2014),*नाट्य एवंकलाशिक्षा* वर्धमान महावीर खुला विश्वविद्यालय कोटा राजस्थान https://www.researchgate.net/profile/Dr_Akhilesh_Kumar2/publication/281834157_natya_evam_kala_siksa/links/55fa617208ae07629dfe648c/natya-evam-kala-siksa.pdf
- जैनअनिलकुमार(2015),*शिक्षामेंअभिनयएवंकला*]वर्धमानमहावीरखुलाविश्वविद्यालयकोटा]राजस्थान http://assets.vmou.ac.in/BED114.pdf
- डोगराभारती (2018),*शिक्षामें नाट्य एवंकला*]इंदिरा गांधी राष्ट्रीय मुक्त विश्वविद्यालय]नई दिल्लीfile:///C:/Users/faith/Downloads/BESL-123%20B1%20H.pdf
- वर्माआर. के., चक्रवर्ती यू.के., वर्माडेकेश्वरप्रसाद (2013),*कला एवंकलाशिक्षण,* राज्य शैक्षिकअनुसंधानऔरप्रशिक्षणपरिषद् रायपुर, छत्तीसगढ http://www.scert.cg.gov.in/pdf/dedfirst2013/kalashikshan.pdf

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(Established vide Act No. 25 (2009) of Parliament, Accredited 'A' Grade by NAAC)

Ph.D. SCHEME AND SYLLABUS
(2020-21)

Semester	Core/ Elective	Paper Code	Title of the Paper	Credits	
				Theory	Practical
I	Core	SOE PHE 02 01 01 C4004	Research Methodology in Physical Education	4	
	Core	SOE PHE 02 01 02 C4004	Statistics and Computer Applications	4	
	Core	SOE PHE 02 01 03 C1022	Research and Publication Ethics	1	1
	Discipline Centric Elective Courses (DCEC)				
	Elective	SOE PHE 02 01 01 E3024	Research Based Kinesiology and Sports Biomechanics	3	1
		SOE PHE 02 01 02 E3024	Psycho-Socio Basis of Physical Education	3	1
		SOE PHE 02 01 03 E3024	Scientific Principles of Sports Training	3	1

	Total Core Course Credits	Total Elective Couse Credits	Total Credits
Semester- I	10	4	14

Note: For more details regarding Credit and other Academic requirement Ordinance II (A) of the University may be referred.

RESEARCH METHODOLOGY IN PHYSICAL EDUCATION

Course Code: SOE PHE 02 01 01 C4004

L	T	P	Credits
4	0	0	4

Learning Outcomes

After completion of the course, the students will be able to:

- Explain various approaches in the field of research.
- Develop a research proposal.
- Select an appropriate sampling design for a research study.
- Construct tools for different types of research.
- Document and disseminate research findings in physical education.
- Explain the significance of intellectual property rights in the field of research.

UNIT-I

Introduction to Research

1. Basic concept of Research and its scope in physical education
2. Types/Classification of Researches

Review of Literature

1. Importance, location of the research material – index, books, bibliography, reviews, abstract, critical and allied literature
2. Steps in reviewing literature and critically writing of review of literature

Selection of Research Problem

1. Identification of area for research in Physical Education
2. Selection of problem & variables, writing of title and objectives, Hypothesis and its form, limitation and delimitation of research problem, rationale of research study

UNIT-II

Methods of Research

1. Analytical Research- Philosophical, Historical and Meta-Analyses
2. Descriptive Research –Case Study and Survey (Cross-sectional, Longitudinal and Correlational)
3. Qualitative and Quantitative Research
4. Experimental Designs: Pre-experimental Designs, True Experimental Designs and Quasi Experimental Designs

UNIT-III

Sampling and Tools in Research

1. Sampling: Population, Sample, Frame, Probability and Non- Probability Sampling Techniques, Sample size and sampling error
2. Characteristics of a good research tools
3. Types of tools for data collection – standardised and non-standardised
4. Questionnaire, Interview, Observation, Psychological Test, Sociometric Techniques, Scales, and Inventories
5. Procedure of development and standardization of tools
6. Methods for establishing reliability and validity
7. Primary and secondary sources for data collection

UNIT-IV

Academic Writing

1. Different formats for reference and bibliography- APA, MLA, Chicago and Harvard
2. Silent features of writing research proposal/report - Language & style, Precision, Consistency, Continuity, use of third person, use of tense, Use of headings, Table, Graph and Front page of thesis
3. Research Proposal Writing
4. Method of writing research papers for seminars and publication in journals
5. Introduction to Poster Presentation
6. Writing of research dissertation and thesis
7. Writing of research Project

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue

Suggested Readings:

Kothari, C. R and Garg Gaurav (2014). *Research Methodology: Methods and Techniques*, 3rd Edition, New Age International Publishers.

Kumar, R. (2005). *Research Methodology: A Step-By-Step Guide for Beginners*. 2nd Edition, PearsonEducation.

Pannerselvam, R. (2009). *Research Methodology*. Prentice Hall.

Prathapan, K. (2014). Research Methodology for Scientific Research. IKInternational.

Sansanwal, D.N. (2020). *Research Methodology and Applied Statistics*. Shipra Publisher.

Singh, Y.K. (2008). *Fundamentals of Research Methodology and Statistics*. New Age International Publishers.

STATISTICS AND COMPUTER APPLICATIONS

Course Code: SOE PHE 02 01 02 C4004

L	T	P	Credits
4	0	0	4

Learning Outcomes

After completion of the course, the students will be able to:

- Explain different Measuring Scales of Data
- Explain application of different data Analysis Software
- Illustrate data analysis with multiple correlation and regression techniques
- Analyze and present data with multivariate techniques.

UNIT-I

Computer Application

1. Using MS Word for typing, formatting, editing, reviewing, and preparing references/bibliography
2. Using MS Power Point for preparing academic presentations
3. Using MS Excel for data processing and analysis
4. Using SPSS, R (R Foundation for Statistical Computing), MATLAB, MINITAB, and STATA for data processing and analysis
5. Google form for data collection, Padlet, Google Drive, Reference Manager

UNIT-II

Nature of Data, Hypothesis Testing and Design of Experiments

1. Nature of data and levels of measurement.
2. Measures of Central Tendency and variability, Co-efficient of Variation.
3. Testing normally Shapiro Wilk and Kolmogorov Smirnov test, Q-Q plot and Box plots for identifying outliers, Developing profiles, Concept in hypothesis testing: Type I and II error, Power of the test, Sample size determination.
4. Parametric and Non-Parametric test, One & Two sample T-test, Analysis of Variance (One Way & Two-Way ANOVA), Chi-Square test.
5. Post-hoc analysis Test: LSD, Scheffe's, Tukey- HSD, Correction for Inflating Type I error due to multiple comparisons. Effects size.

UNIT-III

Correlation and Regression Analysis

1. Correlation- Partial and multiple, limitations, Testing of significance
2. Regression Analysis- Simple and multiple regressions. Estimating intercept and slope.
3. Least square methods, analyzing residuals, Residual Plot: Testing assumptions in the regression model Standard error of estimate, Testing significance of slope and model, Coefficient of Determination (R2)
4. The Multiple Regression Model- Developing a Multiple Regression Model, Standardized regression coefficients. Different ways of testing a regression model, testing the significance of overall model and regression coefficients.
5. Analyzing residuals, standard Error of the Estimate, The coefficient of determination (R2). Adjusted R2, Testing the significant of R2. Different approaches in developing multiple regression model: Stepwise, Forward, Backward and Enter

UNIT-IV

Introduction to Statistical Design and Multivariate Analysis

1. Analysis of Covariance: Concept of Analysis of Covariance, ANCOVA model, Hypothesis tested.
2. Application of ANCOVA in sports research. Statistical test used, Preparation of data file, Defining variables for the data in table. Output generated in the analysis and its interpretation.
3. Classification of Multivariate Techniques: Techniques for understanding dependency and Interdependence. Techniques for understanding structural modeling.
4. Factor analysis (Exploratory and Confirmatory.), Logistic Regression. Multivariate Analysis of Variance (MANOVA) model.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue

Suggested Readings:

Sansanwal, D.N. (2020). *Research Methodology and Applied Statistics*. Shipra Publisher.

Verma, J.P. (2019). *Statistics and Research Methods in Psychology with Excel.* Springer Nature Singapore Pte Ltd.

---. (2015). *Repeated Measures Design for Empirical Researchers*. John Wilkey& sons.

---. (2014). *Statistics for Exercise Science and Health with Microsoft Excel*. John Wilkey& sons.

---. (2012a). *Data Analysis in Management with SPSS Software.* Springer Science & Business Media.

---. (2012b). *Statistics for Psychology.* Tata McGraw Hill Education Private Limited.

RESEARCH AND PUBLICATION ETHICS

Course Code: SOE PHE 02 01 03 C1022

L	T	P	Credits
1	0	2	2

Learning Outcomes

After completion of the course, the students will be able to:

- Explain the philosophy and ethics of research
- Prepare research in a scientific manner
- Present articles in standardized journals/ publications
- Understand and usage of tools to check plagiarism.

UNIT-I

Philosophy and Ethics

Introduction to philosophy: definition, nature and scope, concept, branches. Ethics: definition, moral philosophy, nature of moral judgements and reactions.

UNIT-II

Scientific Conduct

Ethics with respect to science and research. Intellectual honesty and research integrity. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP). Redundant Publications: duplicate and overlapping publications, salami slicing. Selective reporting and misrepresentation of data.

UNIT-III

Publication Ethics

Publication Ethics: definition, introduction and importance. Best Practices/Standards setting initiatives and guidelines: COPE, WAME, etc. Conflict of Interest. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice-versa, types. Violation of publication ethics, authorship and contributorship. Identification of publication misconduct, complaints and appeals. Predatory publishers and journals.

Practical

1. Open Access Publishing

Open Access Publications and Initiatives. SHERPA/ ROMEO online resource to check publisher copyright & self-archiving policies. Software tool to identify predatory publications developed by SPPU. Journal finder / Journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

2. Publication Misconduct

Subject specific ethical issues, FFP, authorship. Conflict of Interest. Complaints and Appeals: examples and fraud from India and Abroad. Use of Plagiarism software like TURNITIN, URKUND and other Open Source Software tools.

3. Database and Research Metrics

Indexing Databases, Citation Databases: Web of Science, Scopus, etc. Impact factor of Journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score. Metrics: H-index, G index, I10 index, altmetrics.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue

Suggested Readings:

Beall, J. (2012). *Predatory Publishers are Corrupting Open Access*.Nature.

Bird, A. (2006). *Philosophy of Science*. Routledge.

Chaddah, (2018) *Ethics in Competitive Research: Do Not Get Scooped; Do Not Get Plagiarized*.

Indian National Science Academy (INSA). (2019). *Ethics in Science Education, Researchand Governance*.

Resnik, D.B. (2011). *What is Ethics in Research and why is it Important.* National Institute of Environmental HealthSciences.

RESEARCH BASED KINESIOLOGY AND SPORTS BIOMECHANICS

Course Code: SOE PHE 02 01 01 E3024

L	T	P	Credits
3	0	2	4

Learning Outcomes

After completion of the course, the students will be able to:

- Understand about the importance of applied kinesiology and Sports Biomechanics.
- Analyse the action of muscles.
- Classify the different types of motion and force and its application in sports.
- Understand about the Methods /Tools /Software to Analysis of Human Movements.

UNIT-I

Introduction and Trends in Kinesiology

1. Aims and objectives of Kinesiology.
2. Need and importance of Kinesiology in PhysicalEducation.
3. Joints, Types of joints, Description of Humanmovement.
4. Axis and Planes – types and their interrelationship
5. Muscles and Role of muscles. Structural and classification of muscle.

UNIT-II

Introduction and Trends in Sports Biomechanics

1. Classification of force system.
2. Classes of Lever and their principles in sports and physicalactivities.
3. Concepts of Equilibrium andStability.
4. Motions, Laws of motion, their application and Kinematics.

UNIT-III

Analysis of Techniques of Sports Movement

1. Analysis of static positions of the body
    a) Sitting /Standing and Lying
2. Analysis of Locomotion.
    a) Walking / Running and Jumping

b) Hopping or Leaping

3. Basic steps of Analysis SportTechnique
    a) Development of Model
    b) Observation
    c) Identification of Faults
    d) Evaluation of Faults
    e) Instruction to the Performer

UNIT-IV

Analysis of Techniques with modern Equipments

1. Methods of analysis of sportsskills:
    a) Qualitative Methods
    b) Quantitative Method
2. Methods ofinvestigation:
    a) Photo instrumentation: Camera, Films, Exposure Meters, Calibration of Camera Speed, Filming Fundamentals, Films Analysis, Fundamentals of film analysis.
3. Others methods ofinvestigation:
    a) Goniometry
    b) Accelerometers
    c) Dynamometry
    d) Electro-Myograph

Practical

1. Goniometry – measurement of joint ROM / Elgon.
2. Manual testing of big muscles of the body.
3. Basic anthropometric measurements (stature, sitting height, different body segment length, weight, BMI and skin fold measurements).
4. Action of Muscles of upper and lower extremities by palpations method.
5. Manual calculations of various kinetic and kinematic parameters – distance, displacement, speed, velocity, acceleration, momentum, force, mass, weight, resultant vector, pressure, work, power, energy etc.

6. Stick diagram (basic techniques; anatomical posture, walking, push up, sit ups etc.).
7. Goniometry – measurement of joint ROM / Elgon.
8. Basic anthropometric measurements (stature, sitting height, different body segment length, weight, BMI and skin fold measurements).
9. Classification of different movement according to axes in plane.

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue

Suggested Readings:

Carl, J. Payton & Adrian, Burden. (2017). Biomechanical Evaluation of Movement in Sport and Exercise. The British Association of Sport and Exercise Sciences Guide, Routledge.

Duane, Knudson. (2012). Fundamentals of Biomechanics. Springer publication; 2nd edition.

Hoffman, S.J. (2005). *Introduction to Kinesiology*. Human Kinesiology PublicationIn.

Knudson, D. (2007). *Fundamentals of Biomechanics*. SpringerPublication.

Kumar, P. (2019). "Biomechanical Analysis of Forward Head Posture among Pondicherry University Research Scholars Based On the Laptop Working Hours: An Analytical Study". *International Journal of Emerging Technologies and Innovative Research*, 6 (6), 463-466.

Kumar, P., & Singh, R. R. M. (2019). "Biomechanical analysis of anisomelia among the young children's in Puducherry". *Discrepancy* (LLD), 330, 19.

Peter, M. & Mc. Ginnis. (2013). *Biomechanics of Sport and Exercise*. Human Kinetic Publication, ThirdEdition.

Raj Lakshmi, D. (2007). *Biomechanics for Sports and Games*. Sports Educational Technologies.

Singh, R. R. M. (2019). "Biomechanical Analysis of Footprint Measurement among School Boys: A Positive Approach to Posture". *Journal of the Gujarat Research Society*, 21(1), 167-169.

PSYCHO-SOCIO BASIS OF PHYSICAL EDUCATION

Course Code: SOE PHE 02 01 02 E3024

L	T	P	Credits
3	0	2	4

Learning Outcomes

After completion of the course, the students will be able to:

- Develop understanding about various learning, personality and motivation theories.
- Understand about how the psychological factors affect sports performance.
- Develop the concept of team cohesion and leadership.
- Understand how to assess anxiety, coordination and reaction of athletes.
- Understand the usage of different psychological and sociological test.

UNIT-I

Introduction

1. Relationship of sport psychology with other sportsciences
2. Psychological Profiling ofSportsmen/Athletes
3. Self-regulation, Bio-feedback, Self Confidence and Selfefficacy
4. Coping with stress and anxiety, Preparing athlete for majorcompetition
   Goal setting and SportsPerformance.

UNIT-II`

Personality-based tests

1. Personality traits of Sportsmen and Theories ofPersonality
2. Anxiety – Types, Theories and Effect of Anxiety onperformance
3. Effects of Spectators, society, family, etc. on sportsperformance, Personality Test: 16 PF, EPQ.
4. Interest,Attitude test

UNIT-III

Social Implications

1. Sociology of Sports as a separate discipline, inter-relation of sports and Sociology.
2. Social Significance of Sports, Social Evils- Drugs, Smoking, Violence, Inequality.
3. Psycho-Social implications and impact of organized youth sport.
4. Society as a web of social relationship, Place of sport and games in different societies, Role of Physical Education in the context of social problems.
5. Relationship of sports with social institutions- Family, School, Education system, Peer groups, Voluntary Association, Religion, Organized sports programmes for children.

UNIT-IV

Psychological Skills Training

1. PST and Sports Performance, Designing and Implementing PST Programme.
2. Common problems in Implementing PSTProgramme.
3. Importance of Psychological Skill TrainingProgramme.
4. Imagery, Types of Imagery, VMBR, PMR, Autogenic Training, Deep Breathing, Guided Imagery.
5. Cognitive Technique for Building Confidence Concentration and Attention Control Training, Intervention strategies for activation techniques.

Practical

1. Assessment of Personality {Personality Tests [Eysenck, Big Five] and introduction to Projective Technique [Thematic Apperception Test and Rorschach Test].
2. Assessment of Motivation - Achievement Motivation, Participation Motivation and SMS Incentive Motivation inventory.
3. Assessment of Emotions and Emotional Intelligence in sport.
4. Measuring Anxiety and Assessment-Spieilberger Anxiety Test, Sport Competition Anxiety test (SCAT).
5. Reaction Time Experiments, Anticipation, Adaptive Spatial Ability, Depth Perception.
6. Measuring Cohesion, Designing and implementing PST programme.
7. Assessment of Socio-Psychological aspect of sport participation.

8. Attentional Span, Memory Experiments and Intelligence testing (Jalota, Ravens Progressive Matrices).

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue

Suggested Readings:

Cox, R.H. (1998). *Sport Psychology – Concepts and Applications.* Iowa Champaign, IL. Human KineticsPublishers.

Cratty, Bryant. J. (1973). *Movement Behavior and Motor Learning*. Philadelphia: Lea and Febiger.

DC Gonzalez, (2013). *The Art of Mental Training - A Guide to Performance Excellence*. Gonzo Lane Media Publisher.

John Perry, (2016). *Sports Psychology - A Complete Introduction*. Teach Yourself Publisher.

Ronald E.Smith,(2012). *Sport Psychology for Youth Coaches: Developing Champions in Sports and Life.* Rowman & LittlefieldPublishers.

SCIENTIFIC PRINCIPLES OF SPORTS TRAINING

Course Code: SOE PHE 02 01 03 E3024

L	T	P	Credits
3	0	2	4

Learning Outcomes

After completion of the course, the students will be able to:

- Understand the concept of training and planning.
- Develop mastery on training sessions.
- Understand about how the psychological factors affect sports performance.
- Develop the concept of periodization.
- Aware about the preparation for competition.

UNIT-I

1. Teaching, Training and Coaching: Meaning, aims & Characteristic
2. Principles of Training
3. Training Load: Meaning & characteristic of training load
4. Principles of Load & Adaptation, Judgment of Load
5. Over Load: Causes, Symptoms and tackling of over load and Altitude Training-Cross Training.

UNIT-II

1. Strength: Meaning, Importance & types of Strength, Methods & Precautions of Strengthtraining.
2. Endurance : Meaning, Importance & types of Endurance, Factors determining endurance, Methods of Endurance Training.
3. Speed: Meaning, Importance & types of Speed, Factors Determining Speed, Methods of speedtraining.
4. Flexibility: Meaning, Importance & types of flexibility, Factors Determining flexibility, Methods of flexibility development.
5. Co-ordinative Ability: Meaning, Importance & types of Co-ordinative ability, Factors determining Co-ordinative ability & Methods of development.

UNIT-III

1. Training Methods
    a) Weight training, Circuit training
    b) Continuous training, Interval training
    c) Fartlek training
    d) Repetition training- Isometric, Isotonic
2. Technical Training & Tactical Training: Meaning, Importance of Methods of Technical training.
3. Doping: Definition & type of doping.

UNIT-IV

1. Planning of training: Meaning of Planning, Importance, and Principles of Planning of types of Training Plans. Training plan, Macro cycle, Meso cycle, Micro cycle, short term and long-term plan.
2. Periodization: Meaning and its types, contents for various period of training, General Principles of training schedules. Single, Double and Multiple periodization
3. Factor influencing the Performance in Sports.

Practicals

1. Measurement of Height and Sitting Height.
2. Measurement of Biacromial Diameter (Shoulder Width)
3. Measurement of HumerusBicondylar Diameter (Elbow Width)
4. Measurement of Chest Circumference (Normal and Maximal)
5. Determination of Body Mass Index.
6. Evaluation of Flexibility (Sit & Reach Test)
7. Evaluation of Strength (Grip Strength, Leg Strength and Back Strength)
8. Estimation of Target Heart Rate
9. Measurement of heart rate
10. Blood Pressure measurement (sphygmomanometer)
11. Evaluation of Percent Body Fat and Lean Body Mass by the through skin fold (Durninand Rehman Chart)

Transaction Mode: Lecture, Demonstration, Group Discussion, Project Method, Seminar, Dialogue

Suggested Reading:

Bompa, T. O., & Buzzichelli, C. (2018). *Periodization-: Theory and Methodology of Training*. Human kinetics.

Bompa, T., Bompa, T. O., & Carrera, M. (2005). *Periodization Training for Sports* (2nd Edition). Human Kinetics.

Jesudoss,S. J. (2015). *Principles of Sports Training*. Friends Publications. (ISBN-9789384603304).

Kurz, T. (2001). *Science of Sports Training: How to Plan and Control Training for Peak Performance*. Stadion.

Loehr, J. E. (1995). *PDF The New Toughness Training for Sports: Mental Emotional Physical Conditioning From One of The World Premier Sports Psychologists*. Online Book.

OBE, F. W. D. (2014). *Sports Training Principles: An Introduction To Sports Science*. Bloomsbury Publishing.

Viru, A. (2017). *Adaptation In Sports Training*. Routledge Publishers.

CENTRAL UNIVERSITY OF HARYANA

Scheme

Ph. D. in Psychology

Sr No	Courses	Code	Credits
1.	**Course I: Advanced Research Methodology**	SAHS PSY 02 01 01 C 6006	6
2.	**Course II: Research and Publication Ethics**	SAHS PSY 02 01 02 C 2002	2
3.	**Course III: Specialization- Optional (anyone from the following)** 1. Individual Differences 2. Organizational Psychology 3. The Science and Application of Positive Psychology	SAHS PSY 02 01 03 E 4004 SAHS PSY 02 01 04 E 4004 SAHS PSY 02 01 05 E 4004	4
4.	**Course IV:** Seminars*	SAHS PSY 02 01 06 C 0202	2
	Total		**14**

* Research Scholars are required to present two seminars, one from advanced research methodology and one from a course of specialization.

CENTRAL UNIVERSITY OF HARYANA

PH.D. IN PSYCHOLOGY (SYLLABUS)

CORE COURSE-I

ADVANCED RESEARCH METHODOLOGY

SAHS PSY 02 01 01 C 6006

Credits:6

Objective:

This course will introduce the student with some basic concepts of research and its methodologies. It will introduce the student with advancements in the domain of Research Methodology.

Learning Outcomes:

After completing the course, the student will be able to:

1. *Demonstrate the knowledge of research approaches and findings in Psychology*
2. *Critically access information related to the study of behavior and mental processes and use the critical assessment in forming conclusions and arguments.*
3. *Use technology for studying concepts and conducting research*

UNIT-I

Psychological Research: Nature. Major Approaches: Univariate and Multivariate.

Research Designs: Principles and Basic Parameters of Experimental Design. Within Groups

Designs-Two Factors Repeated Measures, Latin Square, and Graeco-Latin Square Design.

Between Groups Designs: Factorial-Two and Three Dimensional.

UNIT-II

Analysis of Variance: Uses, Assumptions, and Applications of ANOVA in Psychological

Research.

ANOVA: Independent and unequal N (One way, two way, and three-way); Repeated

Measures (One way and two way).

UNIT-III

Multivariate Analyses: Factor Analysis, Cluster Analysis, Canonical Correlation, Multiple

Regression (SEM, Path Analysis), Discriminant Function Analysis, Multidimensional Scaling.

UNIT-IV

Qualitative Analysis: Applications, Assumptions, and Limitations.

Qualitative Methods: Content Analysis, Grounded Theory, Category Identification,

Narratives.

Suggested Books:

Broota, K.D. (1989). *Experimental Design in Behavioural Research.* New Delhi: Willey Eastern.

Creswell, J. W., & Creswell, J. D. (2017). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. London: Sage Publications.

Guilford, J.P. (1954). *Psychometric Methods (2nd Ed.)* New York: McGraw Hill.

Hair, J.F., Anderson, R.E., Tatham, R.L., & Black, W.C. (1995). *Multivariate Data Analysis*. Jersey: Prentice-Hall.

Kerlinger, F. N. (1966): *Foundations of Behavioural Research*. (Third Edition). Bangalore: Prism Books Pvt. Ltd.

Nunnally, J. (1978). *Psychometrics Theory (2nd Ed.).* New York: McGraw Hill.

Singh A.K (1996). *Testes, Measurement, and Research Methods in Behavioral Science.* Patna: Bharathi Bhavan.

Shaughnessy, J.J. Zechmeister E.B., and Zechmeister, J.S. (2000). *Research Method in Psychology.* New York: McGraw Hill.

Smith, J.A. (2008). *Qualitative Psychology: A Practical Guide to Research Methods.* New Delhi: Sage.

CORE COURSE-II

RESEARCH AND PUBLICATION ETHICS

SAHS PSY 02 01 02 C 2002

Credits:2

Objective:

This course will enable the student to address the ethical concerns involved in carrying out research in psychology, since it is essentially about living beings - humans and animals and involves funding from different agencies to carry out research.

Learning Outcomes:

After completing the course,the student will be able to:

1. *Identify different ethics involved in conducting research in the field of psychology.*
2. *Apply the ethics in conducting the research in the field of psychology.*
3. *Develop research plan that is ethically sound and to execute it*

Unit I: Philosophy and Ethics

1. Introduction to Philosophy: Definition, nature and scope, concept, branches
2. Ethics: Definition, moral philosophy, nature of moral judgments and reactions

Scientific Conduct

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, fabrication, and plagiarism (FFP)
4. Redundant publications: Duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

c. Publication Ethics

1. Publication ethics: Definition, introduction, and importance
2. Best practices/ standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: Definition, concept, problems that lead to unethical behaviour and vice versa, types
5. Violation of publication ethics, authorship, and contributor ship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

Unit II: Practice

1. Open Access Publishing

1. Open access publications and initiatives

2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder/ journal suggestion tools viz. JANE, Elsevier Finder, Springer Journal Suggested, etc

b. Publication Misconduct

A. Group Discussions

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals examples and fraud from India and abroad

B. Software tools

Use of plagiarism software like Turnitin, Urkund and other open source software tools

c. Databases and Research Metrics

A. **Databases**

1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc.

B. Research Metrics

1. Impact Factor of Journal as per Journal Citation Report. SNIP, SJR, IPP, Cite Score
2. Metrics: h-index, g index, i10 index, altimetric

Suggested Books:

Bell, J. (2012). *Predatory Publishers are Corrupting Open Access*. Nature, 489(7415), 179-179. http//doi.org/10.1038/489179a

Bird, A. (2006). *Philosophy of Science*. Routledge.

Chadda, P. (2018).*Ethics in Competitive Research: Do not get scooped; do not get plagiarized*.Self-Published.

Indian National Science Academy (INSA). (2019).*Ethics in Science Education, Research and Governance*. http://www.insaindia. In /pdf/Ethics Book.pdf

Iphofen, R. (2020). *Handbook of Research Ethics and Scientific Integrity*. Switzerland: Springer Nature

Resnik, D.B. (2011). *What is ethics in research & why is it important.* National Institute of Environmental Health Science, 1-10.

COURSE III

Specialization- Optional (anyone from the following)

ELECTIVE COURSE-I

INDIVIDUAL DIFFERENCES

SAHS PSY 02 01 03 E 4004

Credits: 4

Objective:

This course will provide the student acquaintance with the theories, models, and advances in the approaches of personality, intelligence, and creativity.

Learning Outcomes:

On the completion of the course the student will be able to:

1. *Demonstratethe theories, models, and approaches of individual differences in view of personality, intelligence, and creativity.*
2. *Measurement of different aspects of individual differences.*

UNIT-I

Personality: Nature and Determinants. Psychometric Approach to Personality: Cattell's Theory, Eysenckian Model, Big Five-Alternative Five, and HEXACO models.

UNIT-II

Intelligence: Nature and Determinants. NeurobiologicalApproach.

Psychometric Approach-Spearman, Cattell, and Guilford.

Information Processing Approach- Jensen, Das, and Sternberg. Emotional Intelligence: Concept and Dimensions.

UNIT-III

Creativity: Nature; Theoretical Approaches- Psychometric, Psychodynamic, Cognitive. Intellectual Styles.

Research Trends: Creativity and Intelligence; Creativity and Personality; Creativity and Motivation.

UNIT-IV

Measurement of Personality: Self Report Inventories, Projective Techniques, and Objective Tests.

Measurement of Intelligence: Issues and Approaches. Assessment of Creativity.

Suggested Books:

Anastasi, A. (1988). *Psychological Testing (6thEd.).* New York: McMillan.

Cattell, R.B. (1987). *Intelligence: Its Structure, Growth, and Action.* North-Holland: Amsterdam.

Eysenck, H.J.& Eysenck, M.W. (1985). *Personality and Individual Differences: A Natural Science Approach*. Plenum Press- New York and London.

Hall G.S. and Lindsey, G. (1988). *Theories of Personality (4Ed.)* New Delhi: Wiley Eastern.

John, O.P., Robins, R.W. & Pervin, L.A. & (2008). *HB of Personality: Theory and Research (3Ed.).* NY: Oxford Press.

Kaufman, J.C. & Sternberg, R.J. (2010). *The Cambridge Handbook of Creativity*. NY: Cambridge University Press.

Larsen, R.J. & Buss, D.M. (2011). *Personality Psychology: Domains of Knowledge about Human Nature*. New Delhi: Tata McGraw-Hill.

Pervin, L.A. (1978). *Personality Theory Assessment and Research*. New York: John Wiley

Sternberg, R.J. & Grigorenko, E. (1997). *Intelligence, Heredity, and Environment.* London: Cambridge University Press.

Sternberg, R.J. (1990). *Metaphors of Mind: Conceptions of the Nature of Intelligence.* London: Cambridge University Press.

Sternberg, R.J. (1999). *Handbook of Creativity*. NY: Cambridge University Press.

Sternberg, R.J. (2003). *Handbook of Human Intelligence*. London: Cambridge University Press.

Wolman, B.B. (1985). *Handbook of Intelligence: Theories, Measurements, and Applications.* New York: John Wiley & Sons.

ELECTIVE COURSE-II

ORGANIZATIONAL PSYCHOLOGY

SAHS PSY 02 01 04 E 4004

Credits: 4

Objectives:

1. *To orient the student towards understanding of individual, group and organization processes in organizational set up.*
2. *To develop training and testing skills in the student.*
3. *To help the student know the relevance of emerging research areas.*

Learning Outcomes:

On the completion of the course the student will be able to:

1. *Explain overall organizational processes and analyze them.*
2. *Demonstrate skills to work on different processes of the organization*
3. *Recognize the importance of Positive work environment and acquire skills to develop it.*

Unit- I

History of Industrial/Organizational Psychology, Paradigms in organizational psychology, Scientific management, Human relations and Contingency approach, Review of literature.

Unit- II

Employee selection and training, Employee motivation and satisfaction, Emotions and workplace performance, Employee health and well-being, Review of literature.

Unit- III

Job and Task analysis, Organizational Design and Development, Group dynamics and Decision making, Team building, Leadership and Governance, Workplace Counseling and high performance and productivity, Organizational Efficiency and Effectiveness.

Unit -IV

Training and development in organizations, Assessment of training needs, design, execution and evaluation, Basic skills of an organizational trainer, Various types of psychological and behavioral training, Role of organizational assessment in training and development.

Suggested Books:

Katz. D and Kahn R.L. (1967).*Social Psychology of Organizations*. Prentice Hall.

Luthans, F. (1998). *Organizational Behaviour*. New York: McGraw-Hill

Nelson D.L., Quick, J. C. (2008). *Organizational Behavior: Foundation, Realities and Challenges,* Thompson-South Western, New Delhi.

Pareek, U. (2006). *Understanding Organizational Behavior*, Oxford University Press, New Delhi.

Schultz, D. and Schultz, S.E. (2002). *Psychology and Work Today*. (8th ed.). New Delhi: Pearson Education.

ELECTIVE COURSE-III

THE SCIENCE AND APPLICATION OF POSITIVE PSYCHOLOGY

SAHS PSY 02 01 05 E 4004

Credits: 4

Objective:

This course wouldenable the student to understand the theory and research related to positive psychology and equip the student to develop and apply positive psychology for enhancement of their self and others.

Learning Outcomes:

On the completion of the course the student will be able to:

1. *Identify different components of positive psychology.*
2. *Describe the components of positive psychology.*
3. *Demonstrate the principles of positive psychology in real life.*

Unit I

Introduction: Positive psychology: Meaning, definition, assumptions, and goals; Relation with other fields, Meaning and measures of happiness and well-being: Hedonic and eudemonic traditions, Indian perspectives, and positive psychology

Unit II

Happiness and well-being: Happiness: Concept and definitions, Happiness, and the facts of life: Gender, love, marriage, close relationships and others, Happiness across the life span: Happiness and well-being across culture and nationalities

Unit III

Emotions, personality traits and well-being: Positive emotions and well-being, Cultivating positive emotions, Positive traits

Unit IV

Virtues, character strengths, and well-being: Classification of human virtues, Wisdom as a foundational strength and virtue; Character strengths and health, Religion, and virtues: Buddhism, Confucianism, Islam, and Hinduism

Suggested Books:

Goleman, D. (2006).*Emotional Intelligence*. BantamBooks.

Seligman M.E. Csikszentmihalyi, M. (2014). *Positive Psychology: An Introduction*. Springer.

Snyder, C. R. & Lopez S.J. (2009).*Oxford Handbook of Positive Psychology*. Oxford University Press.

ELECTIVE COURSE-VI

CORE COURSE-IV

SEMINARS

SAHS PSY 02 01 06 E 4004

Credits: 2

Objective:

Encourage and expose PhD work to support the designed research community of the Institute of Design and beyond

Learning Outcomes:

On the completion of the course the student will be able to progress on their own work and develop a rich set of critiques of each other's work and they will be able to:

1. *Demonstrate the learning of advanced research methodology and his area of specialization.*
2. *Construct the research proposal in specialization.*
3. *Present the proposal in front of the panel.*

Research Scholars are required to present two seminars:

1. One from advanced research methodology
2. One from course of specialization.

Note: The evaluation shall be based on the understanding of advanced research methodology and his/her area of specialization, and construct the research proposal in specialization. Each student has to give at least two Power Point presentations based on the area of research interest in the presence of students, scholars and faculty of the Department. Schedule and summary of presentations, and Evaluation Report/Awards shall be compiled and maintained by the Course Coordinator(s).

MEMORANDUM OF UNDERSTANDING

Between

National Institute of Food Technology Entrepreneurship and Management (NIFTEM), Sonipat Haryana

And

Central University of Haryana (CUH), Mahendragarh, Haryana (India)

The National Institute of Food Technology Entrepreneurship and Management (NIFTEM), Sonipat Haryana and Central University of Haryana (CUH), Mahendragarh, Haryana (India) agreeing on the effective cooperation and experimental participation in the field of academics, training and research enters in to this Memorandum of Understanding (MOU).

The Memorandum of understanding (MoU) made in NIFTEM on 13, April 2021 between:

1. **National Institute of Food Technology Entrepreneurship and Management (NIFTEM)** (Deemed to be University (De-novo Category) under Section 3 of the UGC Act, 1956 An Autonomous Institution under Ministry of Food Processing Industries, Government of India) Sonepat, Haryana, India (herein after referred to as "NIFTEM" the context otherwise requires include their respective nominees, legal representatives and successors); and

2. **Central University of Haryana (CUH),** Mahendragarh, Haryana India set up by an Act of parliament: "The Central Universities Act, 2009" by the GOI (herein after referred to as "CUH" the context otherwise

requires include their respective nominees, legal representatives and successors).

Scope of MoU:

This MoU details the modalities and general conditions regarding collaboration between NIFTEM and CUH for enhancing within the country, to promote the research cooperation between the two institutes.

Objectives

1. NIFTEM and CUH will undertake joint research work in the areas of mutual interest.
2. The concerned scientists of NIFTEM and corresponding faculty members of CUH will formulate research projects with due approval of both the institutes.
3. Impart training to staff, students and technical personnel within the areas of cooperation.
4. Keeping in view the interest and objectives of both the institutes, NIFTEM and CUH will take initiative in writing collaborative extramural grant proposals to agencies in India and abroad.

Sharing of facilities

Both NIFTEM and CUH jointly agree:

1. To share their respective important research and development (R&D) facilities in order to promote research interactions in the areas of cooperation. The institutes agree to share software, other materials and components developed in-house in the areas of cooperation.
2. To share laboratory, animal house, library and other supporting facilities to the personnel cornered in the areas of cooperation.

13/4/21

3. To share research results in the areas of cooperation. Institute will communicate the results together in the form of publications/patents or other forms of intellectual property.
4. Both the parties shall meet their respective expenses which they might incur while carrying out their respective agreed obligations.

Renewal of the MoU

It is agreed that the progress of this MoU shall be monitored by the review committee comprising the Vice Chancellor, NIFTEM and the Vice Chancellor, CUH or their respective nominees through periodic joint meetings. In case there is nothing to the contrary, this MoU shall continue to get renewed automatically, for the next term of 3 (three) years after the completion of one term. Any mid-term change/ alteration in the terms and conditions of this

MoU as suggested by the review committee, if mutually agreeable to the heads of the both the organizations shall also be deemed to be valid for both the organizations for the rest of the duration from thereon. The MoU may be amended from time to time by mutual consent of both the parties. The MoU may be terminated by either of the parties by giving one month's notice.

Intellectual Property Rights

The results of the work produced through the joint efforts of the parties under the terms of this MoU will be jointly owned. Disclosure, if any, of any such results to the parties outside this MoU will only be done with the separate agreements of both the parties. Rights regarding publications, patents, royalty, ownership of software/ design, product and process developed etc/ under the scope of this MoU shall be decided by the two parties on mutual consent.

13/4/21

Dispute Resolution

Both the parties to this MoU being autonomous Central Government Institutes, any dispute relating to the implementation of his MoU shall be resolved through mutual consultations between the Heads of both the institutes.

Signed on this day of April, 13 2021 at NIFTEM in two originals, one to be retained by each of the signatories.

Dr. J.S. Rana
Registrar
NIFTEM, Sonipat Haryana

कुलसचिव / REGISTRAR
राष्ट्रीय खाद्य प्रौद्योगिकी उद्यमशीलता एवं प्रबंधन संस्थान
National Institute of Food Technology Entrepreneurship and Management
कुंडली, सोनीपत–131028 (हरियाणा)
Kundli, Sonipat - 131028 (Haryana)

Dr. J. P. Bhukar
Registrar, CUH,
Mahendragarh, Haryana

कुलसचिव/Registrar
हरियाणा केंद्रीय विश्वविद्यालय
Central University of Haryana
महेन्द्रगढ़ हरियाणा 123029
Mahendergarh, Haryana-123029

Witnesses

1 **Dr. Ashutosh Upadhyay**
Professor & Dean (Academic)
NIFTEM

1 **Dr Gunjan Goel**
HoD, Dept. Microbiology
SIAL, CUH

2 **Dr Neeraj**
Associate Dean (Acad.) &
Associate Prof., Dept. AES
NIFTEM

2 **Dr. Surender Singh**
Associate Professor
Dept. Microbiology
SIAL, CUH

Annexure-XXVIII

Academic Branch <academicbranch@cuh.ac.in>

Request for the approval of the recommendations of Board of Studies (Psychology)

2 messages

School Of Humanities and Social Science <deanshss@cuh.ac.in> Thu, Apr 22, 2021 at 2:53 PM
To: "Dr. Sanjiv Kumar" <sanjivkumar@cuh.ac.in>, HOD Psychology <hodpsychology@cuh.ac.in>, hodpolscience@cuh.ac.in, CUH Rajbir Dalal Pol Sc Prof <rajbirdalal@cuh.ac.in>, "Ms. Rinu" <rinueng@cuh.ac.in>, vinay kumar rao <vinay@cuh.ac.in>, arvindtejawat@cuh.ac.in, narender parmar <narenderparmar@cuh.ac.in>, HOD JMC <hodjmc@cuh.ac.in>, surender bargujar <sbargujar@gmail.com>, "Dr. Chanchal Kumar Sharma" <chanchalsharma@cuh.ac.in>, "Dr. Rajeev Kumar Singh" <rajeevsingh@cuh.ac.in>, "Dr. Payal Chandel" <paayalchandel@cuh.ac.in>, pradeeppsy@cuh.ac.in, reemagill@cuh.ac.in, "Dr. Kumuda Prasad Acharya" <kumuda@cuh.ac.in>, rajeshgill@pu.ac.in, Ramesh Kumar Gautam <rameshkgautam.du@gmail.com>, Jaiveer Dhankhar <jaiveer3133@gmail.com>, C R Darolia <crdarolia@yahoo.com>, vkaushik24@gmail.com, "C.R. DAROLIA" <crdarolia@kuk.ac.in>
Cc: Academic Branch <academicbranch@cuh.ac.in>, "Dr.Anjanikumar Varma, Dean, Academic & Research" <deanacademic@cuh.ac.in>

Dear Sir/Madam,

The following agenda points were circulated for consideration and approval of School Board vide e-mail dated 18.03.2021:

1. Revision of the Syllabi of M.A. (Psychology) Semester II- as recommended by BoS, Psychology

On the basis of the comments /observations received from the esteemed members of the School Board, all the agenda points have been approved subject to the approval of the competent authority, wherever required. The copies of the relevant minutes of BoS (Psychology), syllabus of M.A. (Psychology) Semester II is attached herewith for reference purpose, please.

Yours Sincerely,

Sanjiv Kumar
Dean, School of Humanities and Social Sciences
Central University of Haryana

9416132765

Revised syllabus (after correction).pdf
235K

School Of Humanities and Social Science <deanshss@cuh.ac.in> Thu, Apr 22, 2021 at 2:56 PM
To: Academic Branch <academicbranch@cuh.ac.in>

Dear Sir,
Please include the syllabi of MA Psychology (Semester II) from the trail mail, for consideration in AC meeting to be held on 23.04.2021 as supplementary agenda.
[Quoted text hidden]

Revised syllabus (after correction).pdf
235K

CENTRAL UNIVERSITY OF HARYANA
Department of Psychology
MINUTES OF MEETING
(Board of Studies)

An online/offline meeting of Board of Studies (BoS) was held on 03-03-2021 at 02-00 PM in the office of Department of Psychology. Following members were present in the meeting:

1. Dr. VN Yadav, Head of Department (In-Chair)
2. Prof. Umed Singh (External Member)
3. Prof. Radhe Shyam (External Member)
4. Dr. Payal Chandel (Internal Member)
5. Dr. Pradeep Kumar (Internal Member)
6. Dr. Vishnu Narayan Kucheria (Special Invitee)
7. Dr. Ravi Partap (Special Invitee)
8. Dr. Reetu Sharma (Special Invitee)

At the outset, Dr. VN Yadav welcomed all the members and briefed about the agenda items of the meeting and thereafter, the following agenda items were discussed. The recommendations/suggestions made in the meeting are appended below:-

Sr. No.	Items	Deliberation/ Recommendations
1.	Confirmation of the minutes of BoS held on 15-07-2020.	Minutes of BoS held on 15-07-2020 were confirmed and approved.
2.	Revised Syllabi of Ph.D. Programme for the session 2020-2021 as approved by the Academic Council held on 08/10/2020	Revised Syllabi of Ph.D. Programme for the session 2020-2021 was included as approved by the Academic Council.
3.	To consider and approve the minutes of the DRC of Department of Psychology held on 23-24 November, 2020.	Minutes of the DRC regarding Ph.D. admissions were considered and approved.
4.	Syllabi contents of MA Psychology Programme- Semester II	Syllabi contents of MA Psychology Programme-Semester II were discussed and approved.
5.	To Approve the one academic tour for Students and Research Scholars in academic session.	It was discussed and recommended that one academic tour for Students and Research Scholars in academic session may be organized. It was also suggested that financial arrangements may be reimbursed by university as per the rules.

The meeting ended with vote of thanks from the chair.

The minutes of meeting are submitted for the perusal and the concurrence of all the members. After the concurrence of all the members, the minutes may be submitted for approval of Competent Authority. After the approval of Competent Authority the minutes may be circulated to all concerned.

Dr. VN Yadav

Prof. Umed Singh

Prof. Radhe Shyam

Dr. Payal Chandel

Dr. Pradeep Kumar

Dr. Vishnu Narayan Kucheria

Dr. Ravi Partap

Dr. Reetu Sharma

CENTRAL UNIVERSITY OF HARYANA

MASTER OF ARTS IN PSYCHOLOGY (SEMESTER-WISE STRUCTURE)

SEMESTER-I

S. No.	Course code	Course title	L	T	P	Credit
1.	SAHS PSY 01 01 01 C 4004	Theoretical Foundations of Psychology	4	0	0	4
2.	SAHS PSY 01 01 02 C 4004	Experimental Psychology	4	0	0	4
3.	SAHS PSY 01 01 03 C 4004	Research Methodology	4	0	0	4
4	SAHS PSY 01 01 04 C 4004	Statistics in Psychology	4	0	0	4
5.	SAHS PSY 01 01 05 C 00105	Practicum-I (Experiments and Profiling)	0	0	10	5
	GEC					
1.	SAHS PSY 01 01 01 GEC 4004	General Psychology	4	0	0	4

SEMESTER-II

S. No.	Course code	Course title	L	T	P	Credit
1.	SAHS PSY 01 02 06 C 4004	Biopsychology	4	0	0	4
2.	SAHS PSY 01 02 07 C	Cognitive Psychology	4	0	0	4

	4004					
3.	SAHS PSY 01 02 08 C 4004	Research Methodology & Statistics	4	0	0	4
4.	SAHS PSY 01 02 09 C 4004	Applied Social Psychology	4	0	0	4
5.	SAHS PSY 01 02 10 C 0202	Review Article	0	2	0	2
6.	SAHS PSY 01 02 11 C 00105	Practicum-II (Experiments and Profiling)	0	0	10	5
7.	DCEC	Optional Papers	4	0	0	4
	SAHS PSY 01 02 01 DCEC 4004	Personality				
	SAHS PSY 01 02 02 DCEC 4004	Sports Psychology				
	SAHS PSY 01 02 03 DCEC 4004	Motivation and Emotion				
	SAHS PSY 01 02 04 DCEC 4004	Indian Psychology				
	SAHS PSY 01 02 05 DCEC 4004	Child Psychology				
	SAHS PSY 01 02 06 DCEC 4004	Environmental Psychology				
	GEC					
1.	SAHS PSY 01 02 02 GEC 4004	Psychology in Everyday Life	4	0	0	4

SEMESTER-III

S.	Course code	Course title	L	T	P	Credit

No.						
1.	SAHS PSY 01 03 12 C 4004	Psychopathology	4	0	0	4
2.	SAHS PSY 01 03 13 C 4004	Mental Abilities	4	0	0	4
3.	SAHS PSY 01 03 14 C 4004	Psychological Testing	4	0	0	4
4.	SAHS PSY 01 03 15 C 4004	Practicum-III (Psychological Tests)	0	0	10	5
5.	DCEC	Optional Papers				
	SAHS PSY 01 03 07 DCEC 0404	Dissertation*	0	4	0	4
	SAHS PSY 01 03 08 DCEC 4004	Rehabilitation Psychology	4	0	0	4
	SAHS PSY 01 03 09 DCEC 4004	Military Psychology				
	SAHS PSY 01 03 10 DCEC 4004	Criminal and Forensic Psychology				
	SAHS PSY 01 03 11 DCEC 4004	Organizational Behaviour and Training				
	SAHS PSY 01 03 12 DCEC 4004	Positive Psychology				
	SAHS PSY 01 03 13 DCEC 4004	Human Resource Management				
	SAHS PSY 01 03 14 DCEC 4004	Consumer Behaviour and Marketing				
	GEC					
1.	SAHS PSY 01 03 03 GEC 4004	Social and Community Psychology	4	0	0	4

The Course on Dissertation may be offered to students after assessment by the Departmental Committee.

SEMESTER-IV

S.No.	Course code	Course title	L	T	P	Credit
1.	SAHS PSY 01 04 16 C 4004	Clinical Psychology	4	0	0	4
2.	SAHS PSY 01 04 17 C 4004	Psychometrics	4	0	0	4
3.	SAHS PSY 01 04 18 C 4004	Guidance and Counselling	4	0	0	4
4.	SAHS PSY 01 04 19 C 00105	Practicum-IV (Psychological Tests)	0	0	10	5
5.	DCEC	Optional Papers				
	SAHS PSY 01 04 15 C 0404	Dissertation*	0	4	0	4
	SAHS PSY 01 04 16 C 4004	Cyber Psychology	4	0	0	4
	SAHS PSY 01 04 17 C 4004	Educational Psychology				
	SAHS PSY 01 04 18 C 4004	Developmental Psychopathology				
	SAHS PSY 01 04 19 C 4004	Health Psychology				
	SAHS PSY 01 04 20 C 4004	Cross-Cultural Psychology				
	SAHS PSY 01 04 21 C 4004	Asian/Indian Healing Psychotherapies				
	SAHS PSY 01 04 22 C 4004	School Counselling				
	SAHS PSY 01 04 23 C 4004	Exceptional Children				
	GEC					
1.	SAHS PSY 01 04 04 GEC 4004	Stress & Health	4	0	0	4

. Eligibility Criteria: The students who opted for dissertation in third semester will continue Dissertation in 4th Semester.

C = Core Course

DCEC= Discipline Centric Elective Course

GEC= Generic Elective Course

SEMESTER-II **CORE COURSE-VI**

BIOPSYCHOLOGY

SAHS PSY 01 02 06 C 4004

Credits: 4 (Hrs. /week: 4) *Total: 100 marks*

Internal Assessment: 30 marks
Examination: 70 marks

Objectives:

To acquaint students with the different methods to study brain and its structure. To provide the basic understanding of the structure of human brain, how transmission of information takes within its structures. Further explain the students in detail about the neural organization by which the coordination in the body takes place along with the associated systems which help in making neural coordination effective and how different physiological processes such as hunger, thirst and sleep are regulated by bodily functions.

Learning Outcomes:

After completing the course, students will be able to:

- *Identify various methods to study the brain, structure of neuron, and organization of nervous system.*
- *Describe various functions of neurons, synapse's, neurotransmitters, and endocrine glands.*
- *Explain the mechanism involved in various physiological processes such as hunger, thirst and sleep.*
- *Apply the information of different methods to study brain and its structure and physiological processes in understanding and managing human behaviour.*

UNIT- I

Biopsychology: Nature, Scope and Approach; Methods of study: Lesion, Ablation, Brain Stimulation, Scanning methods – CT, MRI, fMRI and PET; Electrophysiological Recordings - EMG, EEG, AEP.

UNIT-II

Cell: Structure and Functions Neuron: Structure, Functions and Types; Supporting Cells in Nervous System: Structure and Functions of Glia Cells.

Nerve Impulse: Conduction; Synaptic Transmission: Structure of Synapse, Process of Synaptic Transmission (Chemical events at synapse); Neurotransmitters: Types and functions.

UNIT-III

Nervous System: Organization; CNS: Structure and Functions.

Peripheral Nervous System: Somatic System, Spinal and Cranial Nerves; Autonomic Nervous System: Sympathetic and Parasympathetic.

UNIT-IV

Endocrine Glands: Structure, Location and Functions. Ingestive Behaviour: Neural Mechanisms of Hunger and Thirst. Physiological mechanisms of Sleep and Waking; Stages and Types of sleep; Sleep Disorders.

Recommended Books:

1. Bannett, T. L. (1977). *Brain and Behaviour*. California: Brooks/Cole.

2. Carlson, N. R. (2005). *Foundations of Physiological Psychology*, 6th ed. Pearson Education and Dorling Kindersley (India): New Delhi.

3. Gazzaniga, M. S., Lvry, R. B., & Mangun, G. R. (2002). *Cognitive Neuroscience*: The Biology of the mind 2nd Edition. New York; W.W. Norton & Company, Inc.

4. Kalat, J. N. (2001*). Biological Psychology.* California: Wadsworth.

5. Pinel, John P. J., & Stevens, J. B. (2016). *Introduction to Biopsychology.* 9th ed. Pearson Pearson (India): New Delhi.

SEMESTER-II **CORE COURSE-VII**

COGNITIVE PSYCHOLOGY

SAHS PSY 01 02 07 C 4004

Credits: 4 (Hrs. /week: 4) *Total: 100 marks*

Internal Assessment: 30 marks
Examination: 70 marks

Objectives:

The main objective is to develop core competency in the area of cognitive psychology. To acquaint students with the different approaches of cognitive psychology. To explain the various models of attention and memory, and basic understanding of thinking, language acquisition, and problem-solving behaviour. They will be able to explain how the human brain interprets and manipulates information.

Learning Outcome:

After completing the course, student will be able to:

- *Comprehend various cognitive phenomena*
- *Describe different approaches of cognitive psychology.*
- *Describe various models of attention and memory, basic understanding of thinking, language acquisition, and problem-solving behaviour.*
- *Describe, explain, evaluate and communicate the impact of researches done in the area of cognition.*

UNIT–I

Cognitive Psychology: Historical Background, Scope, Approaches- Top down, Bottom-Up, and Information Processing, Methods of study- Behavioural and Physiological.

UNIT- II

Attention: Nature, Capacity, and Information Processing. Selective Attention: Nature, Models Filter and Attenuation. Divided Attention. Pattern Recognition: Template Matching, and Feature Analysis.

UNIT-III

Memory: Nature, Methods of Study; Types of Memory, Models of Memory: Atkinson and Shiffrin, Levels of Processing, Parallel Distributed Processing. Autobiographical memory.

Eye-Witness Testimony. Mnemonics. Forgetting: Nature, Factors, and Theories.

UNIT-IV

Thinking: Nature; Problem Solving: Nature and Strategies. Concept Formation.

Language: Properties; Structure; and Processes of Language Acquisition. Reasoning: Nature and Types.

Recommended Books:

Benjafield, J. G. (2000). *Cognition*. Oxford University Press, Delhi.

Eysenck, M.W., and Keane, M.P (2000). *Cognitive Psychology: A student's guide*. Psychology Press.

Galotti, K. M. (2011). *Cognitive Development*. Sage Publication.

Galotti, K.M. (2000). *Cognitive Psychology in and out of the Laboratory*. Delhi: Thomson.

Goldstein, B. E. (2005). *Cognitive Psychology*. Wadsworth, London.

Kellogg, R. T. (2012). *Fundamentals of Cognitive Psychology*. Lab Angles: Sage.

Solso, R. L. (2001). *Cognitive Psychology*. Delhi: Pearson Education.

Sternberg, R. J. (2007). *Cognitive Psychology*. Delhi: Thomson.

Sternberg, R. J., & Sternberg, K. (2011). Cognitive Psychology. 8th Edition. Wadsworth Publishing Co Inc; International edition.

Thomas, A. M. & Matlin, M. W. (2019). *Cognition (10th Ed.)*. New York: Wiley.

SEMESTER-II **CORE COURSE-VIII**

RESEARCH METHODOLOGY & STATISTICS

SAHS PSY 01 02 08 C 4004

Credits: 4 (Hrs. /week: 4) *Total: 100 marks*

Internal Assessment: 30 marks

Examination: 70 marks

Objectives:

To provide basic understanding of different types of research designs and know about various techniques of statistics. Further, to demonstrate and describe about the basic understanding of SPSS and research writing format. To provide a foundation for better understanding of research methodology and the uses of the right statistical tool for conducting a research meaningfully.

Learning Outcome:

After completing the course, student will be able to:

- *Identify different types of research designs.*
- *Identify the appropriate statistical tools and tests for a research study.*
- *Identify and control the errors in a research study.*
- *Acquaint themselves with SPSS and format of research writing.*

UNIT-I

Research Design: Criteria and Principles, Between Groups and Within Groups Designs: Single Factor and Factorial.

Quasi-experimental designs: Non-equivalent comparison groups and Time Series.

UNIT-II

Analysis of Variance: Basic Concepts, One way ANOVA (Separate and Repeated measures). Two Way ANOVA: (Separate groups), Post-Hoc Tests: Newmn-keuls Test, Duncan Multiple Range Test, Tukey Test; Trends Analysis.

UNIT-III

Nonparametric Statistics: Importance, Sign Test, Wilcoxon Signed Ranks Test, MannWhitney-Wilcoxon U-Test. Median Test, and Kendall Coefficient of Concordance; ANOVA: Kruskal-Wallis One Way ANOVA, Friedman Two Way ANOVA.

UNIT-IV

Regression Prediction (bivariate); Multiple Regression (three variables); Factor Analysis: Basic Concepts.

Ethical Issues in Research; Preparing a Research Proposal (APA Style).

Recommended Books:

Bordens, K. S. & Abbott, B. B. (2006). *Research Design and Methods: A Process Approach.* 10th Edition. McGraw Hill.

Broota, K. D. (1989). *Experimental Design in Behavioural Research.* New Delhi: Wiley Eastern.

Coolican, H. (2018). Research Methods & Statistics in Psychology. 7th edition, Routledge,

Goodwin, C. J., & Goodwin, K. (2002). Research in Psychology: Methods & Design.

Gravetter, F. J. & Forzano, L. B. (2018). *Research Methods for Behavioural Sciences.* 6th Edition. Cengage Learning, Canada.

Gravetter, F. J. & Wallnau, L. B. (2016). *Statistics for the Behavioural Sciences.* 10th Edition. Cengage Learning, Canada.

Guilford, J. P. (1954). *Psychometric Methods.* McGraw-Hill Inc., US.

Kerlinger, F. N. (1973). *Foundation of Behavioural Research*. New York: Holt Rinehart and Winston.

McGuigan, F. J. (1983). *Experimental Psychology: Methods of research (4th Ed.)*. New Jersey: Prentice Hall.

Shaughnessy, J. J. and Zechmeister, E.B. (1997). *Research Methods in Psychology*. New York: McGraw Hill.

Siegel, S. and Castellan, N. J. (1988). *Nonparametric statistics for the behavioural sciences.* Kogakusha: McGraw Hill.

Singh, A. K. (2017). *Tests, measurements, and research methods in behavioural sciences.* New Delhi: Tata McGraw Hill.

Winer, B. J. (1971). *Statistical principles and experimental design*. Kogakusha: McGraw Hill.

SEMESTER-II **CORE COURSE-IX**

APPLIED SOCIAL PSYCHOLOGY

SAHS PSY 01 02 09 C 4004

Credits: 4 (Hrs. /week: 4) *Total: 100 marks*

Internal Assessment: 30 marks

Examination: 70 marks

Objectives:

To describe the nature and application of social psychology, research methods used in understanding social behavior. To explain how the attitudes can be formed and changed. To acquaint students with the concept and theories of prosocial behavior, aggression, interpersonal attraction and intergroup, relations.

Learning Outcomes:

After completing the course, student will be able to:

- *Define Social Psychology and methods of study.*
- *Identify various processes of socialization, social perception and social influence.*
- *Describe the formation and change of attitudes.*
- *Explain the theories and dynamics of groups (roles, norms, and cohesiveness).*
- *Compare and apply various theories of aggression.*

UNIT-I

Introduction: Nature and Scope of Social Psychology

Methods: Experimental, Survey, Ethnography, and Sociometry.

Ethical Issues in Social Psychological Research.

UNIT-II

Socialization Processes: Nature, Approaches, Agencies
Social Perception: Communication, Attribution, Attribution, Impression Formation and Management.

Group: Types, Dynamics and Norms. Social Identity, Crowd Behaviour.

UNIT-III

Attitude: Nature, Formation, Maintenance and theories of Change (Heider's and Festinger)

Social Influence: Conformity, Compliance, and Obedience.

Stereotyping, Prejudice, and Discrimination: Causes and Effects.

UNIT-IV

Group: Dynamics and Norms. Social Identity, Crowd Behaviour.

Aggression: Nature, Sources; and Theories- Biological, Social Learning and Cognitive.

Strategies of Aggression Control.

Helping Behaviour: Altruism and Pro-social Behaviour, Bystander Effect.

Application of Social Psychology: Health, Environment, Law and Personal Space.

Recommended Books:

Alcock, J., & Sadava, S. (2014). *An Introduction to School Psychology: Global Perspectives*. New Delhi: Sage Publication.

Baron, R. A., & Byrne, D. (2004). *Social Psychology*. Singapore: Pearson Education

Baron, R. A., Byrne, D., & Johnson, B. T. (1998). *Exploring Social Psychology*. USA: Allyn and Bacon.

Fiske, S. T., Gilbert, D. T., & Lindzey, G. (Eds.). (2010). *Handbook of Social Psychology.* (Vol. 1 & 2). John Wiley and Sons.

Myers, D. G., Sahajpal, P., & Behera, P. (2012). *Social Psychology*. New Delhi: Tata McGraw-Hill.

Taylor, S. E., Peplau, L.A., & Sears D. O. (2006): *Social Psychology* (12th Ed.). Pearson. Prentice Hall.

SEMESTER-II **CORE COURSE-X**

REVIEW ARTICLE

SAHS PSY 01 02 10 C 0202

Credit: 02

At the end of their semester the students shall submit the written review article as per the Guidelines prescribed below.

Objectives

To enable the students to conduct review of literature on specific areas of interest. To enable the students to develop the ability to infer specific outcomes from large pool of research studies.

Learning Outcomes

After completing the course, student will be able to:

- *Practice their critical thinking and writing skills which will be useful to further their career prospects*

- *Conduct review of literature and make practical conclusions and scope of research from it.*

Briefing Session

A briefing session for all the students and concerned faculty guides will be organized by the department in the beginning/mid of even semester to enable them to prepare well & proceed for the course as per guidelines and to make sure that the students are able to finalize, the broad area of work.

Finalization and approval of topic of Review and schedule of activities

a) Student shall finalize the broad area /topic, and work schedule of his / her review article in consultation with the faculty guide.

b) The area/topic, work schedule of review article shall be approved by the department.

Allocation of Faculty Guide

Each student shall be assigned a faculty guide for their review article well in advance in a formal manner depending on the number of students per faculty member, the available specialization among the faculty guides by department. - The faculty guide must closely interact with the student and monitor the progress of the student.

The layout guidelines for the submission of the Report

The final review paper is compulsory for the semester. Therefore, must adhere to following parameters.

Word length: 3000 to 4000 words.

No. of Copies 01,

Spiral binding

Language: English

Paper: A4

Margin: According to APA guidelines

Recommended Books:

American Psychological Association. (2010). Publication manual of the American Psychological Association (6thed.). Washington, DC: American Psychological Association. Essential Reading / Recommended Reading

Hartley, J. (2008). Academic Writing and Publishing: A Practical Guide, New York: Taylor and Francis.

Sternberg, R. J. & Sternberg, K. (2010). *The Psychologist's Companion: A guide to writing scientific papers for students and researchers* (5th Ed.). Cambridge University Press.

SEMESTER-II **CORE COURSE- XI**

PRACTICUM-II (EXPERIMENTS AND PROFILING)

SAHS PSY 01 02 11 C 00105

Credits: 5 (Hrs. /week: 10) *Total: 100 marks*

Internal Assessment: 30 marks

Examination: 70 marks

Objectives

To enable the students to acquire skills in various experiments. To acquaint students with the profiling of various experimental instruments. Further, to enable students in applying those skills and information in conducting experiments.

Learning Outcomes

After completing the course, student will be able to:

- *Conduct the various experiments to verify the psychological theories.*
- *Prepare profile of the experimental Equipments.*

Part-A Any ten practical's out of the following are to be conducted during the semester. One practical will be allotted to the candidate during examination and evaluation will be based on Practical Conduction, Report and Viva-Voce during the practical Exam.

1. Diocotic Listening
2. Measurement of divided/ Selective Attention.
3. Transfer of Training.
4. Short Term Memory (STM)
5. Long Term Memory (LTM)
6. Zeigarnik Effect
7. Schedule of Reinforcement (Instrumental Conditioning)
8. Concept Formation.
9. Forgetting.
10. TAT
11. Sociometry

12. Study of Emotions (Facial Expression)
13. GSR – Galvanic Skin Response
14. Data entry and Analysis using Software (SPSS/Excel).
15. Hemispheric Specialization.
16. Measurement of Motives
17. Complex Reaction Time
18. Stroop Test.
19. Tower of Hanoi
20. Psytoolkit, IOWA Gambling Task

Part-B Profiling of Equipment's- Candidate is required to prepare profile of 5 equipment's. Profiles of one equipment will be allotted to the candidate during the examination and evaluation will be based on Profile Record, Report and Viva –Voce.

SEMESTER-II **DISCIPLINE CENTRIC ELECTIVE COURSE-I**

PERSONALITY

SAHS PSY 01 02 01 DCEC 4004

Credits: 4 (Hrs. /week: 4) *Total: 100 marks*

Internal Assessment: 30 marks

Examination: 70 marks

Objectives:

To acquaint students with various aspects of personality. To help them identify various factors affecting personality. To create awareness of personality profiling and techniques to assess individual's personality. To enable students to compare and contrast various theories of personality.

Learning Outcomes:

After completing the course, student will be able to:

- *Identify various aspects of personality.*
- *Apply personality assessment techniques.*
- *Describe and predict about personality assessment profile.*

UNIT- I

Introduction: Nature, Conceptual History; Basic Assumptions about Human Nature; Genetic and Environmental Determinants of Personality.

Type Theories: Galen's Theory, Personality Typology (Sheldon and Kretschmer), and Triguna theory.

UNIT- II

Approaches to Study Personality: Psychoanalytic, Individual, Analytic, Cognitive, Social Learning, and Humanistic.

UNIT-III

Trait Theories: Allport's Theory, Cattell's Theory; Basic Concepts, Identification of Temperament, Ability, and Dynamic traits.

Eysenckian Model: Structure, Physiological Basis and Behavioural Correlates.

Emergence and Structure of Five Factor and Alternative Five Factors Models of Personality.

UNIT-IV

Assessment of Personality: Questionnaire and Self Report (16 PF, EPQ-R, Neo-PI-R); Projective Techniques; Rorschach, TAT, SIS, Rotter's Incomplete Sentences Blank; Objective Analytic Tests.

Recommended Books:

Boyle, G. J., Matthews, G., & Saklofske, D. H. (Eds.). (2008). *The SAGE handbook of personality theory and assessment, (Vol. 1&2) Personality theories and models.* Sage Publications, Inc.

Cattell, R. B., & Kline, P. (1977). *The Scientific Analysis of Personality and Motivation.* London: Academic Press.

Eysenck, H. J. (1981). *Model for personality.* New York: Springer-Verlag. Page 23 of 52

Eysenck, H. J., & Eysenck, M.W. (1985). *Personality and Individual Differences: A Natural Science Approach.* Plenum Press- New York and London

Hall G. S., & Lindzey, G. (1988). *Theories of Personality (4Ed.)* New Delhi: Wiley Eastern.

Hjelle, L. L., & Ziegler, D. J. (1992). *Personality theories: Basic assumptions, research, and applications* (3rd Ed.). McGraw-Hill Book Company.

John, O. P., Robins, R. W., & Pervin, L. A. (2008). *HB of Personality: Theory and Research (3Ed.)*. NY: Oxford Press.

Larsen, R. J., & Buss, D. M. (2011). *Personality Psychology: Domains of Knowledge about Human Nature.* New Delhi: Tata McGraw-Hill.

Pervin, L. A. (1978). *Personality Theory Assessment and Research.* New York: John Wiley

Rao, K. R., Paranjpe, A. C., & Dalal, A. K. (2008). *HB of Indian Psychology.* Delhi: Foundation Sons.

Verma, N. & Singh, U. (2019). *Personality Assessment Objective Analytic Test Approach.* Index International. ISBN- 978-8193618523.

SEMESTER-II **DISCIPLINE CENTRIC ELECTIVE COURSE-II**

SPORTS PSYCHOLOGY

SAHS PSY 01 02 02 DCEC 4004

Credits: 4 (Hrs. /week: 4) *Total: 100 marks*

Internal Assessment: 30 marks
Examination: 70 marks

Objectives:

To acquaint students, with the key aims and concerns of sport psychology. To enable students, explore the role of different psychological aspects, group dynamics and leadership on performance of sports person. This will enable the student to establish the links among personality, motivation and sports.

Learning Outcomes:

After completing the course, students will be able to:

- *Identify the aims of sports psychology, and aspects that affects the performance of sports person.*
- *Describe role of various psychological factors, group dynamics, and leadership on overall well-being and performance.*
- *Explain the importance of personality, motivation, leadership, group dynamics strategies to reduce stress among sports persons.*
- *Apply the knowledge of personality, motivation, leadership and group dynamics to reduce stress and enhance the performance and overall well-being of sports persons.*

UNIT-I

Sports Psychology: Nature, History, Regulatory Bodies (National and International)

Sports Psychology as a Profession: Roles and Ethics.

Type of Sports: Individual Sports, Team Sports, and Combat Sports.
Competition and Cooperation: Concept, Methods to Enhance.

UNIT-II

Personality and Sports: Major perspectives of Personality; Personality and Sports Performance; Examining cognitive strategies and success.

Motivation: Nature; Major approaches of Motivation; Achievement Motivation in Professional Practice; Psychological Momentum in Sports.

UNIT-III

Leadership and Coaching: Components of effective Leadership; Sports oriented interactional approaches to Leadership; Recognizing Breakdowns and Communication, Dealing with Confrontation.

Team cohesion: Nature; Relationship between Cohesion and Performance, Strategies for enhancing Cohesion; Building Self-confidence; Effectiveness of Goal setting.

UNIT-IV

Sports and Psychological Well-Being: Reducing Anxiety and Depression with Exercise Enhancing Quality of Life with Exercise; Relationship between Stress and Injury, Role of Sports Psychology in Injury Rehabilitation.

Overtraining and Burnout: Factors leading to Athlete, Overtraining and Burnout; Relaxation strategies for Sports: Progressive Relaxation, Autogenic Training, Yoga, Meditation and Biofeedback Training

Recommended Books:

Cox, R.H. (2002). *Sport Psychology: Concepts and Applications*. New York; McGraw –

Hill.

Singh, R. (2014). *Sport Psychology.* New Delhi: Friends Publications.

Weinberg, R.S., Gould, D. (2011)*Foundations of Sport and Exercise Psychology*United State of America. Human Kinetics.

Woods, R.B. (2011). *Social Issues in Sport.* U.S.A.: Human Kinetics.

SEMESTER-II **DISCIPLINE CENTRIC ELECTIVE COURSE -III**

MOTIVATION & EMOTION

SAHS PSY 01 02 03 DCEC 4004

Credits: 4 (Hrs. /week: 4) *Total: 100 marks*

Internal Assessment: 30 marks

Examination: 70 marks

Objectives:

To acquaint students with various aspects of motivation and emotions. Enable students to gain meaning, nature, and various components. Enable students identify different techniques of measuring motivation. Facilitate students to understand various theories related to motivation and emotion.

Learning Outcomes:

After completing the course, students will be able to:

- *Identify the meaning and various components of motivation and emotion.*
- *Describe nature of motivation and emotion.*
- *Compare and contrast various theories related to motivation and emotion.*
- *Apply various theories into day to day life.*

UNIT-I

Motivation: Meaning and Nature. Basic Motivational Concepts

Types of Motives: Biological, Psychological and Social.

Measurement of Motives: Projective Technique, Questionnaire Method, Situational Tests, Analysis of Historical Events.

UNIT-II

Theories of Motivation: Instinct Theories, Drive Theory, Incentive Theories, Opponent Process Theory, Optical-Level Theory, Need Hierarchy Theories, Vector Valence Theory

UNIT-III

Emotions: Nature, Characteristics, Types, Functions, and Physiological Correlates.

Role of Hemisphere in Emotions, Facial Feedback Hypothesis, Emotional Stroop, Measurement of Human Emotions.

UNIT-IV

Theories of Emotions: James-Lange's Theory, Cannon-Bard's Theory, Schachter-Singer, Lazarus Theory of Emotion, Lindzey Activation Theory, Papez-Maclean, Affective Events Theory.

Recommended Books:

Borod, J. (Ed.) (2000*). The neuropsychology of emotions*. Oxford: Oxford University Press.

Campbell, J. B., Hall, C. S., & Lindzey, G. (2007). *Theories of Personality*. 4th Ed. Wiley: India

Carlson, N. R. (2007). *Foundations of physiological psychology*. N.D.: Pearson Edu.

Ekman, P. & Davidson, R.J. (1995). *The nature of emotion: Fundamental questions*. NY: Oxford University Press.

Franken, R. E. (2007). *Human motivation*. USA: Thomson Higher Education.

Oatley, K. & Jenkins, J. M. (1992). *Understanding emotions.* Cambridge: Blackwell publishers

Salovey, P. & Sluyter, D. (Ed.) (1997). Emotional development and emotional intelligence: Implications.

Weiner, B. (2012). *Human Motivation.* 2nd Ed. Springer.

SEMESTER-II **DISCIPLINE CENTRIC ELECTIVE COURSE-IV**

INDIAN PSYCHOLOGY

SAHS PSY 01 02 04 DCEC 4004

Credits: 4 (Hrs. /week: 4) *Total: 100 marks*

Internal Assessment: 30 marks

Examination: 70 marks

Objectives:

To acquaint students with knowledge, nature and applicability of Indian Psychology and the importance of Indian Mythology in the field of psychology. To develop understanding of Psychological Perspectives of Indian Psychology. To help students understand Personality, Self, Motivation and Emotion in Indian perspective. To enable them to understand the role of Indian Psychology in the field of Mental Health, Education and Social Conflicts.

Learning Outcomes:

After completing the course, student will be able to:

- *Elaborate the contribution of Indian knowledge systems in generating a comprehensive system of psychology.*
- *Compare and contrast various systems of philosophy in India.*
- *Describe core psychological concepts available in the Indian traditions.*
- *Demonstrate the inherent holism in Indian thought – a view of the person as a bio-psychosocial-spiritual entity.*

UNIT- I

The Core and context of Indian Psychology

The Indian paradigm on psychological knowledge.

Science and Spirituality: Avidya and Vidya.

UNIT-II

Introduction to Indian Perspectives: Upanishads, Samkhya, Vedanta, Jainism, Buddhism, Nyaya, Charvak, Bhagvadgita.

UNIT –III

Personality in Indian Psychology; Self and Identity in Indian Psychology;

Motivation and Emotion in Indian Psychology.

UNIT –IV

Applications of Indian Psychology: Management of Mental Health, Resolution of Social Conflicts, Yoga: Health and Well-Being

Recommended Books:

Ajaya Swami (1983). *Psychotherapy East and West:* A Unifying Paradigm. Honesdale, Pennsylvania: The Himalayan International Institute of Yoga Science and philosophy of the U.S.A.

Guba, E.G. (1990). The alternative paradigm dialog. In E.G. Guba (Ed.), the Paradigm Dialog, pp. 17-30, New Delhi: Sage.

Heehs, P. (Ed.) (2002). *Indian Religions*: The spiritual traditions of South Asia. Delhi: Permanent Black.

Cornelissen, M., R.M., Mishra, G., &Verma, S (2014). *Foundations and applications of Indian psychology*. Indian: Pearson.

Rao, K.R., Paranjpe, A.C., & Dalal, A. K. (2008). *Handbook of Indian Psychology*. New Delhi: Foundation Book

Smith, H. (1994). *The illustrated world's religions: A guide to our wisdom traditions* (p. 256). San Francisco: Harper San Francisco.

SEMESTER-II **DISCIPLINE CENTRIC ELECTIVE COURSE-V**

CHILD PSYCHOLOGY

SAHS PSY 01 02 05 DCEC 4004

Credits: 4 (Hrs. /week: 4) *Total: 100 marks*

Internal Assessment: 30 marks

Examination: 70 marks

Objectives:

To provide students the understanding of various aspects of child psychology through several theories. To enable them to understand about various developmental stages of child and also to identify the different methods to study child's behaviour.

Learning Outcomes:

After completing the course, students will be able to:

- *Distinguish different stages of child development.*
- *Describe different research methods to study child's behaviour.*
- *Explain and predict child's behaviour in day-to-day life.*

UNIT-I

Child Psychology: Nature and Scope, Genetic and Environmental Determinants of Development, Heredity-Environment interaction. Basic Issues in study of Child Development

Methods of study: Case Study, Interview, Observation, Longitudinal, and Cross-sectional.

UNIT-II

Prenatal Development: How life begins, Birth Process, Major periods in Prenatal Development, Prenatal Environmental Influences, Maternal Factors.

Postnatal Development: Adjustment to Postnatal Life, Complications, and Postpartum Period.

UNIT-III

Physical Development: Course of Physical Growth, Development of Brain, Factors affecting Physical Growth.

Motor Development: Development in Early and Middle Childhood, Hormonal Influences, Sex Differences in Motor Development and Perceptual

UNIT-IV

Theories of Development: Contribution of Freud, Erikson, Piaget, Vygotsky, and Kohlberg.

Stages of Development and related issues.

Recommended Books:

Demon, W. and Lerner, R. M. (2008). *Child and Adolescent Development*. Wiley. Hoboken, New Jersey.

Berk, L. E. (2017). *Child Development*. 9th Ed. Pearson, India

Hurlock, EB (2004): *Developmental Psychology: A Life span Approach* (5th Ed. New Delhi) Tata McGraw- Hill publishing Co. Ltd.

Sandrock, J.W. (2017). *Life-Span Development*. 13th Ed. Mc-Graw Hill, India.

Sandrock, J.W. (2017). *Child Development*. 13th Ed. Mc-Graw Hill, India.

Valsiner, J. & Connolly, K. (2003). *Handbook of Developmental Psychology*. New Delhi: Sage Publication.

SEMESTER-II **DISCIPLINE CENTRIC ELECTIVE COURSE-VI**

ENVIRONNEMENTAL PSYCHOLOGY

SAHS PSY 01 02 06 DCEC 4004

Credits: 4 (Hrs. /week: 4) *Total: 100 marks*

Internal Assessment: 30 marks

Examination: 70 marks

Objectives:

To provide acquaintance with the contribution of psychology in understanding the people's responses to environmental problems. It will enable students, to understand the psychological and social consequences of environmental degradation pollutions, crowding, congestion, and encroachment of personal space. To acquaint students with the human-environment transaction, and possibility of behavioural intervention strategies to minimize the adverse effects. At the end, students will be able to be understand how pro-environment behaviour needed to reduce the ill effects of environmental quality.

Learning Outcomes:

After completing the course, students will be able to:

- *Identify the people's responses to environmental problems.*
- *Describe the psychological and social consequences of environmental degradation pollutions, crowding, congestion, and encroachment of personal space.*
- *Explain the human-environment transaction, and possibility of behavioural intervention strategies to minimize the adverse effects.*
- *Apply the techniques of pro-environment behaviour which is highly needed to reduce the ill effects of environmental quality.*

Unit-I

Emergence of Environmental Psychology: Nature, History and Scope.

Research Methods of Environmental Psychology: Laboratory Experiments, Field Studies, Case Studies. Questionnaires, and Computer Simulation.
Environmental stress: Concept and type of stress.

Sources of stressors: Cataclysmic, ambient stressors, daily hassles.

Pollutions: noise, air, water, chemical and their consequences.

Unit-II

Human-environment transaction: Personal space, territoriality, crowding.

Indian research on crowding and personal space.

Theoretical models: stimulus overload, behavioural constraint, ecological and adaptation.

Unit-III

Human-Nature Interaction: Concept, Mechanism, Green-Space and Public Health.

Restorative Environment: Concept Theories, Application and Implication.

Unit-IV

Pro-environmental Behaviour: Concept Model and Information Strategies

Intervention: Changing the environmental destructive mind-set, Environmental Education, Environmental Prompts, and Cues,

Recommended Books:

Jain, U. (1987). The psychological consequences on crowding. New Delhi, India: Sage.
Jain, U., & Palsane, M. N. (2004). Environment and behaviour. In J. Pandey (Ed.), Nagar, D. (2006). *Environmental psychology*. New Delhi, India: Concept. Psychology in India *revisited: Developments in the discipline (Vol. 3: Applied social and organizational psychology*, pp. 261-308). New Delhi, India: Sage.
Steg, L., Berg, A. E. V. D., & DeGrooth, J. I. M. (2013). *Environmental Psychology*. Wiley, UK.

SEMESTER-II **GENERIC ELECTIVE COURSE-II**

PSYCHOLOGY IN EVERYDAY LIFE

SAHS PSY 01 02 02 GEC 4004

Credits: 4 (Hrs. /week: 4) *Total: 100 marks*

Internal Assessment: 30 marks

Examination: 70 marks

Objectives:

Enable students to gain the knowledge and to get them acquainted with the applications of basic concepts in different fields of psychology. To enable students, identify different methods to study psychology, to explore one's self, personality, and Intelligence. Further to make students understand how attitude is formed and how it can be altered in a time of need. To gain the science of influencing. Enabling students to know about the science of abnormal behaviour its definition and Disorders as per diagnostic manual.

Learning Outcomes:

After completing the course, student will be able to:

- *Understand & apply psychology in daily life.*
- *Describe various components of human behaviour.*
- *Apply the knowledge of self, attitude change and social influence to manage own and other's behaviour.*
- *Identify the Abnormal behaviour, stress and related health problems.*

UNIT-I

Psychology: Nature, Scope and Applications

Methods of Study: Experimental, Interview, Cross-Cultural, Observation; and Case Study

UNIT-II

Know Thy Self: I & Me, Real-Self, Self-Concept, Self-Esteem; and Self-Efficacy.

Personality: Nature, Development and Assessment.
Intelligence: Nature, Theories and Measurement.

UNIT-III

Social Group: Nature, Types and Norms.

Attitude: Formation, Functions and Change of Attitude

Social Influence: Conformity, Compliance and Obedience; Helping Behaviour- Altruism and Pro-Social Behaviour

UNIT-IV

Abnormality: Meaning, Nature, Criteria.

Mental Disorders: Symptoms and Causes of Anxiety, Mood, Psychosomatic, and Eating Disorders.

Recommended Books:

Baron, R.A. & Byrne, D. (2004). *Social Psychology*. Singapore: Pearson Education

Carson, R.C., Butcher, J. N., Mineka, S., & Hooley, J. M. (2007). Abnormal Psychology (13). Ed. Pearson Education. New Delhi, India.

Heatherton, T., Halpern, D., & Heine Steve (2012). *Psychological Science*. WW

Norton & Company. Inc. New York.

Larsen, R.J. & Buss, D.M. (2011)*Personality Psychology: Domains of Knowledge about Human Nature*. New Delhi: Tata McGraw-Hill.