



CENTRAL UNIVERSITY OF HARYANA

18th Meeting of the Academic Council

07th October, 2015 (11:00 A.M.)

18th meeting of the Academic Council of the Central University of Haryana was held on 7th October, 2015, at 11:00 AM in the Conference Room of the Transit Office, Gurgaon.

The following members were present:

1. Prof. R.C. Kuhad, Vice Chancellor, Central University of Haryana.	Chairperson
2. Prof. G.L. Sharma Professor and Dean (Admn.), Lal Bahadur Shastri Institute of Management (LBSIM)	Member
3. Prof. M.C. Sharma School of Education, Indira Gandhi National Open University (IGNOU)	Member
4. Prof. K.S. Sangwan(Retd) Dept. of Sociology, MDU Rohtak	Member
5. Prof. H.J. Ghosh Roy Director, IMSAR, Maharshi Dayanand University, Rohtak	Member
6. Dr. (Mrs.) Pawan Sharma , Joint Secretary Law Commission of India	Member
7. Prof. Nikhlesh Yadav, Head, Department of English, Indira Gandhi University, Meerpur, Rewari	Member
8. Prof. Anup Beniwal Professor & Dean, School of Humanities & Social Sciences, G.G.S. Indraprastha University, New Delhi.	Member
9. Dr. Pardeep S. Chauhan Department of Economics, Kurukshetra University, Kurukshetra	Member
10. Prof. Vijay Kumar Department of History, Maharshi Dayanand University, Rohtak	Member
11. Dr. B.K. Mohapatra Registrar, Shri Lal Bahadur Shastri Rashtriya Sanskrit Vidyapeeth, New Delhi	Member

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| 12. Prof. Ashish Dahiya,
Dean , School of Language, Linguistics, Culture and Heritage, CUH | Member |
| 13. Dr. Bir Singh Yadav
Associate Professor, CUH. | Member |
| 14. Dr. Sanjiv Kumar
Head, Department of English, CUH. | Member |
| 15. Dr. Sarika Sharma
Proctor & Head, Department of Education, CUH. | Member |
| 16. Dr. Aditya Saxena
Head, Department of Physics, CUH. | Member |
| 17. Dr. Pardeep Singh
Assistant Professor, Dept. of Law, CUH. | Member |
| 18. Dr. Suman
Assistant Professor, Dept. of Commerce, CUH. | Member |
| 19. Sh. Ashok Kumar Gogia
Finance Officer, CUH. | Special Invitee |
| 20. Sh. Ram Dutt
Registrar, CUH. | Secretary |

The following members could not attend the meeting:

- 1. Prof. Shahid Ashraf**
Registrar, Jamia Millia Islamia University.
- 2. Prof. S.S. Sangwan**
Dept. of English, Maharshi Dayanand University, Rohtak.
- 3. Prof. J.P. Khurana**
Head, Dept. of Plant Molecular Biology and Biotechnology, University of Delhi, South Campus.

The Vice Chancellor welcomed the members of the Academic Council and briefed them about the following academic and other activities carried out by the University during the last two months:

- Independence Day and Van Mahotsav was celebrated on 15th August, 2015.
- Three day workshop on Vacuum, Plasma and Thin Film Deposition Techniques was organized by the Department of Physics from 22nd to 24th September, 2015. Dr. R. K. Garg of Technology Applications Service (TAS) New Delhi was the Chief Guest. He brought a number of equipments for demonstration, assembled on his own and also imparted training to University students and the students of VIth to XIIth class of the nearby villages adopted by this University till late night every day, totally free of cost.
- Justice Pritam Pal, Hon'ble Lokayukta, Haryana also delivered a lecture on the topic "Institution of Lokayukta: An imperative for Good Governance" on 23rd September, 2015.
- In order to ensure participation of corporate sector, Sh. Vinay Kaushik, Vice President, HR, Samsung Engineering India delivered an extension lecture on Value driven Innovations on 5th October, 2015.
- NSS Camp was also organised in Malda, a village adopted by the University under "Unnat Bharat Abhiyan".
- Sports Meet was also organised in the University on 2nd October, 2015.
- राजभाषा संदर्भ-पुस्तिका (Translation of commonly used Official words/sentences into Hindi) has been released for use by the Officials of the University.

Thereafter, the agenda items were taken up in the following manner:

Resolution No.	Resolution Passed
1	The minutes of the 17 th meeting of the Academic Council held on 23 rd July, 2015 were confirmed.
2	The actions taken on the minutes of the 17 th meeting of the Academic Council held on 23 rd July, 2015, were reported, recorded and confirmed. (Vide Appendix-I)
REPORTING ITEMS	
3.	Receipt of UGC letter.No.F.1-1/2013(CU) dated 25.8.2015 conveying its approval for introduction of following five new departments with effect from the academic session 2015-16 in addition to twenty departments earlier approved by the UGC was reported, recorded and confirmed. (Vide Appendix-II) <ul style="list-style-type: none"> i. Department of Biotechnology ii. Department of Biochemistry iii. Department of Nutrition Biology iv. Department of Microbiology v. Department of Tourism and Hotel Management.
3.a	The action taken by the Vice Chancellor in signing of an MOU with Technology Applications Service (TAS) New Delhi and National Cooperative Union of India (NCUI) New Delhi was reported, recorded and confirmed. (Vide Appendix-III)

4	<p>The action taken by the Vice Chancellor in Constituting an Internal Quality Assurance Cell (IQAC) NAAC cum Steering Committee consisting of the following was reported, recorded and confirmed</p> <ol style="list-style-type: none"> 1. Prof. R.C. Kuhad, : Chairman Vice-Chancellor, CUH 2. Prof. Ashish Dahiya : Director Dept. of THM, CUH 3. Prof. D.P.S. Varma : External Member University of Delhi, Delhi 4. Prof. Vinay Kumar Gupta : External Member University of Delhi, Delhi 5. Prof. Karam Pal Narwal : External Member Dept. of Management, GJUS&T, Hisar 6. Prof. Anup S. Mann : External Member Dept. of Physics, MDU, Rohtak 7. Dr. Sanjiv Kumar : Member Dept. of English, CUH 8. Dr. Chanchal Kumar Sharma : Member Dept. of Pol. Sc., CUH 9. Dr. Sunita Tanwar : Member Dept. of Management Studies, CUH 10. Dr. Dinesh Chahal : Member Dept. of Education, CUH 11. Mr. Vijay Kumar : Member Assistant Registrar, CUH 12. Dr. Samiksha Godara : Member Dept. of Law, CUH 13. Dr. Arvind Tejawat : Member Dept. of Hindi, CUH 14. Dr. Ranjan Aneja : Member Dept. of Economics, CUH 15. Dr. Suman : Member Dept. of Commerce, CUH 16. Ms. Divya : Member Dept. of Management Studies, CUH <p>Members mentioned at Sl. No. 2 & 7 to 16 will act as NAAC Steering Committee.</p>
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ITEMS FOR CONSIDERATION

5	<p>Considered the changes in The University Logo with latest 3D technique to be carried out through some specialized professional agency. The slant/ angle of book as displayed in the University logo was required to be modified to make it straight.</p> <p><i>Resolved to recommend to the Executive Council that the proposed modification in the logo may be approved with a suggestion that further modification may be considered, if needed, in consultation with the Artist/Designers and Academicians. Till then, the logo being recommended now shall be use . (Vide Appendix-IV)</i></p>
6	<p>Resolved that the following amendments to Ordinances of the University may be recommended to the Executive Council for approval.</p> <p>1. Add Ordinance IV (A) and IV (B) after Ordinance III.</p> <p>Ordinance IV (A): Qualifications for appointment to the teaching and other posts:</p> <p>The qualifications for appointment to the following posts shall be those as prescribed under the UGC Regulations 2010, as amended from time to time:</p> <ol style="list-style-type: none"> 1. Professor 2. Associate Professor 3. Assistant Professor 4. Librarian/ Dy. Librarian/ Assistant Librarian 5. Director/ Deputy Director/ Assistant Director of Physical Education & Sports. 6. Any other post/s qualifications for which are prescribed under the UGC Regulations. <p>Provided that the University may prescribe specialized and desirable qualifications, whenever needed.</p> <p>Provided further that the Executive Council of the University may prescribe guidelines for short listing of candidates for appointment to the posts of Assistant Professor/ Assistant Librarian/ Assistant Director of Physical Education & Sports.</p> <p>Ordinance IV (B): Career Advancement Scheme (CAS)-2010.</p> <p>1 (a) The teachers of the University shall be eligible to be considered for up gradation/ promotion under the Career Advancement Scheme (CAS)-2010 of the University Grants Commission, as amended from time to time.</p> <p>(b) The Selection Committee for considering promotion as Professor, Associate Professor under CAS-2010 shall be the same as prescribed under Statute 18 of the Statutes of the University for appointment to these posts.</p> <p>Provided that the Screening-Evaluation Committee/ Selection Committee for promotion of an Assistant Professor from one Academic Grade Pay (AGP) to the next AGP shall consist of the following:</p>

	<ol style="list-style-type: none"> 1. The Vice-Chancellor or his nominee - Chairperson 2. The Dean of the concerned School 3. The Head of the concerned Department 4. One Subject Expert drawn from a panel approved by the Academic Council. 5. An academician representing SC/ST/OBC/PWD/Minority/Women to be nominated by the Vice-Chancellor, if any of the candidates representing these categories is an applicant and if any of the above members of the Selection Committee does not belong to that category. <p>Three members including the Chairperson and the expert shall form the quorum.</p> <p>2(a) The Assistant/ Deputy Librarian and Assistant/ Deputy Director of Physical Education & Sports shall be eligible to be considered for promotion under the Career Advancement Scheme (CAS)-2010 of the University Grants Commission as amended from time to time.</p> <p>(b) The Screening-Evaluation Committee/ Selection Committee for considering promotion of Assistant/ Deputy Librarian and Assistant/ Deputy Director of Physical Education & Sports, shall consist of the following:</p> <ol style="list-style-type: none"> 1. The Vice-Chancellor or his nominee - Chairperson 2. Two experts nominated by the Vice-Chancellor from amongst a panel approved by the Academic Council. 3. An academician representing SC/ST/OBC/PWD/Minority/Women to be nominated by the Vice-Chancellor, if any of the candidates representing these categories is an applicant and if any of the above members of the Selection Committee does not belong to that category. <p>Three members including the Chairperson and at least one expert shall form the quorum.</p> <p>Provided that while considering the candidates under both the categories 1 & 2 above:</p> <p>(i) In case the Selection Committee finds that a candidate is not suitable for promotion, it may consider him/her for promotion after one year. In such a case, his/her eligibility for promotion shall be deferred by one year.</p> <p>(ii) Every candidate will be required to appear for interview before the Selection Committee unless on a request from any candidate the Selection Committee agrees to consider him/her in absentia.</p> <p>(iii) In case of any dispute with regard to information given by the candidate in his/her self-assessment proforma, the decision of the Selection Committee shall be final.</p>
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	<p>2. Amendments to Ordinance IV: Selection Committee Procedure.</p> <table border="1"> <thead> <tr> <th>Existing</th><th>Proposed</th></tr> </thead> <tbody> <tr> <td>Ordinance-IV</td><td>Ordinance-IV(C)</td></tr> <tr> <td>Clause 2- The Registrar, and while the Office of the Registrar is vacant, the Deputy Registrar nominated by the Vice-Chancellor for the purpose, shall be the ex-officio Secretary to the Selection Committee, but shall not be deemed to be a member thereof.</td><td>To be deleted</td></tr> <tr> <td>Clause 20- The Chairman-Convenor shall have the power to lay down the procedure in respect of any matter not mentioned in the Act/ Statute/ Ordinance.</td><td>No Change</td></tr> <tr> <td>Clause 22- The statutory provision of relaxing of age, minimum qualification, experience etc. prescribed in case of the candidates belonging to SC/ST/OBC/PWD categories will be made applicable to them.</td><td>To be deleted</td></tr> <tr> <td>Clause 23- If any candidate is recommended by the Selection Committee for appointment in relaxation of any of the prescribed conditions relating to qualifications, age, experience etc., shall be so stated and recorded.</td><td>To be deleted</td></tr> </tbody> </table>	Existing	Proposed	Ordinance-IV	Ordinance-IV(C)	Clause 2- The Registrar, and while the Office of the Registrar is vacant, the Deputy Registrar nominated by the Vice-Chancellor for the purpose, shall be the ex-officio Secretary to the Selection Committee, but shall not be deemed to be a member thereof.	To be deleted	Clause 20- The Chairman-Convenor shall have the power to lay down the procedure in respect of any matter not mentioned in the Act/ Statute/ Ordinance.	No Change	Clause 22- The statutory provision of relaxing of age, minimum qualification, experience etc. prescribed in case of the candidates belonging to SC/ST/OBC/PWD categories will be made applicable to them.	To be deleted	Clause 23- If any candidate is recommended by the Selection Committee for appointment in relaxation of any of the prescribed conditions relating to qualifications, age, experience etc., shall be so stated and recorded.	To be deleted
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7	<p>Resolved that the following amendments to Ordinance V of the Ordinances of the University may be recommended to the Executive Council for approval.</p> <p>(I) To add the following as Clause-1:</p> <p>1. Designation & Pay Scales</p> <p>The designation, pay & allowances and other service conditions of the University teachers and other staff shall be those as prescribed by the University Grants Commission (UGC) from time to time.</p> <p>(II) To amend the serial numbers of the Clauses consequent to the above addition</p> <p>2. Teachers to be a whole-time employees (No change)</p> <p>3. Nature of Duties (No change)</p> <p>4. Probation (No change)</p> <p>5. Increment (No change)</p>												

6. Age of Superannuation

6.1 Every teacher in the service of the University shall superannuate from service on the afternoon on the last date of the month in which he/she attains the age as prescribed by the University Grants Commission/ Government of India from time to time.

6.2 in place of 5.2	No Change
6.3 in place of 5.3	No Change
6.4 in place of 5.4	No Change

7. Resignation (No change)

8. Voluntary Retirement (No change)

9. Superannuation Benefits (No change)

10. Variations in Terms and Conditions of Service (No change)

11. Fixation of Pay of Re-employed Teachers (No change)

12. Contract

The written contract between a teacher and the University required to be entered into under Clause (3) of Statute (22) shall be in the prescribed form. The teacher shall be bound by the terms and conditions enumerated in the

"Form of Agreement of Service for University Teachers", vide Annexure to this Ordinance.

13. Special Contracts (No change)

(III) To add the following after Clause-13 in pursuance of the UGC Regulations, 2010:

14. CODE OF PROFESSIONAL ETHICS**I. TEACHERS AND THEIR RESPONSIBILITIES:**

Whoever adopts teaching as a profession assumes the obligation to conduct himself / herself in accordance with the ideal of the profession. A teacher is constantly under the scrutiny of his students and the society at large. Therefore, every teacher should see that there is no incompatibility between his precepts and practice. The national ideals of education which have already been set forth and which he/she should seek to inculcate among students must be his/her own ideals. The profession further requires that the teachers should be calm, patient and communicative by temperament and amiable in disposition.

Teachers should:

- (i) Adhere to a responsible pattern of conduct and demeanor expected of them by the community;
- (ii) Manage their private affairs in a manner consistent with the dignity of the profession;
- (iii) Seek to make professional growth continuous through study and research;
- (iv) Express free and frank opinion by participation at professional meetings, seminars, conferences etc. towards the contribution of knowledge;
- (v) Maintain active membership of professional organizations and strive to improve education and profession through them;
- (vi) Perform their duties in the form of teaching, tutorial, practical, seminar and research work conscientiously and with dedication;
- (vii) Co-operate and assist in carrying out functions relating to the educational responsibilities of the Department, college and the University such as: assisting in appraising applications for admission, advising and counseling students as well as assisting the conduct of university and college examinations, including supervision, invigilation and evaluation; and
- (viii) Participate in extension, co-curricular and extra-curricular activities including community service.

II. TEACHERS AND THE STUDENTS**Teachers should:**

- (i) Respect the right and dignity of the student in expressing his/her opinion;
- (ii) Deal justly and impartially with students regardless of their religion, caste, political, economic, social and physical characteristics;
- (iii) Recognize the difference in aptitude and capabilities among students and strive to meet their individual needs;
- (iv) Encourage students to improve their attainments, develop their personalities and at the same time contribute to community welfare;

- (v) Inculcate among students scientific outlook and respect for physical labour and ideals of democracy, patriotism and peace;
- (vi) Be affectionate to the students and not behave in a vindictive manner towards any of them for any reason;
- (vii) Pay attention to only the attainment of the student in the assessment of merit;
- (viii) Make themselves available to the students even beyond their class hours and help and guide students without any remuneration or reward;
- (ix) Aid students to develop an understanding of our national heritage and national goals; and
- (x) Refrain from inciting students against other students, colleagues or administration.

III. TEACHERS AND COLLEAGUES

Teachers should:

- (i) Treat other members of the profession in the same manner as they themselves wish to be treated;
- (ii) Speak respectfully of other teachers and render assistance for professional betterment;
- (iii) Refrain from lodging unsubstantiated allegations against colleagues to higher authorities; and
- (iv) Refrain from allowing considerations of caste, creed, religion, race or sex in their professional endeavor.

IV. TEACHERS AND AUTHORITIES:

Teachers should:

- (i) Discharge their professional responsibilities according to the existing rules and adhere to procedures and methods consistent with their profession in initiating steps through their own institutional bodies and/or professional organizations for change of any such rule detrimental to the professional interest;
- (ii) Refrain from undertaking any other employment and commitment including private tuitions and coaching classes which are likely to interfere with their professional responsibilities;
- (iii) Co-operate in the formulation of policies of the institution by accepting various offices and discharge responsibilities which such offices may demand;

	<p>(iv) Co-operate through their organizations in the formulation of policies of the other institutions and accept offices;</p> <p>(v) Co-operate with the authorities for the betterment of the institutions keeping in view the interest and in conformity with dignity of the profession;</p> <p>(vi) Should adhere to the conditions of contract;</p> <p>(vii) Give and expect due notice before a change of position is made; and</p> <p>(viii) Refrain from availing themselves of leave except on unavoidable grounds and as far as practicable with prior intimation, keeping in view their particular responsibility for completion of academic schedule.</p> <p>V. TEACHERS AND NON-TEACHING STAFF:</p> <p>(i) Teachers should treat the non-teaching staff as colleagues and equal partners in a cooperative undertaking, within every educational institution; and</p> <p>(ii) Teachers should help in the function of joint staff-councils covering both teachers and the non-teaching staff.</p> <p>VI. TEACHERS AND GUARDIANS</p> <p>Teachers should:</p> <p>(i) Try to see through teachers' bodies and organizations, that institutions maintain contact with the guardians, their students, send reports of their performance to the guardians whenever necessary and meet the guardians in meetings convened for the purpose for mutual exchange of ideas and for the benefit of the institution.</p> <p>VII. TEACHERS AND SOCIETY</p> <p>Teachers should:</p> <p>(i) Recognize that education is a public service and strive to keep the public informed of the educational programmes which are being provided;</p> <p>(ii) Work to improve education in the community and strengthen the community's moral and intellectual life;</p> <p>(iii) Be aware of social problems and take part in such activities as would be conducive to the progress of society and hence the country as a whole;</p> <p>(iv) Perform the duties of citizenship, participate in community</p>
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activities and shoulder responsibilities of public offices;

- (v) Refrain from taking part in or subscribing to or assisting in any way activities which tend to promote feeling of hatred or enmity among different communities, religions or linguistic groups but actively work for National Integration.

Note: All provisions of the amended Ordinance V shall, mutatis-mutandis, also be applicable to the Teachers appointed prior to the amendment of this Ordinance.



Annexure to Ord. V

FORM OF AGREEMENT OF SERVICE FOR UNIVERSITY TEACHERS

Memorandum of Agreement made this theday of.....two thousand..... between Shri/Shrimati (hereinafter called the 'Teacher') of the first part, and the Delhi University being a body corporate constituted under Act No. VIII of 1922, hereinafter called the University of the second Part.

It is hereby agreed as follows:

1. That the University hereby appoints Shri/Shrimati to be a member of the teaching staff of the University with effect from the date the said.....takes charge of the duties of his/her office and the said..... hereby accepts the engagement, and undertakes to take such part and perform such duties in the University as may be required by and in accordance with the Act, Statutes and Ordinances, as amended from time to time, of the University, whether the same relate to organisation of instruction, or teaching, or the examination of students or their discipline or their welfare, and generally to act under the direction of the authorities of the University.
2. That the Teacher shall be on probation for a period of one year and this probationary period may further be extended by not more than 12 months by the Executive Council. The teacher shall be confirmed in this appointment on the expiration of his/her probationary period, unless not later than one month before the expiration thereof the University inform him/her in writing of its intention not to confirm him/her.
3. That the said..... shall be a whole-time teacher of the University and subject to clause 2 and unless the contract is terminated by the Executive Council or by the teacher as hereinafter provided, shall continue in the service of the University until he/she completes such age as may be prescribed by the Ordinances of the University.
4. That the University shall pay Shri/Shrimatiduring the continuance of his/her engagement hereunder as a remuneration for his/ her services a salary of Rs..... per mensem, raising by annual increments of Rs..... to a maximum salary of Rs..... per mensem :

Provided that wherever there is any change in the nature of the appointment or the emoluments of the teacher, particulars of the change shall be recorded in Schedule I annexed hereto, under the signatures of both parties and the terms of this agreement shall apply mutatis mutandis to the new post and the terms and conditions attached to that post.



5. That the said..... agrees to be bound by the Ordinances and Regulations in force in the University as amended from time to time.

6. The Teacher also agrees to be bound by the Central Civil Services Conduct Rules as amended from time to time.

7. That the teacher shall devote his/her whole time to the service of the University and shall not without the permission of the University, engage, directly or indirectly, in any trade or business whatsoever, or in any private tuition or other work to which any emolument or honorarium is attached, but this prohibition shall not apply to work undertaken in connection with the examinations of Universities or Public Service Commissions, and where the permission of the Vice-Chancellor has been obtained; to any other examination work, nor shall the prohibition be applicable to any literary work or publication.

8. (i) Notwithstanding anything hereinbefore contained, the Executive Council of the University shall be entitled to initiate disciplinary action against the teacher on the ground of misconduct in accordance with the provisions hereinafter set forth.

(ii) The Vice-Chancellor may, when he deems it necessary, suspend the teacher on the ground of misconduct or pending investigation of the charges against him/her. When he suspends the teacher, he shall report it to the next meeting of the Executive Council.

(iii) The Executive Council shall investigate all matters reported to it by the Vice-Chancellor about the misconduct of the teacher whether he has been suspended or not. The Executive Council may appoint a Committee for the purpose. The teacher shall be notified in writing of the charges against him and shall be given not less than three weeks' time to submit his explanation in writing.

The Executive Council or the Committee may hear the teacher and take such evidence as it may consider necessary. The Executive Council may impose any of the following penalties on the teacher, where it deems that the misconduct of the teacher deserves to be dealt within that manner, after it has considered the explanation and the evidence, if any, and/or the report of the Committee, if one has been appointed:

- (i) Censure
- (ii) Withholding of increment with or without cumulative effect
- (iii) Withholding of promotion for a specified period
- (iv) Reduction to lower grade or post for a specified period
- (v) Compulsory retirement
- (vi) Termination/ disengagement of service.

(iv) Where the termination of the service or compulsory retirement on the ground of misconduct is after suspension by the Vice-Chancellor as aforesaid, the termination of service or compulsory retirement will be from the date of suspension.



9. The penalty of termination/ disengagement of Service/ Compulsory retirement under these provisions shall not be imposed by the Executive Council except by a resolution passed by a vote of not less than a two-thirds majority of the members present at the meeting, provided that the two thirds majority is not less than half the total number of members of the Executive Council. Before a resolution, under this clause is passed the Executive Council shall give notice to the teacher of the proposal to impose the penalty of termination/ disengagement/compulsory retirement and not less than three weeks' time to make such representation as the teacher may like to make. Every resolution terminating the service/compulsory retirement under this clause shall be passed only after consideration of representation, if any, of the teacher. The teacher whose services are terminated or who is compulsory retired under this clause shall be given not less than one months' notice from the date on which he is notified of the resolution or not less than one months' salary in lieu of notice.

10. The teacher may prefer an appeal against the decision of the Executive Council for imposition of the penalty of termination/ disengagement/ compulsory retirement within 30 days of the date of the order to the Executive Council. The Executive Council will refer the appeal to an Appeal Committee consisting of a nominee of the Chancellor as Chairman, a nominee of the Executive Council and a representative of the teacher concerned. The Appeal Committee will submit its findings to the Executive Council, who after considering the findings of the Committee, will pass appropriate orders on the appeal.

Provided that during the pendency of the appeal, the teacher shall continue to draw such salary or subsistence allowance, as the case may be as he was drawing immediately prior to his termination/ disengagement/ compulsory retirement.

11. The teacher may, at any time, terminate his/her engagement by giving the Executive Council three months' notice in writing, or by payment of an amount equal to three months' salary in lieu of notice.

12. On the termination of this engagement from whatever cause the teacher shall deliver up to the University all books, apparatus, records and such other articles belonging to the University as may be due from him/ her.

SCHEDULE I

Name of Teacher in full.....

Address.....

Designation.....

Salary Rs..... in the grade of

Note: The changes in the grade, salary or designation should be briefly described.

Change of designation or grade

Signature of Teacher

Date of approval of E.C.

Date from which change takes effect

Signature of Officer
for University.



8	<p>Resolved that the following amendments to the Ordinances of the University may be recommended to the Executive Council for approval.</p> <p>To add the following after Ordinance XV:</p> <p><u>Ordinance-XV-A: General Rules for Examination</u></p> <ol style="list-style-type: none"> 1. Applications for admission to University examinations shall be made in the prescribed form and forwarded to the Controller of Examinations through the Head of the Department/Dean of the School concerned: 2. While forwarding the applications for admission to various examinations the Head of the Department/the Dean of the School concerned shall be required to certify in respect of each applicant as follows: <p>"that the candidate has satisfied himself/herself by the production of a certificate of a competent authority that he/she has passed the examination which qualifies him for admission to the examination."</p> <p>The Controller of Examinations shall send the admission tickets of all the candidates, whose applications for admission to the various examinations have been received by the Head of the Department/the Dean of the School concerned for delivery to the candidates concerned. Before delivering the admission ticket to each candidate the Head of the Department/the Dean of the School concerned shall satisfy himself that the candidate concerned has put in the requisite attendance at lectures etc. as laid down in the Ordinances of the University and is otherwise eligible to appear at the respective examination. The admission tickets in respect of candidates who have not fulfilled the attendance requirements or are otherwise not eligible to appear at the examination shall not be delivered to them and shall be returned to the Controller of Examinations together with a statement showing the detailed attendance position and/or other facts in each case.</p> <p>Provided that if practical examination in any subject is held before the examination in theory papers, it shall not be necessary for the Controller of Examinations, in respect of candidates who are pursuing a regular course of study, to send Admission Tickets to enable them to take such practical examination, and it shall suffice if he sends a list containing the roll numbers of such candidates to the Head of the Department/the Dean of the School for being put up on the notice board of the Department/School to enable such candidates to take their examination on the basis of the roll numbers assigned to them. Such candidates shall take the practical examination provisionally subject to their being issued Admission Tickets later in terms</p>
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	<p>of the foregoing provision.</p> <p>3. (1) Application for admission to examinations shall be accompanied by the prescribed fees.</p> <p>(2) A candidate who due to sickness or other cause is unable to present himself/herself for any examination shall not be entitled to claim a refund of his fees, but such a candidate may be permitted to present himself/herself at the next ensuing examination without payment of a further fee.</p> <p>4. (1) Subject to the provisions contained in Clause 2 above every candidate whose application has been accepted by the University for admission to an examination shall be given an admission ticket showing the name of the candidate and the roll number assigned to him for admission to the examination.</p> <p>(2) The ticket shall be sent to the HoD/Dean of the School concerned, who will give it to the candidate after obtaining his/her signature on the ticket.</p> <p>5. A candidate may not be admitted into the examination hall, if he/she fails to present to the officer-in-charge of the examination his admission ticket or to satisfy the officer that it will be produced within a reasonable time.</p> <p>6. The Officer-in-Charge of the examination shall have power to call upon any candidate appearing at an examination to give a specimen signature for purpose of identification.</p> <p>7. Permission to appear at a University examination may be withdrawn before or during the course of the examination for conduct which, in the opinion of the Vice-Chancellor, justifies the candidate's exclusion.</p> <p>8. If a candidate for any University examination owes any money to the University on any account and fails to pay the money, or has borrowed or has in his possession any book, apparatus, or other property belonging to the University or any kit supplied by the N.C.C./N.S.S. and fails to return the same, the Vice-Chancellor may withhold or authorise the withholding of the admission ticket of the candidate, or, if the admission ticket has already been issued suspend the order of admission till all such money has been paid or such property returned by the candidate.</p> <p>9. Notwithstanding anything contained expressly or impliedly in these rules, the Vice-Chancellor may, on being satisfied after such enquiry as he/she may deem fit, withdraw retrospectively, prior to the publication of the final result of a candidate in a course, the permission granted to such candidate to pursue that course or to appear at a University examination in relation thereto, on any of the following grounds or cancel the result of such candidate, if it comes to his notice, within 4 months of the publication of the said final result that:</p> <p>(i) the candidate was ineligible for admission to the course but was wrongly admitted, or</p> <p>(ii) the candidate was ineligible to take the examination on account of shortage of attendance but was permitted to do so by some mistake or some other</p>
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unavoidable reason, or

- (iii) a discrepancy was found in the attendance record on account of which the candidate who had taken the examination was in fact ineligible, or
- (iv) a discrepancy was discovered in the award of marks etc. which rendered that result of the candidate liable to be cancelled to his disadvantage.
- (v) Any other ground which makes the candidate ineligible to appear in the examination.

Provided that no such action shall be taken by the Vice- Chancellor without giving an opportunity to the concerned candidate to show cause against the proposed action and provided further that such action shall be reported to the Academic Council for the confirmation.

10. Subject to the provisions of the Act, the Statutes and the Ordinances, the regulations may provide for all other matters relating to conduct of examinations including those concerning examination committees, tabulation of marks and results, fee for re-checking examination results and for the supply of marks, dates for submission of examination forms, directions to candidates for examinations, directions to superintendents of examinations and duties of invigilators.

Ordinance-XV-B: Disorderly conduct and use of unfair means in examination.

1. For the purposes of this Ordinance -

- a) Examination means an examination conducted by the University.
- b) The year means the academic year;
- c) Candidate includes an examinee taking any examination in a particular year and wherever the context so permits, every student on the rolls of the University;
- d) The use of dishonest or unfair means in the examination include:
 - (i) assisting in any manner whatsoever any other candidate in answering the question paper during the course of the examination;
 - (ii) taking assistance from any other candidate or any other person or from any book, paper, notes or other material in answering the question paper during the course of the examination;
 - (iii) carrying into the examination room any book, paper, notes, or other material whatsoever likely to be used directly or indirectly by the candidate in connection with the examination;
 - (iv) smuggling in an answer book or a continuation sheet;
 - (v) taking out or arranging to send out an answer book or its any page or a continuation sheet;
 - (vi) replacing or getting replaced an answer book or its any page or continuation sheet during or after the examination;
 - (vii) getting impersonated by any person in examination;
 - (viii) deliberately disclosing one's identity or making any distinctive mark in

	<p>the answer book for that purpose;</p> <p>(ix) communicating with or talking to any other candidate or unauthorised person in or around the examination room during the course of the examination;</p> <p>(x) communicating or attempting to communicate directly or through a relative, guardian and friend with an examiner with the object of influencing him in the award of marks;</p> <p>e) Disorderly conduct in the examination includes:</p> <p>(i) misbehaviour in connection with the examination, with the Superintendent, the Invigilator on duty or the other staff working at the Examination Centre, or with any other candidate, in or around the examination centre, before, during or after the examination hour;</p> <p>(ii) leaving the examination room before the expiry of the stipulated time or without handing over the answer book to the Invigilator-in-charge or without signing the attendance sheet;</p> <p>(iii) intentionally tearing off the answer book or a part thereof or a continuation sheet;</p> <p>(iv) disturbing or disrupting the examination;</p> <p>(v) inciting others to leave the examination room or to disturb or disrupt the examination;</p> <p>(vi) Carrying into the examination centre any weapon of offence.</p> <p>2. No candidate shall make use of any dishonest or unfair means or indulge in disorderly conduct in the examination.</p> <p>3. A candidate found guilty of the use of dishonest or unfair means or disorderly conduct in the examination may be disqualified from passing the examination for which he/she was a candidate, and may, in addition, be debarred from appearing at any future examination of the University for a further period to be stated or be expelled from the University and declared not a fit and proper person to be admitted to any further examination of the University.</p> <p>4. (a) Any candidate who, in the opinion of the Invigilator on duty or the Examiner conducting a practical or oral examination or the Superintendent of the Examination Centre, contravenes or is suspected of contravening the provisions of clause 2 in the examination room, shall be forthwith challenged by such Invigilator, Examiner or Superintendent who shall ask for a signed statement from the candidate.</p> <p>The candidate may be subjected to a search of his/her person to recover any incriminating material from him/her by the examination staff on duty.</p> <p>(b) Without prejudice to the provision contained in sub-clause (a) above the Superintendent of an Examination Centre or the Examiner conducting practical or oral examination shall also have the power to expel a candidate who in his opinion, has contravened the provisions of clause 2, from the examination centre for the remaining duration of the paper.</p> <p>5. (a) The Superintendent of the Examination Centre or the Examiner or any Officer of the University, as the case may be, shall report in writing to the Controller of</p>
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	<p>Examinations the case of every student who has contravened the provision of clause</p> <p>(b) The reporting authority shall give full facts of the case in his report and forward with it the statements, if any, made on the occasion by the candidate and the Invigilator on duty and papers, books and other material recovered from the candidate, if any.</p> <p>6. There shall be one or more Examination Disciplinary Committees. Each such Committee, hereinafter referred to as the Examination Disciplinary Committee shall be constituted as under:</p> <p>(a) On the recommendation of the Vice-Chancellor the Executive Council shall, at the beginning of each year, draw up a panel of teachers of the University to be nominated on the Examination Disciplinary Committee.</p> <p>(b) Each Examination Disciplinary Committee shall comprise of two teachers to be nominated by the Vice-Chancellor from amongst the panel, one of them being of the status of at least an Associate Professor.</p> <p>(c) The Controller of Examinations or any person authorised by him, of the rank of not less than an Assistant Controller of Examinations/Assistant Registrar will function as non-member Secretary of the Examination Disciplinary Committee.</p> <p>7. The Vice-Chancellor shall determine from time to time the number of Examination Disciplinary Committees.</p> <p>8. (a) The Controller of Examinations or any person authorised by him/her in this behalf shall communicate to the candidate, in respect of whom a report has been received pursuant to clause 5(a), the precise nature of allegations against him and shall require him/her to furnish his written explanation within a stipulated period.</p> <p>(b) On receipt of the explanation from the candidate or on the expiry of the period stipulated for submitting explanation if no explanation is received from him the Vice-Chancellor shall assign his case for consideration to the Examination Disciplinary Committee and, where there are more Committees than one, such Examination Disciplinary Committee as he may deem fit.</p> <p>9. After considering all the material on record including the explanation, if any, submitted by the candidate, the Examination Disciplinary Committee if satisfied that the candidate is guilty of the use of dishonest or unfair means or disorderly conduct in the examination, shall recommend to the Executive Council the punishment that may be imposed on the candidate under clause 3 according to the nature of the offence.</p> <p>10. The Executive Council may, after considering the report, of the Examination Disciplinary Committee take such action against the candidate under clause 3 as it may deem fit.</p> <p>11. A candidate on whom may any punishment has been imposed under clause 3 may, within 15 days from the date of the receipt of the communication in that behalf, make a representation to the Vice-Chancellor for review of his case and the Vice-Chancellor, if satisfied that the case is fit for reconsideration refer the same to the Executive Council. The Executive Council may thereupon review the case and pass such orders as it may consider fit.</p>
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	<p>12. In the case of a candidate who has been expelled from the University in terms of provisions of Clause 3, the Executive Council may, on the recommendation of the Vice-Chancellor, on the expiry of three years after such expulsion including the examination in connection with which he was punished, exempt a candidate from further operation of the punishment awarded.</p> <p>13. If within four months of the publication of the results, it is brought to the notice of the Controller of Examinations that a candidate was guilty of the use of dishonest or unfair means at the examination in respect of which his result was declared, the provisions of this Ordinance shall apply mutatis mutandis to the case of such a candidate provided that before imposing any penalty including the penalty of cancellation of his result, he shall be given another opportunity, to show cause against the proposed punishment and his explanation, if any, shall be considered by the Executive Council.</p> <p>14. A candidate against whom an enquiry is pending about his allegedly having resorted to the use of dishonest or unfair means or disorderly conduct in the examination or against whom action is initiated under the provisions of the preceding clause shall, if he takes or has taken any subsequent examination, be deemed to have been only provisionally admitted to that subsequent examination. That examination will stand cancelled and his result thereof would not be declared if on account of the punishment imposed on him as a result of the said enquiry or action, he would not have been entitled to take that examination but for his provisional admission thereto.</p> <p>15. If a person, not otherwise covered by these provisions, is found guilty of having impersonated a candidate or of having written, outside the examination hall, an answer book or its any page or a continuation sheet which he knows or has reason to believe will be smuggled into the examination hall for the benefit of any candidate, or of having managed otherwise to replace the answer book or its any page of the candidate after the examination, he shall be disqualified from appearing in any University examination for a period to be stated. The provisions of this Ordinance relating to the manner of imposition of penalty shall, in so far as they may be applicable, apply to the case of such a person.</p> <p>Ordinance-XV-C: Withholding Conferment of any Degree/Diploma or Award of any Certificate.</p> <p>Notwithstanding anything contained in Ordinance X-A or in any other Ordinance, the Executive Council may, on the recommendation of the Vice-Chancellor, by a resolution passed with the concurrence of not less than two thirds of the members voting, withhold for such period as they may deem fit, conferment of any Degree/Diploma or Award of any Certificate to any successful candidate at an examination of the University, for reasons, which, in their opinion, justify such withholding e.g., unruly or disorderly conduct, or violence on the campus or in a College, or conviction for an offence involving violence or moral turpitude.</p>
9	<p>Resolved that the following amendments to the Ordinance XV relating to Award of P.G. Degree/Diplomas of the Ordinances of the University may be recommended to the Executive Council for approval.</p> <p>I. To add Clause 1.9 after Clause 1.8:</p>

a. The following courses of study shall be offered by the University:

- (i) Doctor of Philosophy (Ph.D.) in – Economics, Education, English, Hindi, Political Science, Microbiology, Biochemistry, Biotechnology, Nutrition Biology, Tourism & Hotel Management, Management Studies and Physics.
- (ii) Master of Philosophy (M.Phil.) of one year's duration in – Economics, Education, English, Hindi and Political Science.
- (iii) Master's Degree Programmes:

Name of Programme	Duration
M.A. (Economics)	Two Years
M.B.A.	Two Years
M.Com.	Two Years
M.Sc. (Mathematics)	Two Years
M.Sc. (Statistics)	Two Years
M.C.A.	Three Years
M.Sc. (Environmental Science)	Two Years
M.Sc. (Geography)	Two Years
M.Sc. (Chemistry)	Two Years
M.Sc. (Physics)	Two Years
M.A. (History)	Two Years
M.A. (Political Science)	Two Years
M.A. (Psychology)	Two Years
M.A. (Sociology)	Two Years
M.A. (Journalism and Mass Communication)	Two Years
M.A. (Education)	Two Years
M.A. (English)	Two Years
M.A. (Hindi)	Two Years
LL.M.	Two Years
M.Lib.	Two Years
M.Sc. (Microbiology)	Two Years
M.Sc. (Biochemistry)	Two Years
M.Sc. (Biotechnology)	Two Years
M.Sc. (Nutrition Biology)	Two Years
Master of Hotel Management & Catering Technology	Two Years

- (iv) Bachelor in Vocational Studies (B.Voc)
- (v) Post-graduate Diploma Programmes.
- (vi) Certificate Courses.

II. To add Clause-17 after Clause-16:

Clause-17: Attendance

- (i) A student of any of the Master's/Post-graduate courses will not be eligible to appear in any examination of any semester unless he/she

	<p>has attended, in all subjects, 75% of the lectures/presentations and practical separately, delivered in the University for the course of study in each semester.</p> <p>(ii) In case a student who</p> <ol style="list-style-type: none"> a) is selected as a member of the N.C.C. to participate in the annual N.C.C. Camps or is deputed to undertake Civil Defence work and allied duties; or b) is enrolled in the National Service Scheme and is deputed to various public assignments by or with the approval of the Head of the Department concerned; or c) is selected to participate in sports as part of their Curricular Activities (CA); or d) represents the University in Inter University tournaments organized by the University, or a student selected for coaching camp of the University team Camp organized by the University or a student who represents Haryana state in National tournaments organized by National Sports Federations, or a student who represents the University in tournaments organized by Association of Indian Universities, or a student who represents India in International Tournaments organized by International Federations/ Associations and FISU, (selection through AIU), or a student who represents India in Olympics/Commonwealth Games/Youth Games/ World Championships/ organized by International Olympic Committee, or in national or international fixtures in games and sports approved by the Competent Authority; or e) is required to represent the University at the Inter-University Youth Festival; or f) is required to participate in periodical training in the Territorial Army or a student who is deputed by the University to take part in Inter-University sports or fixtures, debated, Seminars, symposia or social work projects or a student who is required to participate in curricular activities held in other Universities or such other activities held in other Universities approved by the Head for this purpose. <p>On calculating the total number of lectures etc. delivered in the University for his/her course of study in each Semester, the number of lectures etc., delivered in each subject, during the period of absence and as approved by the Head for the above purpose, shall deemed to have been attended by the student.</p> <p>(iii) The Head of the Department may consider, on the basis of the Medical Certificates produced, exceptionally hard cases of students who had fallen seriously ill or had met with an accident during the year disabling them from attending classes for a certain period, with a view to determining whether the lectures etc. delivered during the said period, or a part thereof, could be excluded for purposes of calculation</p>
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	<p>of attendance of the year and decide each case on its own merits.</p> <p>(iv) The Departments shall be required to notify the attendance position of each of their students for each month on the notice board and the website of the University, and clearly indicate the lectures/ practical/ presentation/ tutorials held subject wise and the numbers attended by each student.</p> <p>(v) The Department shall notify on the notice board and the website of the College, the final attendance position of each of its students within five days of the dispersal of the classes in the last session of the Semester. Not later than five days, thereafter, a student may, by an application to the Head, claim benefit of exclusion of lectures under sub-clause (iii) above on grounds to be specified and accompanied by the relevant documents. All such applications submitted within time shall be considered and disposed of by the Head of the Department at least 3 days prior to the commencement of the examination, in which the student is intending to appear.</p> <p>(vi) The benefit of exclusion of lectures contemplated in para (iii) above, shall in no case exceed 1/3 of the total number of lectures/practical/ presentation/tutorials delivered.</p> <p>(vii) In the case of a married woman student who is granted maternity leave, in calculating the total number of lectures delivered in the University for her course of study in each semester, in the number of lectures in each subject delivered during the period of her maternity leave shall not be taken into account.</p> <p>No person shall be deemed to have satisfied the required conditions in respect of his instructions, unless in addition to the requirements regarding attendance and other conditions, he has appeared and satisfied by his performance the Head of the Department in such tests, written and/or oral, as may be held by him in his discretion. The Head of the Department shall have, and shall be deemed always to have had, the power to detain a student in the same class in which he has been studying, or not to send him/her in the same class in which he has been studying, or not to send him/her for the University Examination, in case he did not appear at the tests aforesaid or his performance was not satisfactory. The Head of the Department shall have power to strike off the name of a student who is grossly irregular in attendance in spite of warning, or when the absence of the student is for such a long period that he cannot put in requisite percentage of attendance.</p> <p><i>Clause 17 of the Ordinance relating to attendance will be implemented from Academic Session 2015-16.</i></p>
10	<p>Resolved that the following amendments to the Ordinances of the University may be recommended to the Executive Council for approval.</p> <p>To add the following after Ordinance XIX:</p> <p><u>Ordinance-XIX-A: Prohibition of and punishment for Ragging</u></p> <p>1) Ragging in any form is strictly prohibited within the premises of the</p>

	University and/or outside the University Campus as well as on public transport.																					
	2) Complaints against ragging shall be dealt in accordance with the 'UGC Regulations on Curbing the Menace of Ragging in Higher Educational Institutions, 2009 as amended from time to time. (Vide Appendix-V)																					
11	<p>Resolved that the following rules for refund of various kinds of fee paid by the students may be recommended to the Executive Council for approval.</p> <p style="text-align: center;"><u>PROPOSED RULES FOR REFUND OF VARIOUS KINDS OF FEE</u></p> <p><u>A. ADMISSION FEE: REGULAR DEPARTMENTS OF THE UNIVERSITY</u></p> <table><tr><th>Sr. No.</th><th>Reasons for seeking refund</th><th>Quantum of fee to be refunded</th></tr><tr><td>a)</td><td>When a student applies for withdrawal of admission 15 days before the last date of admission fixed by the University.</td><td>Full fee after deduction of Rs. 500/- and full Examination fee.</td></tr><tr><td>b)</td><td>When a student applies for withdrawal of admission, three working days before the last date of admission (including the last day of admission)</td><td>Full fee after deduction of Rs. 1000/- and full examination fee. No fee will be refunded thereafter.</td></tr><tr><td>c)</td><td>When admission is made inadvertently due to error/omission/commission on the part of the University</td><td>Full fee and full examination fee</td></tr><tr><td>d)</td><td>When cancellation of admission is due to concealment/falsification of facts, submission of false/fake certificate(s), non-submission of the required documents, providing misleading information by the student or for any error/mistake on the part of the student</td><td>No fee will be refunded</td></tr><tr><td>e)</td><td>When a student of self-financing programme applies for the withdrawal of admission on or before the last date of admission</td><td>Full fee after deduction of Rs. 1000/- and full examination fee</td></tr><tr><td>f)</td><td>If a student provisionally admitted to a programme on declaration of the result of his/her qualifying examination/compartamental examination becomes ineligible for admission and his/her admission is cancelled</td><td>Full fee after deduction of Rs. 1000/- provided that he/she applies for refund in the same financial year</td></tr></table>	Sr. No.	Reasons for seeking refund	Quantum of fee to be refunded	a)	When a student applies for withdrawal of admission 15 days before the last date of admission fixed by the University.	Full fee after deduction of Rs. 500/- and full Examination fee.	b)	When a student applies for withdrawal of admission, three working days before the last date of admission (including the last day of admission)	Full fee after deduction of Rs. 1000/- and full examination fee. No fee will be refunded thereafter.	c)	When admission is made inadvertently due to error/omission/commission on the part of the University	Full fee and full examination fee	d)	When cancellation of admission is due to concealment/falsification of facts, submission of false/fake certificate(s), non-submission of the required documents, providing misleading information by the student or for any error/mistake on the part of the student	No fee will be refunded	e)	When a student of self-financing programme applies for the withdrawal of admission on or before the last date of admission	Full fee after deduction of Rs. 1000/- and full examination fee	f)	If a student provisionally admitted to a programme on declaration of the result of his/her qualifying examination/compartamental examination becomes ineligible for admission and his/her admission is cancelled	Full fee after deduction of Rs. 1000/- provided that he/she applies for refund in the same financial year
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g)	In case a student, after his/her admission, expires within one month of the last date of admission	Full fee including examination fee will be refunded to his/her parents
h)	In case an M.Phil. or Ph.D. student applies for withdrawal of admission within seven days of the date of admission	Full fee after deduction of Rs. 500/-
i)	If an M.Phil. or Ph.D. student, pursuing the programme, discontinues his/her study or withdraws his/her admission after seven days of the date of admission	50% of the total fee
j)	In case admission to the Ph.D. programme is offered at a later date and the student withdraws his/her admission within one month	50% of the total fee
k)	When a student has been allowed to change the programme of study within the departments of the University	After adjustment of fees already paid the student will be required to pay the remaining amount due as prescribed for the new programme. In case the amount paid by the student in the previous programme is more than the amount due for the second programme, the excess amount will be refunded or adjusted towards further month(s) fee

B. REFUND OF EXAMINATION FEE

Sr. No.	Reasons for seeking refund	Quantum of fee to be refunded
a)	In the event of student's inability to continue his/her studies at least one month before the commencement of the examination duly certified by the Head of the Department/Dean of the School	Full Fee after deduction of Rs. 200/-

	<table><tr><td>b)</td><td>If on rechecking of the result, any error or omission is discovered in respect of the marks originally awarded by the examiner concerned or in the record of results prepared by the University</td><td>Full re-checking fee deposited by the candidate for the purpose shall be refunded to the candidate</td></tr></table>	b)	If on rechecking of the result, any error or omission is discovered in respect of the marks originally awarded by the examiner concerned or in the record of results prepared by the University	Full re-checking fee deposited by the candidate for the purpose shall be refunded to the candidate							
b)	If on rechecking of the result, any error or omission is discovered in respect of the marks originally awarded by the examiner concerned or in the record of results prepared by the University	Full re-checking fee deposited by the candidate for the purpose shall be refunded to the candidate									
<p>C. <u>REFUND OF FEE PAID FOR STATEMENT OF MARKS/MIGRATION CERTIFICATE/PROVISIONAL CERTIFICATE/SPECIAL CERTIFICATE/ OFFICIAL TRANSCRIPT/Duplicate Certificate, ETC.</u></p>											
<table><tr><th>Sr. No.</th><th>Reasons for seeking refund</th><th>Quantum of fee to be refunded</th></tr><tr><td>a)</td><td>If a candidate applies for supply of any of the above documents but does not avail it or withdraws the application.</td><td>No fee will be refunded.</td></tr></table>			Sr. No.	Reasons for seeking refund	Quantum of fee to be refunded	a)	If a candidate applies for supply of any of the above documents but does not avail it or withdraws the application.	No fee will be refunded.			
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a)	If a candidate applies for supply of any of the above documents but does not avail it or withdraws the application.	No fee will be refunded.									
<p>D. <u>REFUND OF HOSTEL FEE:</u></p>											
<table><tr><th>Sr. No.</th><th>Reasons for seeking refund</th><th>Quantum of fee to be refunded</th></tr><tr><td>a)</td><td>If a student leaves the hostel within 30 days of the date of his/ her admission for any reason</td><td>Full fee paid by him/ her except the monthly charges will be refunded</td></tr><tr><td>b)</td><td>If a student withdraws his/ her admission after 30 days of his/ her admission for any reason.</td><td>No fee will be refunded.</td></tr></table>			Sr. No.	Reasons for seeking refund	Quantum of fee to be refunded	a)	If a student leaves the hostel within 30 days of the date of his/ her admission for any reason	Full fee paid by him/ her except the monthly charges will be refunded	b)	If a student withdraws his/ her admission after 30 days of his/ her admission for any reason.	No fee will be refunded.
Sr. No.	Reasons for seeking refund	Quantum of fee to be refunded									
a)	If a student leaves the hostel within 30 days of the date of his/ her admission for any reason	Full fee paid by him/ her except the monthly charges will be refunded									
b)	If a student withdraws his/ her admission after 30 days of his/ her admission for any reason.	No fee will be refunded.									
<p>E. In all cases, security deposit/caution money (if any) shall be refunded after submission of clearance from the relevant quarters, provided he/she applies for refund of the same within a period of one year from the date of leaving the institution.</p> <p><i>These rules shall be implemented from the Academic Session 2015-16 and will supersede all previous rules in this regard if any.</i></p>											
12	<p>Resolved that the amendments to Ordinance II (A) relating to Ph.D degree of the University may be recommended to the Executive Council for approval. (Vide Appendix VI)</p> <p><i>Further resolved that the Vice Chancellor be authorised to constitute a committee to design the mode & syllabus for the conduct of entrance examination for admission to Ph.D.</i></p>										

13	Resolved that the amendments to Ordinance II relating to M.Phil degree of the University may be recommended to the Executive Council for approval. (Vide Appendix VII)
Supplementary Agenda Items	
14	Resolved that the recommendations of Board of Studies (expert committee) of the Department of Biotechnology made in its meeting held on 17 th September, 2015 to review the syllabi of M.Sc. Biotechnology 1 st to 4 th Semesters be approved. (Vide Appendix VIII)
15	Resolved that the recommendations of Board of Studies of the Department of English and Foreign Languages made in its meeting held on 5 th October, 2015 to review the syllabi of MA (English) 1 st Semester be approved. (Vide Appendix IX)
16	Resolved that the recommendations of Board of Studies of the Department of Microbiology made in its meeting held on 27 th September, 2015 to review the syllabi of M.Sc. (Microbiology) 1 st to 4 th Semesters be approved. (Vide Appendix X)

The meeting ended with a vote of thanks to the Chair.


VICE CHANCELLOR


REGISTRAR

17th ACADEMIC COUNCIL MEETING

[illegible]

	<p>The Academic Council congratulated the Vice Chancellor and the faculty for getting UGC's approval for the two programmes under B.Voc. and welcomed and endorsed the decision of the Vice Chancellor to start these programmes from the current academic session.</p>	<p>session 2015-16</p>
4.	<p>Online Declaration of the UGC conveying its approval to start <i>Diploma course in Biochemical Techniques</i> under Community College Scheme was reported, recorded and confirmed. (Annexure 2)</p> <p>The Vice Chancellor informed that the University is likely to get approval of the UGC for starting skill development based programmes as well under Deen Dayal Upadhyay KAUSHAL KENDRA scheme. Upon receiving formal approval from the UGC, the programmes that are planned to be initiated under community college scheme will be merged with Deen Dayal Upadhyay KAUSHAL KENDRA.</p> <p>The Academic Council appreciated the initiatives taken by the Vice Chancellor and sincere efforts made by the faculty towards introduction of skill development courses under the schemes offered by the UGC. The Council endorsed the same and advised to initiate necessary steps as and when University hears officially from UGC.</p>	<p>The University has received approval of starting DDU Kaushal Kendra and grant has also been received. Details are being worked out to start the courses during the session 2015-16. It has further been informed that if, the University is already approved either under the scheme of Community Colleges or B.Voc. programs or both, these schemes will get subsumed under the DDU Kaushal Kendra and as provided under para 10.2 of the guidelines for DDU Kaushal Kendra, the expenditure incurred under any of the scheme will be met out of the grants to be released to the DDU Kaushal Kendra. The University has written to the UGC seeking permission to start following three courses :-</p> <p>i. B.Voc in Tourism & Hospitality Management</p> <p>ii. B.Voc program (Biomedical Science).</p> <p>iii. B.Voc Program (Industrial Waste Management).</p> <p>The University has written to the UGC seeking permission to start three courses viz.</p>

5.	<p>The action taken by the Vice Chancellor in deciding to initiate the process of establishing academic collaboration and/or Innovation Incubation Linkages in collaboration with the following were reported, recorded and confirmed:</p> <ul style="list-style-type: none"> • SVI-Analytica, New Delhi • Center of Innovative and Applied Bioprocessing, Mohali • Technology Based Incubator (TBI), University of Delhi • National Small Industries Corporation(NSIC) , New Delhi • National Cooperative Union of India (NCUI), New Delhi <p>The Vice Chancellor informed the members that the University does not have adequate laboratory facilities for the students of PG courses in science subjects. He stressed upon the need for having technical support from different agencies and organisations for the benefit of the students and faculty. Thus, the University has entered into academic and research collaboration with the aforementioned agencies.</p>	Noted
6.	<p>The action taken by the Vice Chancellor regarding revision and restructuring of course structures of all departments in tune with the requirements of the CBCS was reported, recorded and confirmed.</p> <p>The revised course structures were ratified by the Council (Annexure 3)</p> <p>It was resolved further that the syllabus/course structures be revised as and when the need arises for the same for which the Vice Chancellor was authorized to take appropriate steps. The Academic Council appreciated the initiative taken by the Vice Chancellor in implementing CBCS in the PG courses of the University.</p>	<p>The Course structures and CBCS Ordinance have been circulated to all departments.</p>

Items for consideration and approval


7.	<p>The Council considered numbering of the following Ordinances already approved by the EC from time to time and recommended the same for the approval of the Executive Council.</p> <table><tr><th>Proposed Number</th><th>Ordinance</th></tr><tr><td>I</td><td>Governing Grant of Status of Recognized Institutions.</td></tr><tr><td>II</td><td>Award of Degree of M.Phil & Ph.D.</td></tr><tr><td>III</td><td>Powers & Duties of Dean of Schools of Studies.</td></tr><tr><td>IV</td><td>Selection Committee Procedure</td></tr><tr><td>V</td><td>Conditions of Service of Appointed Teachers of the University.</td></tr><tr><td>VI</td><td>Emoluments & other terms and conditions of Service of Pro Vice-Chancellor.</td></tr><tr><td>VII</td><td>Emoluments & other terms and conditions of Service of the Registrar.</td></tr><tr><td>VIII</td><td>Functions & Duties of the DSW.</td></tr><tr><td>IX</td><td>Appointments made under statute 19(2).</td></tr><tr><td>X</td><td>Proposed Ordinance for empanelment of Adjunct Faculty and appointment of Consultants in the University.</td></tr><tr><td>XI</td><td>Board of Studies</td></tr><tr><td>XII</td><td>The School Board.</td></tr><tr><td>XIII</td><td>Head of the Department.</td></tr><tr><td>XIV</td><td>Leave Rules for Teaching Staff.</td></tr><tr><td>XV</td><td>Programmes leading to the Award of Post-Graduate Degrees/ Diplomas.</td></tr><tr><td>XVI</td><td>Medium of Instructions</td></tr><tr><td>XVII</td><td>Assignment of Departments to the Schools.</td></tr><tr><td>XVIII</td><td>Manner of Appointment & Emoluments of Employees other than Teachers and other Academic Staff.</td></tr><tr><td>XIX</td><td>Sensitization, Prevention and Redressal of Sexual Harassment.</td></tr><tr><td>XX</td><td>Convocation</td></tr></table>	Proposed Number	Ordinance	I	Governing Grant of Status of Recognized Institutions.	II	Award of Degree of M.Phil & Ph.D.	III	Powers & Duties of Dean of Schools of Studies.	IV	Selection Committee Procedure	V	Conditions of Service of Appointed Teachers of the University.	VI	Emoluments & other terms and conditions of Service of Pro Vice-Chancellor.	VII	Emoluments & other terms and conditions of Service of the Registrar.	VIII	Functions & Duties of the DSW.	IX	Appointments made under statute 19(2).	X	Proposed Ordinance for empanelment of Adjunct Faculty and appointment of Consultants in the University.	XI	Board of Studies	XII	The School Board.	XIII	Head of the Department.	XIV	Leave Rules for Teaching Staff.	XV	Programmes leading to the Award of Post-Graduate Degrees/ Diplomas.	XVI	Medium of Instructions	XVII	Assignment of Departments to the Schools.	XVIII	Manner of Appointment & Emoluments of Employees other than Teachers and other Academic Staff.	XIX	Sensitization, Prevention and Redressal of Sexual Harassment.	XX	Convocation	<p>The concerned Ordinances with numbering have been uploaded on University website.</p>
Proposed Number	Ordinance																																											
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XX	Convocation																																											
8.	<p>The Council considered the following draft amendments to the Ordinances of the University in pursuance of the UGC letter D.O. No. F.7-1/2015 (NSQF) dated 27 April 2015 (Ref: "UGC Guidelines for Empanelment of Adjunct Faculty in Universities and Colleges") and recommended the same for approval of the EC:</p> <p><u>Add the following after Ordinance IX</u></p> <p>Ordinance X: Empanelment of Adjunct Faculty and appointment of Consultants. (Annexure 4)</p> <ol style="list-style-type: none">1. Empanelment of Adjunct Faculty2. Appointment of Consultants <p>It was resolved further that the Vice Chancellor be authorized to engage the Adjunct Faculty/ Consultants. Since they will be very senior faculty, they should not be made to go through the usual selection process.</p>	<p>Copy endorsed to the concerned office and Ordinance uploaded on the University website.</p>																																										

9.	<p>The Council considered the following draft amendments in the Ordinance XII relating to the “School Board” and recommended the same for approval of the EC:</p> <table><tr><th>Exiting clause</th><th>Proposed amendment</th></tr><tr><td>1. Composition of the School Board: The School Board shall consist of :</td><td>No Change</td></tr><tr><td>i. The Dean of the Schools;</td><td>No Change</td></tr><tr><td>ii. The Head/Chairperson of the Departments/ Centres in the School;</td><td>No Change</td></tr><tr><td>iii. The Professors in the Departments/ Centres in the School;</td><td>No Change</td></tr><tr><td>iv. One Associate Professor and one Assistant Professor, by rotation according to seniority, from each Department/Centre in the School;</td><td>No Change</td></tr><tr><td>v. Five members nominated by the Academic Council for their special knowledge in any subject assigned to the School or in any allied branch of knowledge;</td><td>Upto five members (Preferably one member from each department/ subject) will be nominated by the Vice Chancellor for their special knowledge in any subject assigned to the School or in any allied branch of knowledge.</td></tr><tr><td>vi. Such other members, but not exceeding five, as may be specified.</td><td>To be Deleted</td></tr></table>	Exiting clause	Proposed amendment	1. Composition of the School Board: The School Board shall consist of :	No Change	i. The Dean of the Schools;	No Change	ii. The Head/Chairperson of the Departments/ Centres in the School;	No Change	iii. The Professors in the Departments/ Centres in the School;	No Change	iv. One Associate Professor and one Assistant Professor, by rotation according to seniority, from each Department/Centre in the School;	No Change	v. Five members nominated by the Academic Council for their special knowledge in any subject assigned to the School or in any allied branch of knowledge;	Upto five members (Preferably one member from each department/ subject) will be nominated by the Vice Chancellor for their special knowledge in any subject assigned to the School or in any allied branch of knowledge.	vi. Such other members, but not exceeding five, as may be specified.	To be Deleted	<p>Amended Ordinance uploaded on the University website.</p> <p>Composition of School Board with names of the persons nominated by the Vice Chancellor is being circulated.</p>
Exiting clause	Proposed amendment																	
1. Composition of the School Board: The School Board shall consist of :	No Change																	
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vi. Such other members, but not exceeding five, as may be specified.	To be Deleted																	
10.	<p>The Council considered the following draft amendments in ordinance XI relating to the Constitution of Board of Studies and recommended the same for approval of the EC:</p> <table><tr><th>Exiting clause</th><th>Proposed amendment</th></tr><tr><td>1. Each Department shall have a Board of Studies with the following constitution.</td><td>No Change</td></tr><tr><td>a) Head of the Department, who shall be the Chairman and Convener.</td><td>No Change</td></tr><tr><td>b) Dean of the School concerned or his/her nominee (ex-officio member)</td><td>To be Deleted</td></tr><tr><td>c) All the Professors of the Departments / Centre (ex-officio members)</td><td>No Change</td></tr><tr><td>d) One Associate Professor of the Department by rotation in order of seniority</td><td>No Change</td></tr><tr><td>e) One Assistant Professor of the Department by rotation in order of seniority.</td><td>No Change</td></tr><tr><td>f) Two teachers, from amongst the faculty members of the University belonging to the allied and cognate disciplines, nominated by the Vice Chancellor.</td><td>To be Deleted</td></tr></table>	Exiting clause	Proposed amendment	1. Each Department shall have a Board of Studies with the following constitution.	No Change	a) Head of the Department, who shall be the Chairman and Convener.	No Change	b) Dean of the School concerned or his/her nominee (ex-officio member)	To be Deleted	c) All the Professors of the Departments / Centre (ex-officio members)	No Change	d) One Associate Professor of the Department by rotation in order of seniority	No Change	e) One Assistant Professor of the Department by rotation in order of seniority.	No Change	f) Two teachers, from amongst the faculty members of the University belonging to the allied and cognate disciplines, nominated by the Vice Chancellor.	To be Deleted	<p>Amended Ordinance uploaded on the University website.</p> <p>Composition of Board of Studies with names of the persons nominated by the Vice Chancellor has been circulated.</p>
Exiting clause	Proposed amendment																	
1. Each Department shall have a Board of Studies with the following constitution.	No Change																	
a) Head of the Department, who shall be the Chairman and Convener.	No Change																	
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f) Two teachers, from amongst the faculty members of the University belonging to the allied and cognate disciplines, nominated by the Vice Chancellor.	To be Deleted																	

	g) Two subject experts, not in the service of the University, to be nominated by the Vice Chancellor.	One or Two subject experts, not in the service of the University, to be nominated by the Vice Chancellor.	
11.	<p>The Council considered the following draft amendment to the Ordinances of the University and recommended the same for approval of the EC:</p> <p>Add the following after Ordinance No. XII Ordinance No XIII: Head of the Department</p> <p>1. (i) Each Teaching Department shall have a Head of Department who shall be appointed by the Vice-Chancellor for a period of three years by rotation; provided that Headship of the Department shall rotate between Professors and Associate Professors on seniority basis. Provided further that if a Professor/Associate Professor, who has availed one full term of Headship, then he/she will be eligible for appointment of Head of Department on rotation only after completion of full chain of cycle in order of seniority.</p> <p>(ii) In the case of a Department where no teacher is eligible for appointment as Head of Department, the Dean of the concerned School Board shall be the Head of Department.</p> <p>(iii) In case a senior person is on long leave, the next eligible person will be appointed as Head of the Department and he will continue as such till the completion of his/her term, even if the senior person returns from leave during that period. However, the senior person will be eligible for appointment as Head of Department after the expiry of the term of the present incumbent.</p> <p>(iv) In case the Head of Department, by reason of illness, absence or any other cause, is unable to perform the duties of his/her office, the duties of the office shall be</p>		<p>Copy endorsed to the concerned branch.</p> <p>Ordinance uploaded on the University website.</p>

	<p>performed by the next eligible person, unless, the Vice Chancellor orders otherwise.</p> <p>(v) In case a person refuses to accept the offer of appointment as Head of Department or resigns on his/her own, he/she will not be eligible for appointment as Head of Department till his/her turn comes again after the completion of the rotation circle among the eligible teachers.</p> <p>(vi) If the Vice-Chancellor deems it necessary, he/she may appoint next eligible person as Head of Department irrespective of the fact that the term of the present Head of Department has not yet expired.</p> <p>2. The Head of the Department shall be the academic head of the Department and shall convene and preside over the meetings of the Department and the Board of Studies.</p> <p>3. The Head of the Department shall under the general supervision of the Vice Chancellor:</p> <p>(i) Organize the teaching and research work in the Department.</p> <p>(ii) Frame the time table in conformity with allocation of the teaching work made by the Department.</p> <p>(iii) Maintain discipline in the class rooms and laboratories through the teachers.</p> <p>(iv) Assign to the teachers in the Department such duties as may be necessary for the proper functioning of the Department.</p> <p>(v) Assign work to and exercise control over the non-teaching staff in the Department. And</p> <p>(vi) Be responsible for the coordination and supervision of teaching and research in the Department.</p> <p>(vii) Be responsible for the records, equipment and furniture of the Department and the books of the Departmental Library.</p> <p>(viii) Operate the Budget of the Department.</p> <p>(ix) Perform such other functions as may be assigned by the Dean, the Board of the School concerned, the</p>	
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	<p>Academic Council and the Vice-Chancellor.</p> <p>Note: The constitution of Selection Committee for the teaching posts includes the Head of Department as a member of the Selection Committee. We have advertised the teaching positions and recruitment process is also to take place shortly. But till date no ordinance related to Head of the Department has been created by the University. Therefore the above amendment in the ordinance is being proposed.</p>	
12.	<p>The recommendations of the Departmental Research Councils (DRC) with regard to allotment of PhD students to Supervisors were placed before the Council.</p> <p>After detailed deliberations the Academic Council resolved that the consideration of the minutes of DRCs be deferred and the Vice Chancellor be authorised to decide the further course of action, keeping in view the interests of the students. It was further resolved that the cases where students seek extension, decision may be taken on the merit of the case and in no case the approval be granted beyond three months. This will be adopted as a one-time measure and should not be taken as precedence for future. It was also unanimously agreed that the ceiling for allotment of Ph.D students may be fixed as Professors-8; Associate Professors-6; Assistant Professors-4. In case a teacher, under whom Ph.D students were registered, leaves the university, his/her students may be assigned to the eligible regular faculty over and above the prescribed ceiling mentioned above. The teachers may be allowed to act as co-supervisors in the case of only one student. If there is a need to have additional co-supervisor for specialized knowledge, the same may be engaged from outside the University. It was resolved that the University should propose suitable amendments in the relevant ordinance accordingly.</p>	<p>One time extension of three months has been given to all such students who could not submit their dissertation in time with clear stipulation that it will not be taken as precedence for future. Ceiling for allotment of Ph.D. students have been circulated to all departments. A committee has been constituted to review the ordinance for M.Phil & Ph.D.</p>


 रजिस्ट्रार
 हरियाणा केन्द्रीय विश्वविद्यालय
 गाँव - जाँट पाली
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UNIVERSITY GRANTS COMMISSION
BAHADURSHAH ZAFAR MARG
NEW DELHI 110002

24/08/2015
24/08/2015
24/08/2015

4. Comm. Order is issued in the prescribed
the Secretary, Education and Higher Education

No.F.1-1/2013 (CU)

24th August, 2015

25 AUG 2015

The Registrar
Central University of Haryana
Jant-Pali Villages
Mahendergarh
Haryana - 123029

Sub: Approval of Teaching posts for XII Plan period for Central Universities – Central University of Haryana.

Sir,

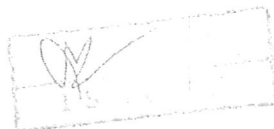
With reference to your letter No. CUH/2015-Reg./63 dated 27th July, 2015, the undersigned is directed to convey the approval of UGC for introduction of following new five departments from the academic session 2015-16 in place of 5 departments earlier approved by UGC vide letter number even dated 5th February, 2014.

1. Department of Biotechnology.
2. Department of Biochemistry.
3. Department of Microbiology.
4. Department of Nutrition Biology.
5. Department of Tourism and Hotel Management.

This issue has the approval of the competent authority

Yours faithfully

(Sushma Rathore)
Under Secretary



9-
V. Taha
24/8/15

**MEMORANDUM OF
UNDERSTANDING (MOU)**


BETWEEN

**NATIONAL COOPERATIVE UNION
OF INDIA (NCUI), NEW DELHI**

AND

**CENTRAL UNIVERSITY OF
HARYANA (CUH), MAHENDRAGARH
(HARYANA)**

**DATED: 24th September, 2015
PLACE: GURGAON CAMP OFFICE, CUH,
MAHENDRAGARH (HARYANA)**



MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding is signed between National Cooperative Union of India, the apex cooperative institution in India (Herein after called as NCUI) / National Council for Cooperative Training (herein after called as NCCT) and Central University of Haryana, Mahendragarh (Haryana) herein after called as (CUH) on 24.07.2015 at Gurgaon Camp Office of CUH, Mahendragarh, Haryana.

That the National Cooperative Union of India which is an apex cooperative organisation representing the entire Indian Cooperative Movement. The objectives of the union are to promote and develop the cooperative movement in India, to educate, to guide and assist the people in their efforts to build up and expand the cooperative sector and to serve as an exponent of cooperative opinion in concurrence with the basic cooperative principles.

That the National Council for Cooperative Training is a National Level Body established with the concurrence of the Government of India, Ministry of Agriculture under the By Laws 16 'A' of NCUI. It is responsible for organising programmes for Human Resource Development in cooperative and allied sector.

That Central University of Haryana, Mahendragarh (Haryana) is a Central University offering various Degrees/ Diploma Courses to students under the recognition of University Grants Commission (UGC).

Whereas both the parties agree to collaborate for undertaking Diploma Course in Cooperative Management for the students of Central University of Haryana, Mahendragarh (Haryana). The duration of Diploma Course in Cooperative Management shall be one year (Two Semesters) from August to May as per university norms covering the following courses for two semesters. The course titles are given below.



COURSE TITLE: COOPERATIVE AND COOPERATIVE MANAGEMENT

Semester: First

Unit -I
Environment for Cooperatives

Unit -II
Cooperative Management

Unit -III
Cooperative Credit, Banking and Non-credit Cooperatives

Unit -IV
Project work on successful cooperative societies / organizations
(to be started in first semester)

COURSE TITLE: COOPERATIVE FINANCE AND MICRO ENTERPRISES

Semester: Second

Unit -I
Cooperative Accounts, Audit & MIS

Unit -II
Cooperative Project Planning, Formulation & Entrepreneurship Development

Unit -III
Cooperatives Law

Unit -IV
Role of Cooperatives in Agriculture & Rural Development

Submission of Project Report



NATIONAL COOPERATIVE UNION OF INDIA (NCUI) / NATIONAL COUNCIL FOR COOPERATIVE TRAINING (NCCT) OBLIGATIONS:

- NCUI / NCCT Shall provide Training of Trainers (ToT) to faculty members of Central University of Haryana (CUH), Mahendragarh (Haryana) through its training units.
- NCUI / NCCT shall design the scheme & syllabus, Methodologies etc for the Course.
- NCUI / NCCT shall facilitate the students in undertaking the project work during the course at the cost of the university.
- The NCUI/ NCCT shall identify successful cooperative societies exclusively run and managed by members and also other cooperative organisations for undertaking the practical field visits of course students to prepare their project reports.
- The NCUI / NCCT shall support and assist the Central University of Haryana in setting of question papers and also assist evaluation of the examination papers and project reports prepared by the students.
- NCUI/ NCCT shall assist the Central University of Haryana, Mahendragarh (Haryana) in establishing/forming of students cooperative in the campus which will cover various services to the students.
- NCUI/ NCCT shall develop study material and provide relevant cooperative books, journals, training manuals etc. for the students on nominal cost basis.
- NCUI / NCCT shall coordinate the study visits of the students to successful cooperative societies to prepare the project report. The travelling and boarding cost as decided by the University will be borne either by the students or by the Central University of Haryana, Mahendragarh (Haryana).

CENTRAL UNIVERSITY OF HARYANA, MAHENDRAGARH (HARYANA) OBLIGATIONS:

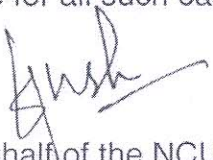
- Central University of Haryana, Mahendragarh (Haryana) shall conduct the Diploma Course in Cooperative Management for the students in their premises.
- Central University of Haryana, Mahendragarh (Haryana) shall follow the scheme, syllabus and examination guidelines of the course as already designed by the NCUI/NCCT and approved by the apex bodies of the Central University of Haryana.

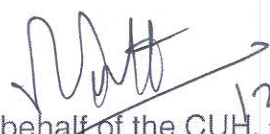


- The Central University of Haryana, Mahendragarh (Haryana) shall prepare panel of resource persons in consultation with officials of NCUI / NCCT for coverage of the syllabus.
- NCUI / NCCT shall provide faculty support to the Central University of Haryana, Mahendragarh (Haryana). Travel expenditure (AC-III Tier by Train / Bus / Taxi), and honorarium (Rs. 1500/- per session of 90 Minutes) and hospitality in their Guest House that includes boarding & lodging of the faculties of NCUI/ NCCT shall be borne by Central University of Haryana, Mahendragarh (Haryana) as per rules of the University.
- The enrolment of the students in each session of the course will be atleast 30 students which will be ensured by CUH as per the rules of the Central University of Haryana, Mahendragarh (Haryana).
- The Central University of Haryana, Mahendragarh (Haryana) shall charge course fees of Rs. 10,000/- from the students as per their guidelines.
- The Central University will decide one Coordinator preferably from Department of Management Studies of CUH who can be contacted and coordinate all the activities of Certificate Course.
- The Diploma to successfully completed students shall be jointly issued by the NCUI and the Central University of Haryana, Mahendragarh (Haryana) to the students and the design of the Certificate will be worked out jointly by CUH and NCUI.

General Points:

- The MOU is initially for a period of three years and may be extended beyond three years by mutual consent of both the parties.
- This MOU may be terminated by either party after giving 90 days written notice of its intention to so terminate the MOU. However, notwithstanding the termination of the MOU, both the parties shall continue to remain responsible for the respective obligations in respect of all the activities which might have already been undertaken prior to termination or then going-on.
- Any dispute arising in the course of the MOU shall be settled amicably and as per the provision of arbitration Laws in which Chief Executive, NCUI / Director General, NCCT, New Delhi will be sole arbitrator. The dispute for all such cases shall be in the jurisdiction of New Delhi.


Signed on behalf of the NCUI/NCCT
(Dr. Dinesh, Chief Executive)


Signed on behalf of the CUH,
Mahendragarh (Haryana)
(Registrar, CUH, Mahendragarh (Haryana)) 13/10/15

Memorandum of Understanding (MOU)

Between

**Technology Applications Service
(TAS), New Delhi**

And

**Central University of Haryana
(CUH), Mahendergarh, Haryana**

Dated: 24th September, 2015

Place: Central University of Haryana
(CUH), Mahendergarh, Haryana

RAH
24/9/15

RK Jang

This Memorandum Of Understanding is signed between Technology Applications Service, New Delhi (Herein after called TAS) and Central University of Haryana, Mahendergarh, Haryana (Herein after called as CUH) on 24.09.2015 at the University Campus in Jant-Pali, Mahendergarh, Haryana.

That the Technology Applications Service is a Delhi based propriety firm working in the fields of (a) Instrumentation Development, (b) Software Development and (c) Training Programs. TAS is devoted to develop new applications of proven technologies and generate self-employment opportunities. TAS is headed by Dr. R. K. Garg, Formerly Scientist, in Council of Scientific and Industrial Research (CSIR) Laboratories- Central Electronics Engineering Research Institute (CSIR-CEERI), Pilani and Central Scientific Instruments Organization (CSIR-CSIO), Chandigarh and formerly Associate Professor, University of Reims, France, Group Leader at CEMES/LOE, Toulouse, France and Guest Scientist at FHI der MPG, Berlin Germany.

That Central University of Haryana, Mahendergarh, Haryana is a Central University established by an act of Parliament in 2009 to provide learning environment for the growth and development of students and faculty through innovative programmes- by pursuing cutting-edge research, scholarly inquiry, and creative endeavors. Currently CUH is offering various degree and diploma courses to students under recognition from University Grants Commission.

Whereas both parties hereby agree to create synergies between the Department of Physics, Central University of Haryana and Technology Applications Service. The purpose of this MOU is to hone the talent of the Post Graduate (PG) students and Research Scholars and provide them with the skills and hands-on exposure in the field of Electron Optics.


24/9/15



Objectives of MOU:

- 1) This undertaking will particularly benefit the final year Post Graduate students equipping them with the technical know-how to design, develop and fabricate filament-less small and broad beam Ion and Electron sources, Specific purpose AC and DC power supplies and Magnetron Sputter Guns for DC/RF systems.
- 2) The MOU will also aim to train the students as part of their PG programme in the relevant areas as per their curriculum requirement.
- 3) The MOU will also endeavor to provide guidance for the project work of the M.Sc. final year students as part of their course work requirement towards fulfillment of their PG degree programme.
- 4) The MOU will also explore future possibilities to jointly design, develop and fabricate instruments in the fields of Electron Optics and Electron Spectroscopy.
- 5) The MOU will facilitate collaboration between CUH and TAS to develop a full-fledged Thin Film fabrication and characterization laboratory along with Electron optics laboratory.

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Technology Applications Service (TAS) Obligations:

- 1) TAS shall provide Training of Trainers (ToT) to faculty members of Central University of Haryana, Mahendergarh, Haryana.
- 2) TAS shall provide their mobile laboratory for conducting at least two workshops of minimum two days duration during one academic year.
- 3) TAS shall provide project work guidance and facilities in their laboratory to the M.Sc. final year students (five) in the fields of Electron Optics towards part fulfillment of the M.Sc. degree requirement at the cost of the University/students.
- 4) TAS will conduct training programmes for five students of Central University of Haryana, Mahendergarh, Haryana, at the cost of the University/students.
- 5) TAS shall identify areas for joint collaboration with Department of Physics, Central University of Haryana, Mahendergarh, Haryana to design, develop and fabricate innovative new products based on Electron Optics.
- 6) TAS in collaboration with Department of Physics, Central University of Haryana, Mahendergarh, Haryana will also explore the possibilities of fabricating low cost instrumentation for Thin Film fabrication laboratory and Electron Optics laboratory.
- 7) TAS shall explore the possibilities to provide the blueprint for facilitating and providing academic and technical support to run skill based courses for designing, developing fabricating filament-less small and broad beam Ion and Electron sources, Specific purpose AC and DC power supplies and Magnetron Sputter Guns for DC/RF systems, Electron Optics and Software programming and development.
- 8) TAS shall also facilitate student educational trips to reputed laboratories in the field of Electron Optics at the cost of the University/students.

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Central University of Haryana (CUH), Mahendergarh, Haryana Obligations:

- 1) CUH shall provide the infrastructure and financial support (travel expenditure (AC-III tier by train/bus/taxi), honorarium (Rs. 1500/- per session of 90 minutes) and hospitality in their guest house that includes boarding and lodging of the faculties/trainers of TAS as per rules of the University) for Training of Trainers (TOT) programme to the faculty members.
- 2) CUH shall provide the infrastructure and financial support (travel expenditure (AC-III tier by train/bus/taxi) and accommodation in guest house) to TAS personnel for conducting workshops.
- 3) CUH will provide laboratory facilities as available with it for carrying out M.Sc. students project work.
- 4) CUH will provide travel expenditure (AC-III tier by train/bus/taxi), honorarium (Rs. 1500/- per session of 90 minutes) and hospitality in their guest house that includes boarding and lodging of the faculties/trainers of TAS as per rules of the University for the conduct of the student training programmes.
- 5) CUH shall provide infrastructure and space for creating laboratories to design, develop and fabricate instrumentation as mentioned in clause (5) and (6) of TAS obligation.
- 6) CUH will form a Committee of Course in consultation with TAS to design and develop skill-based courses including course curriculum, learning objectives and outcomes and mechanism for evaluation and successful completion of the said courses. CUH will also jointly issue certificates to students who successfully complete the course. The financial implications for such skill based courses shall be jointly worked out between CUH and TAS including revenue sharing formula.

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General Points:

- 1) The MOU is initially for a period of two years and may be extended beyond two years by mutual consent of both the parties.
- 2) This MOU may be terminated by either party after giving 90 days written notice of its intention to so terminate the MOU. However, notwithstanding the termination of the MOU, both the parties shall continue to remain responsible for the respective obligations in respect of all the activities which might have already been undertaken prior to the termination or then going-on.
- 3) Any dispute arising in the course of the MOU shall be settled amicably and as per the provision of Arbitration Laws in which Director/Proprietor TAS, New Delhi and Vice-Chancellor, CUH, Mahendergarh, Haryana will be the joint arbitrators. The dispute for all such cases shall be in the jurisdiction of Mahendergarh, Haryana.

R.K. Garg

Signed on behalf of TAS,
New Delhi
(Dr. R. K. Garg)
Director/Proprietor TAS

[Signature] 24/9/15
Signed on behalf of the CUH

रजिस्ट्रार
हरियाणा केन्द्रीय विश्वविद्यालय
(Registrar, CUH)
गाँव - जौन पानी
जिला - महेंद्रगढ़ - 123029
Nde
Mahendergarh, Haryana

Proposed Logo



UNIVERSITY GRANTS COMMISSION
UGC REGULATIONS ON CURBING THE MENACE OF RAGGING IN
HIGHER EDUCATIONAL INSTITUTIONS, 2009.

(under Section 26 (1)(g) of the University Grants Commission Act, 1956)

New Delhi-110002, the 17th June 2009

F.1-16/2007(CPP-II)

PREAMBLE.

In view of the directions of the Hon'ble Supreme Court in the matter of "University of Kerala v/s. Council, Principals, Colleges and others" in SLP no. 24295 of 2006 dated 16.05.2007 and that dated 8.05.2009 in Civil Appeal number 887 of 2009, and in consideration of the determination of the Central Government and the University Grants Commission to prohibit, prevent and eliminate the scourge of ragging including any conduct by any student or students whether by words spoken or written or by an act which has the effect of teasing, treating or handling with rudeness a fresher or any other student, or indulging in rowdy or indisciplined activities by any student or students which causes or is likely to cause annoyance, hardship or psychological harm or to raise fear or apprehension thereof in any fresher or any other student or asking any student to do any act which such student will not in the ordinary course do and which has the effect of causing or generating a sense of shame, or torment or embarrassment so as to adversely affect the physique or psyche of such fresher or any other student, with or without an intent to derive a sadistic pleasure or showing off power, authority or superiority by a student over any fresher or any other student, in all higher education institutions in the country, and thereby, to provide for the healthy development, physically and psychologically, of all students, the University Grants Commission, in consultation with the Councils, brings forth this Regulation.

In exercise of the powers conferred by Clause (g) of sub-section (1) of Section 26 of the University Grants Commission Act, 1956, the University Grants Commission hereby makes the following Regulations, namely;

1. Title, commencement and applicability.-

1.1 These regulations shall be called the "UGC Regulations on Curbing the Menace of Ragging in Higher Educational Institutions, 2009".

1.2 They shall come into force from the date of their publication in the Official Gazette.

1.3 They shall apply to all the institutions coming within the definition of an University under sub-section (f) of section (2) of the University Grants Commission Act, 1956, and to all institutions deemed to be a university under Section 3 of the University Grants Commission Act, 1956, to all other higher educational institutions, or elements of such universities or institutions, including its departments, constituent units and all the premises, whether being academic, residential, playgrounds, canteen, or other such premises of such universities, deemed universities and higher educational institutions, whether located within the campus or outside, and to all means of transportation of students, whether public or private, accessed by students for the pursuit of studies in such universities, deemed universities and higher educational institutions.

2. Objectives.-

To prohibit any conduct by any student or students whether by words spoken or written or by an act which has the effect of teasing, treating or handling with rudeness a fresher or any other student, or indulging in rowdy or indisciplined activities by any student or students which causes or is likely to cause annoyance, hardship or psychological harm or to raise fear or apprehension thereof in any fresher or any other student or asking any student to do any act which such student will not in the ordinary course do and which has the effect of causing or generating a sense of shame, or torment or embarrassment so as to adversely affect the physique or psyche of such fresher or any other student, with or without an intent to derive a sadistic pleasure or showing off power, authority or superiority by a student over any fresher or any other student; and thereby, to eliminate ragging in all its forms from universities, deemed universities and other higher educational institutions in the country by prohibiting it

under these Regulations, preventing its occurrence and punishing those who indulge in ragging as provided for in these Regulations and the appropriate law in force.

3. What constitutes Ragging.- Ragging constitutes one or more of any of the following acts:

- a. any conduct by any student or students whether by words spoken or written or by an act which has the effect of teasing, treating or handling with rudeness a fresher or any other student;
- b. indulging in rowdy or indisciplined activities by any student or students which causes or is likely to cause annoyance, hardship, physical or psychological harm or to raise fear or apprehension thereof in any fresher or any other student;
- c. asking any student to do any act which such student will not in the ordinary course do and which has the effect of causing or generating a sense of shame, or torment or embarrassment so as to adversely affect the physique or psyche of such fresher or any other student;
- d. any act by a senior student that prevents, disrupts or disturbs the regular academic activity of any other student or a fresher;
- e. exploiting the services of a fresher or any other student for completing the academic tasks assigned to an individual or a group of students.
- f. any act of financial extortion or forceful expenditure burden put on a fresher or any other student by students;
- g. any act of physical abuse including all variants of it: sexual abuse, homosexual assaults, stripping, forcing obscene and lewd acts, gestures, causing bodily harm or any other danger to health or person;
- h. any act or abuse by spoken words, emails, post, public insults which would also include deriving perverted pleasure, vicarious or sadistic thrill from actively or passively participating in the discomfiture to fresher or any other student ;
- i. any act that affects the mental health and self-confidence of a fresher or any other student

with or without an intent to derive a sadistic pleasure or showing off power, authority or superiority by a student over any fresher or any other student.

4. Definitions.-

- 1) In these regulations unless the context otherwise requires,-
 - a) "Act" means, the University Grants Commission Act, 1956 (3 of 1956);
 - b) "Academic year" means the period from the commencement of admission of students in any course of study in the institution up to the completion of academic requirements for that particular year.
 - c) "Anti-Ragging Helpline" means the Helpline established under clause (a) of Regulation 8.1 of these Regulations.
 - d) "Commission" means the University Grants Commission;
 - e) "Council" means a body so constituted by an Act of Parliament or an Act of any State Legislature for setting, or co-ordinating or maintaining standards in the relevant areas of higher education, such as the All India Council for Technical Education (AICTE), the Bar Council of India (BCI), the Dental Council of India (DCI), the Distance Education Council (DEC), the Indian Council of Agricultural Research (ICAR), the Indian Nursing Council (INC), the Medical Council of India (MCI), the National Council for Teacher Education (NCTE), the Pharmacy Council of India (PCI), etc. and the State Higher Education Councils.
 - f) "District Level Anti-Ragging Committee" means the Committee, headed by the District Magistrate, constituted by the State Government, for the control and elimination of ragging in institutions within the jurisdiction of the district.
 - g) "Head of the institution" means the Vice-Chancellor in case of a university or a deemed to be university, the Principal or the Director or such other designation as the executive head of the institution or the college is referred.
 - h) "Fresher" means a student who has been admitted to an institution and who is undergoing his/her first year of study in such institution.
 - i) "Institution" means a higher educational institution including, but not limited to an university, a deemed to be university, a college, an institute, an institution of national importance set up by an Act of Parliament or a constituent unit of such institution, imparting higher education beyond 12 years of schooling leading to, but not necessarily culminating in, a degree (graduate, postgraduate and/or higher level) and/or to a university diploma.

j) "NAAC" means the National Academic and Accreditation Council established by the Commission under section 12(ccc) of the Act;

k) "State Level Monitoring Cell" means the body constituted by the State Government for the control and elimination of ragging in institutions within the jurisdiction of the State, established under a State Law or on the advice of the Central Government, as the case may be.

(2) Words and expressions used and not defined herein but defined in the Act or in the General Clauses Act, 1897, shall have the meanings respectively assigned to them in the Act or in the General Clauses Act, 1897, as the case may be.

5. Measures for prohibition of ragging at the institution level:-

- a) No institution or any part of it thereof, including its elements, including, but not limited to, the departments, constituent units, colleges, centres of studies and all its premises, whether academic, residential, playgrounds, or canteen, whether located within the campus or outside, and in all means of transportation of students, whether public or private, accessed by students for the pursuit of studies in such institutions, shall permit or condone any reported incident of ragging in any form; and all institutions shall take all necessary and required measures, including but not limited to the provisions of these Regulations, to achieve the objective of eliminating ragging, within the institution or outside,
- b) All institutions shall take action in accordance with these Regulations against those found guilty of ragging and/or abetting ragging, actively or passively, or being part of a conspiracy to promote ragging.

6 Measures for prevention of ragging at the institution level.-

6.1 An institution shall take the following steps in regard to admission or registration of students; namely,

- a) Every public declaration of intent by any institution, in any electronic, audio-visual or print or any other media, for admission of students to any course of study shall expressly provide that ragging is totally prohibited in the institution,

and anyone found guilty of ragging and/or abetting ragging, whether actively or passively, or being a part of a conspiracy to promote ragging, is liable to be punished in accordance with these Regulations as well as under the provisions of any penal law for the time being in force.

- b) The brochure of admission/instruction booklet or the prospectus, whether in print or electronic format, shall prominently print these Regulations in full.

Provided that the institution shall also draw attention to any law concerning ragging and its consequences, as may be applicable to the institution publishing such brochure of admission/instruction booklet or the prospectus.

Provided further that the telephone numbers of the Anti-Ragging Helpline and all the important functionaries in the institution, including but not limited to the Head of the institution, faculty members, members of the Anti-Ragging Committees and Anti-Ragging Squads, District and Sub-Divisional authorities, Wardens of hostels, and other functionaries or authorities where relevant, shall be published in the brochure of admission/instruction booklet or the prospectus.

- c) Where an institution is affiliated to a University and publishes a brochure of admission/instruction booklet or a prospectus, the affiliating university shall ensure that the affiliated institution shall comply with the provisions of clause (a) and clause (b) of Regulation 6.1 of these Regulations.
- d) The application form for admission, enrolment or registration shall contain an affidavit, mandatorily in English and in Hindi and/or in one of the regional languages known to the applicant, as provided in the English language in Annexure I to these Regulations, to be filled up and signed by the applicant to the effect that he/she has read and understood the provisions of these Regulations as well as the provisions of any other law for the time being in force, and is aware of the prohibition of ragging and the punishments prescribed, both under penal laws as well as under these Regulations and also affirm to the effect that he/she has not been expelled and/or debarred by any institution and further aver that he/she would not indulge, actively or passively, in the act or abet the act of ragging and if found guilty of ragging and/or abetting ragging, is liable to be proceeded against under these Regulations or under any penal law or any

other law for the time being in force and such action would include but is not limited to debarment or expulsion of such student.

- e) The application form for admission, enrolment or registration shall contain an affidavit, mandatorily in English and in Hindi and/or in one of the regional languages known to the parents/guardians of the applicant, as provided in the English language in Annexure I to these Regulations, to be filled up and signed by the parents/guardians of the applicant to the effect that he/she has read and understood the provisions of these Regulations as well as the provisions of any other law for the time being in force, and is aware of the prohibition of ragging and the punishments prescribed, both under penal laws as well as under these Regulations and also affirm to the effect that his/her ward has not been expelled and/or debarred by any institution and further aver that his/her ward would not indulge, actively or passively, in the act or abet the act of ragging and if found guilty of ragging and/or abetting ragging, his/her ward is liable to be proceeded against under these Regulations or under any penal law or any other law for the time being in force and such action would include but is not limited to debarment or expulsion of his/her ward.
- f) The application for admission shall be accompanied by a document in the form of, or annexed to, the School Leaving Certificate/Transfer Certificate/Migration Certificate/Character Certificate reporting on the inter-personal/social behavioural pattern of the applicant, to be issued by the school or institution last attended by the applicant, so that the institution can thereafter keep watch on the applicant, if admitted, whose behaviour has been commented in such document.
- g) A student seeking admission to a hostel forming part of the institution, or seeking to reside in any temporary premises not forming part of the institution, including a private commercially managed lodge or hostel, shall have to submit additional affidavits countersigned by his/her parents/guardians in the form prescribed in Annexure I and Annexure II to these Regulations respectively along with his/her application.
- h) Before the commencement of the academic session in any institution, the Head of the Institution shall convene and address a meeting of various functionaries/agencies, such as Hostel Wardens, representatives of students,

parents/ guardians, faculty, district administration including the police, to discuss the measures to be taken to prevent ragging in the institution and steps to be taken to identify those indulging in or abetting ragging and punish them.

- i) The institution shall, to make the community at large and the students in particular aware of the dehumanizing effect of ragging, and the approach of the institution towards those indulging in ragging, prominently display posters depicting the provisions of penal law applicable to incidents of ragging, and the provisions of these Regulations and also any other law for the time being in force, and the punishments thereof, shall be prominently displayed on Notice Boards of all departments, hostels and other buildings as well as at places, where students normally gather and at places, known to be vulnerable to occurrences of ragging incidents.
- j) The institution shall request the media to give adequate publicity to the law prohibiting ragging and the negative aspects of ragging and the institution's resolve to ban ragging and punish those found guilty without fear or favour.
- k) The institution shall identify, properly illuminate and keep a close watch on all locations known to be vulnerable to occurrences of ragging incidents.
- l) The institution shall tighten security in its premises, especially at vulnerable places and intense policing by Anti-Ragging Squad, referred to in these Regulations and volunteers, if any, shall be resorted to at such points at odd hours during the first few months of the academic session.
- m) The institution shall utilize the vacation period before the start of the new academic year to launch a publicity campaign against ragging through posters, leaflets and such other means, as may be desirable or required, to promote the objectives of these Regulations.
- n) The faculties/departments/units of the institution shall have induction arrangements, including those which anticipate, identify and plan to meet any special needs of any specific section of students, in place well in advance of the beginning of the academic year with an aim to promote the objectives of this Regulation.
- o) Every institution shall engage or seek the assistance of professional counsellors before the commencement of the academic session, to be available

when required by the institution, for the purposes of offering counselling to freshers and to other students after the commencement of the academic year.

- p) The head of the institution shall provide information to the local police and local authorities, the details of every privately commercially managed hostels or lodges used for residential purposes by students enrolled in the institution and the head of the institution shall also ensure that the Anti-Ragging Squad shall ensure vigil in such locations to prevent the occurrence of ragging therein.

6.2 An institution shall, on admission or enrolment or registration of students, take the following steps, namely;

- a) Every fresh student admitted to the institution shall be given a printed leaflet detailing to whom he/she has to turn to for help and guidance for various purposes including addresses and telephone numbers, so as to enable the student to contact the concerned person at any time, if and when required, of the Anti-Ragging Helpline referred to in these Regulations, Wardens, Head of the institution, all members of the anti-ragging squads and committees, relevant district and police authorities.
- b) The institution, through the leaflet specified in clause (a) of Regulation 6.2 of these Regulations shall explain to the freshers, the arrangements made for their induction and orientation which promote efficient and effective means of integrating them fully as students with those already admitted to the institution in earlier years.
- c) The leaflet specified in clause (a) of Regulation 6.2 of these Regulations shall inform the freshers about their rights as bona fide students of the institution and clearly instructing them that they should desist from doing anything, with or against their will, even if ordered to by the seniors students, and that any attempt of ragging shall be promptly reported to the Anti-ragging Squad or to the Warden or to the Head of the institution, as the case may be.
- d) The leaflet specified in clause (a) of Regulation 6.2 of these Regulations shall contain a calendar of events and activities laid down by the institution to facilitate and complement familiarization of freshers with the academic environment of the institution.

- e) The institution shall, on the arrival of senior students after the first week or after the second week, as the case may be, schedule orientation programmes as follows, namely; (i) joint sensitization programme and counselling of both freshers and senior students by a professional counsellor, referred to in clause (o) of Regulation 6.1 of these Regulations; (ii) joint orientation programme of freshers and seniors to be addressed by the Head of the institution and the anti-ragging committee; (iii) organization on a large scale of cultural, sports and other activities to provide a platform for the freshers and seniors to interact in the presence of faculty members; (iv) in the hostel, the warden should address all students; and may request two junior colleagues from the college faculty to assist the warden by becoming resident tutors for a temporary duration. (v) as far as possible faculty members should dine with the hostel residents in their respective hostels to instil a feeling of confidence among the freshers.
- f) The institution shall set up appropriate committees, including the course-in-charge, student advisor, Wardens and some senior students as its members, to actively monitor, promote and regulate healthy interaction between the freshers, junior students and senior students.
- g) Freshers or any other student(s), whether being victims, or witnesses, in any incident of ragging, shall be encouraged to report such occurrence, and the identity of such informants shall be protected and shall not be subject to any adverse consequence only for the reason for having reported such incidents.
- h) Each batch of freshers, on arrival at the institution, shall be divided into small groups and each such group shall be assigned to a member of the faculty, who shall interact individually with each member of the group every day for ascertaining the problems or difficulties, if any, faced by the fresher in the institution and shall extend necessary help to the fresher in overcoming the same.
- i) It shall be the responsibility of the member of the faculty assigned to the group of freshers, to coordinate with the Wardens of the hostels and to make surprise visits to the rooms in such hostels, where a member or members of the group are lodged; and such member of faculty shall maintain a diary of his/her interaction with the freshers under his/her charge.

- j) Freshers shall be lodged, as far as may be, in a separate hostel block, and where such facilities are not available, the institution shall ensure that access of seniors to accommodation allotted to freshers is strictly monitored by wardens, security guards and other staff of the institution.
- k) A round the clock vigil against ragging in the hostel premises, in order to prevent ragging in the hostels after the classes are over, shall be ensured by the institution.
- l) It shall be the responsibility of the parents/guardians of freshers to promptly bring any instance of ragging to the notice of the Head of the Institution.
- m) Every student studying in the institution and his/her parents/guardians shall provide the specific affidavits required under clauses (d), (e) and (g) of Regulation 6.1 of these Regulations at the time of admission or registration, as the case may be, during each academic year.
- n) Every institution shall obtain the affidavit from every student as referred to above in clause (m) of Regulation 6.2 and maintain a proper record of the same and to ensure its safe upkeep thereof, including maintaining the copies of the affidavit in an electronic form, to be accessed easily when required either by the Commission or any of the Councils or by the institution or by the affiliating University or by any other person or organisation authorised to do so.
- o) Every student at the time of his/her registration shall inform the institution about his/her place of residence while pursuing the course of study, and in case the student has not decided his/her place of residence or intends to change the same, the details of his place of residence shall be provided immediately on deciding the same; and specifically in regard to a private commercially managed lodge or hostel where he/she has taken up residence.
- p) The Head of the institution shall, on the basis of the information provided by the student under clause (o) of Regulation 6.2, apportion sectors to be assigned to members of the faculty, so that such member of faculty can maintain vigil and report any incident of ragging outside the campus or en route while commuting to the institution using any means of transportation of students, whether public or private.

- q) The Head of the institution shall, at the end of each academic year, send a letter to the parents/guardians of the students who are completing their first year in the institution, informing them about these Regulations and any law for the time being in force prohibiting ragging and the punishments thereof as well as punishments prescribed under the penal laws, and appealing to them to impress upon their wards to desist from indulging in ragging on their return to the institution at the beginning of the academic session next.

6.3 Every institution shall constitute the following bodies; namely,

- a) Every institution shall constitute a Committee to be known as the Anti-Ragging Committee to be nominated and headed by the Head of the institution, and consisting of representatives of civil and police administration, local media, Non Government Organizations involved in youth activities, representatives of faculty members, representatives of parents, representatives of students belonging to the freshers' category as well as senior students, non-teaching staff; and shall have a diverse mix of membership in terms of levels as well as gender.
- b) It shall be the duty of the Anti-Ragging Committee to ensure compliance with the provisions of these Regulations as well as the provisions of any law for the time being in force concerning ragging; and also to monitor and oversee the performance of the Anti-Ragging Squad in prevention of ragging in the institution.
- c) Every institution shall also constitute a smaller body to be known as the Anti-Ragging Squad to be nominated by the Head of the Institution with such representation as may be considered necessary for maintaining vigil, oversight and patrolling functions and shall remain mobile, alert and active at all times.

Provided that the Anti-Ragging Squad shall have representation of various members of the campus community and shall have no outside representation.

- d) It shall be the duty of the Anti-Ragging Squad to be called upon to make surprise raids on hostels, and other places vulnerable to incidents of, and having the potential of, ragging and shall be empowered to inspect such places.
- e) It shall also be the duty of the Anti-Ragging Squad to conduct an on-the-spot enquiry into any incident of ragging referred to it by the Head of the institution

or any member of the faculty or any member of the staff or any student or any parent or guardian or any employee of a service provider or by any other person, as the case may be; and the enquiry report along with recommendations shall be submitted to the Anti-Ragging Committee for action under clause (a) of Regulation 9.1.

Provided that the Anti-Ragging Squad shall conduct such enquiry observing a fair and transparent procedure and the principles of natural justice and after giving adequate opportunity to the student or students accused of ragging and other witnesses to place before it the facts, documents and views concerning the incident of ragging, and considering such other relevant information as may be required.

- f) Every institution shall, at the end of each academic year, in order to promote the objectives of these Regulations, constitute a Mentoring Cell consisting of students volunteering to be Mentors for freshers, in the succeeding academic year; and there shall be as many levels or tiers of Mentors as the number of batches in the institution, at the rate of one Mentor for six freshers and one Mentor of a higher level for six Mentors of the lower level.
- g) Every University shall constitute a body to be known as Monitoring Cell on Ragging, which shall coordinate with the affiliated colleges and institutions under the domain of the University to achieve the objectives of these Regulations; and the Monitoring Cell shall call for reports from the Heads of institutions in regard to the activities of the Anti-Ragging Committees, Anti - Ragging Squads, and the Mentoring Cells at the institutions, and it shall also keep itself abreast of the decisions of the District level Anti-Ragging Committee headed by the District Magistrate.
- h) The Monitoring Cell shall also review the efforts made by institutions to publicize anti-ragging measures, soliciting of affidavits from parents/guardians and from students, each academic year, to abstain from ragging activities or willingness to be penalized for violations; and shall function as the prime mover for initiating action on the part of the appropriate authorities of the university for amending the Statutes or Ordinances or Bye-laws to facilitate the implementation of anti-ragging measures at the level of the institution.

- 6.4 Every institution shall take the following other measures, namely;
- a) Each hostel or a place where groups of students reside, forming part of the institution, shall have a full-time Warden, to be appointed by the institution as per the eligibility criteria laid down for the post reflecting both the command and control aspects of maintaining discipline and preventing incidents of ragging within the hostel, as well as the softer skills of counselling and communicating with the youth outside the class-room situation; and who shall reside within the hostel, or at the very least, in the close vicinity thereof.
 - b) The Warden shall be accessible at all hours and be available on telephone and other modes of communication, and for the purpose the Warden shall be provided with a mobile phone by the institution, the number of which shall be publicised among all students residing in the hostel.
 - c) The institution shall review and suitably enhance the powers of Wardens; and the security personnel posted in hostels shall be under the direct control of the Warden and their performance shall be assessed by them.
 - d) The professional counsellors referred to under clause (o) of Regulation 6.1 of these Regulations shall, at the time of admission, counsel freshers and/or any other student(s) desiring counselling, in order to prepare them for the life ahead, particularly in regard to the life in hostels and to the extent possible, also involve parents and teachers in the counselling sessions.
 - e) The institution shall undertake measures for extensive publicity against ragging by means of audio-visual aids, counselling sessions, workshops, painting and design competitions among students and such other measures, as it may deem fit.
 - f) In order to enable a student or any person to communicate with the Anti-Ragging Helpline, every institution shall permit unrestricted access to mobile phones and public phones in hostels and campuses, other than in class-rooms, seminar halls, library, and in such other places that the institution may deem it necessary to restrict the use of phones.
 - g) The faculty of the institution and its non-teaching staff, which includes but is not limited to the administrative staff, contract employees, security guards

and employees of service providers providing services within the institution, shall be sensitized towards the ills of ragging, its prevention and the consequences thereof.

h) The institution shall obtain an undertaking from every employee of the institution including all teaching and non-teaching members of staff, contract labour employed in the premises either for running canteen or as watch and ward staff or for cleaning or maintenance of the buildings/lawns and employees of service providers providing services within the institution, that he/she would report promptly any case of ragging which comes to his/her notice.

i) The institution shall make a provision in the service rules of its employees for issuing certificates of appreciation to such members of the staff who report incidents of ragging, which will form part of their service record.

j) The institution shall give necessary instructions to the employees of the canteens and messing, whether that of the institution or that of a service provider providing this service, or their employers, as the case may be, to keep a strict vigil in the area of their work and to report the incidents of ragging to the Head of the institution or members of the Anti-Ragging Squad or members of the Anti-Ragging Committee or the Wardens, as may be required.

k) All Universities awarding a degree in education at any level, shall be required to ensure that institutions imparting instruction in such courses or conducting training programme for teachers include inputs relating to anti-ragging and the appreciation of the relevant human rights, as well as inputs on topics regarding sensitization against corporal punishments and checking of bullying amongst students, so that every teacher is equipped to handle at least the rudiments of the counselling approach.

l) Discreet random surveys shall be conducted amongst the freshers every fortnight during the first three months of the academic year to verify and cross-check whether the institution is indeed free of ragging or not and for the purpose the institution may design its own methodology of conducting such surveys.

m) The institution shall cause to have an entry, apart from those relating to general conduct and behaviour, made in the Migration/Transfer Certificate issued to the student while leaving the institution, as to whether the student has been

punished for committing or abetting an act of ragging, as also whether the student has displayed persistent violent or aggressive behaviour or any inclination to harm others, during his course of study in the institution.

n) Notwithstanding anything contained in these Regulations with regard to obligations and responsibilities pertaining to the authorities or members of bodies prescribed above, it shall be the general collective responsibility of all levels and sections of authorities or functionaries including members of the faculty and employees of the institution, whether regular or temporary, and employees of service providers providing service within the institution, to prevent or to act promptly against the occurrence of ragging or any incident of ragging which comes to their notice.

o) The Heads of institutions affiliated to a University or a constituent of the University, as the case may be, shall, during the first three months of an academic year, submit a weekly report on the status of compliance with Anti-Ragging measures under these Regulations, and a monthly report on such status thereafter, to the Vice-Chancellor of the University to which the institution is affiliated to or recognized by.

p) The Vice Chancellor of each University, shall submit fortnightly reports of the University, including those of the Monitoring Cell on Ragging in case of an affiliating university, to the State Level Monitoring Cell.

7. Action to be taken by the Head of the institution.- On receipt of the recommendation of the Anti Ragging Squad or on receipt of any information concerning any reported incident of ragging, the Head of institution shall immediately determine if a case under the penal laws is made out and if so, either on his own or through a member of the Anti-Ragging Committee authorised by him in this behalf, proceed to file a First Information Report (FIR), within twenty four hours of receipt of such information or recommendation, with the police and local authorities, under the appropriate penal provisions relating to one or more of the following, namely;

- i. Abetment to ragging;
- ii. Criminal conspiracy to rag;
- iii. Unlawful assembly and rioting while ragging;

- iv. Public nuisance created during ragging;
- v. Violation of decency and morals through ragging;
- vi. Injury to body, causing hurt or grievous hurt;
- vii. Wrongful restraint;
- viii. Wrongful confinement;
- ix. Use of criminal force;
- x. Assault as well as sexual offences or unnatural offences;
- xi. Extortion;
- xii. Criminal trespass;
- xiii. Offences against property;
- xiv. Criminal intimidation;
- xv. Attempts to commit any or all of the above mentioned offences against the victim(s);
- xvi. Threat to commit any or all of the above mentioned offences against the victim(s);
- xvii. Physical or psychological humiliation;
- xviii. All other offences following from the definition of "Ragging".

Provided that the Head of the institution shall forthwith report the occurrence of the incident of ragging to the District Level Anti-Ragging Committee and the Nodal officer of the affiliating University, if the institution is an affiliated institution.

Provided further that the institution shall also continue with its own enquiry initiated under clause 9 of these Regulations and other measures without waiting for action on the part of the police/local authorities and such remedial action shall be initiated and completed immediately and in no case later than a period of seven days of the reported occurrence of the incident of ragging.

8. Duties and Responsibilities of the Commission and the Councils.-

8.1 The Commission shall, with regard to providing facilitating communication of information regarding incidents of ragging in any institution, take the following steps, namely;

- a) The Commission shall establish, fund and operate, a toll-free Anti-Ragging Helpline, operational round the clock, which could be accessed by students in distress owing to ragging related incidents.
 - b) Any distress message received at the Anti-Ragging Helpline shall be simultaneously relayed to the Head of the Institution, the Warden of the Hostels, the Nodal Officer of the affiliating University, if the incident reported has taken place in an institution affiliated to a University, the concerned District authorities and if so required, the District Magistrate, and the Superintendent of Police, and shall also be web enabled so as to be in the public domain simultaneously for the media and citizens to access it.
 - c) The Head of the institution shall be obliged to act immediately in response to the information received from the Anti-Ragging Helpline as at sub-clause (b) of this clause.
 - d) The telephone numbers of the Anti-Ragging Helpline and all the important functionaries in every institution, Heads of institutions, faculty members, members of the anti-ragging committees and anti ragging squads, district and sub-divisional authorities and state authorities, Wardens of hostels, and other functionaries or authorities where relevant, shall be widely disseminated for access or to seek help in emergencies.
 - e) The Commission shall maintain an appropriate data base to be created out of affidavits, affirmed by each student and his/her parents/guardians and stored electronically by the institution, either on its or through an agency to be designated by it; and such database shall also function as a record of ragging complaints received, and the status of the action taken thereon.
 - f) The Commission shall make available the database to a non-governmental agency to be nominated by the Central Government, to build confidence in the public and also to provide information of non compliance with these Regulations to the Councils and to such bodies as may be authorised by the Commission or by the Central Government.
- 8.2 The Commission shall take the following regulatory steps, namely;

- a) The Commission shall make it mandatory for the institutions to incorporate in their prospectus, the directions of the Central Government or the State Level Monitoring Committee with regard to prohibition and consequences of ragging, and that non-compliance with these Regulations and directions so provided, shall be considered as lowering of academic standards by the institution, therefore making it liable for appropriate action.
- b) The Commission shall verify that the institutions strictly comply with the requirement of getting the affidavits from the students and their parents/guardians as envisaged under these Regulations.
- c) The Commission shall include a specific condition in the Utilization Certificate, in respect of any financial assistance or grants-in-aid to any institution under any of the general or special schemes of the Commission, that the institution has complied with the anti-ragging measures.
- d) Any incident of ragging in an institution shall adversely affect its accreditation, ranking or grading by NAAC or by any other authorised accreditation agencies while assessing the institution for accreditation, ranking or grading purposes.
- e) The Commission may accord priority in financial grants-in-aid to those institutions, otherwise eligible to receive grants under section 12B of the Act, which report a blemishless record in terms of there being no reported incident of ragging.
- f) The Commission shall constitute an Inter-Council Committee, consisting of representatives of the various Councils, the Non-Governmental agency responsible for monitoring the database maintained by the Commission under clause (g) of Regulation 8.1 and such other bodies in higher education, to coordinate and monitor the anti-ragging measures in institutions across the country and to make recommendations from time to time; and shall meet at least once in six months each year.
- g) The Commission shall institute an Anti-Ragging Cell within the Commission as an institutional mechanism to provide secretarial support for collection of information and monitoring, and to coordinate with the State Level Monitoring Cell and University level Committees for effective implementation of anti-ragging measures, and the Cell shall also coordinate with the Non-Governmental agency

responsible for monitoring the database maintained by the Commission appointed under clause (g) of Regulation 8.1.

9. Administrative action in the event of ragging.-

9.1 The institution shall punish a student found guilty of ragging after following the procedure and in the manner prescribed hereinunder:

- a) The Anti-Ragging Committee of the institution shall take an appropriate decision, in regard to punishment or otherwise, depending on the facts of each incident of ragging and nature and gravity of the incident of ragging established in the recommendations of the Anti-Ragging Squad.
- b) The Anti-Ragging Committee may, depending on the nature and gravity of the guilt established by the Anti-Ragging Squad, award, to those found guilty, one or more of the following punishments, namely;
 - i. Suspension from attending classes and academic privileges.
 - ii. Withholding/ withdrawing scholarship/ fellowship and other benefits.
 - iii. Debarring from appearing in any test/ examination or other evaluation process.
 - iv. Withholding results.
 - v. Debarring from representing the institution in any regional, national or international meet, tournament, youth festival, etc.
 - vi. Suspension/ expulsion from the hostel.
 - vii. Cancellation of admission.
 - viii. Rustication from the institution for period ranging from one to four semesters.
 - ix. Expulsion from the institution and consequent debarring from admission to any other institution for a specified period.

Provided that where the persons committing or abetting the act of ragging are not identified, the institution shall resort to collective punishment.

- c) An appeal against the order of punishment by the Anti-Ragging Committee shall lie,
 - i. in case of an order of an institution, affiliated to or constituent part, of a University, to the Vice-Chancellor of the University;

- ii. In case of an order of a University, to its Chancellor.
- iii. In case of an institution of national importance created by an Act of Parliament, to the Chairman or Chancellor of the institution, as the case may be.

9.2 Where an institution, being constituent of, affiliated to or recognized by a University, fails to comply with any of the provisions of these Regulations or fails to curb ragging effectively, such University may take any one or more of the following actions, namely;

- i. Withdrawal of affiliation/recognition or other privileges conferred.
- ii. Prohibiting such institution from presenting any student or students then undergoing any programme of study therein for the award of any degree/diploma of the University.

Provided that where an institution is prohibited from presenting its student or students, the Commission shall make suitable arrangements for the other students so as to ensure that such students are able to pursue their academic studies.

- iii. Withholding grants allocated to it by the university, if any
- iv. Withholding any grants channelised through the university to the institution.
- v. Any other appropriate penalty within the powers of the university.

9.3 Where in the opinion of the appointing authority, a lapse is attributable to any member of the faculty or staff of the institution, in the matter of reporting or taking prompt action to prevent an incident of ragging or who display an apathetic or insensitive attitude towards complaints of ragging, or who fail to take timely steps, whether required under these Regulations or otherwise, to prevent an incident or incidents of ragging, then such authority shall initiate departmental disciplinary action, in accordance with the prescribed procedure of the institution, against such member of the faculty or staff.

Provided that where such lapse is attributable to the Head of the institution, the authority designated to appoint such Head shall take such departmental disciplinary

action; and such action shall be without prejudice to any action that may be taken under the penal laws for abetment of ragging for failure to take timely steps in the prevention of ragging or punishing any student found guilty of ragging.

9.4 The Commission shall, in respect of any institution that fails to take adequate steps to prevent ragging or fails to act in accordance with these Regulations or fails to punish perpetrators or incidents of ragging suitably, take one or more of the following measures, namely;

- i. Withdrawal of declaration of fitness to receive grants under section 12B of the Act.
- ii. Withholding any grant allocated.
- iii. Declaring the institution ineligible for consideration for any assistance under any of the general or special assistance programmes of the Commission.
- iv. Informing the general public, including potential candidates for admission, through a notice displayed prominently in the newspapers or other suitable media and posted on the website of the Commission, declaring that the institution does not possess the minimum academic standards.
- v. Taking such other action within its powers as it may deem fit and impose such other penalties as may be provided in the Act for such duration of time as the institution complies with the provisions of these Regulations.

Provided that the action taken under this clause by the Commission against any institution shall be shared with all Councils.


(Dr. R.K. Chauhan)
Secretary

ANNEXURE I
AFFIDAVIT BY THE STUDENT

I, _____ (*full name of student with admission/registration/enrolment number*)
s/o d/o Mr./Mrs./Ms. _____, having
been admitted to _____ (*name of the institution*), have
received a copy of the UGC Regulations on Curbing 'the Menace of Ragging in Higher
Educational Institutions, 2009, (hereinafter called the "Regulations") carefully read and
fully understood the provisions contained in the said Regulations.

2) I have, in particular, perused clause 3 of the Regulations and am aware as to
what constitutes ragging.

3) I have also, in particular, perused clause 7 and clause 9.1 of the Regulations and
am fully aware of the penal and administrative action that is liable to be taken against
me in case I am found guilty of or abetting ragging, actively or passively, or being part
of a conspiracy to promote ragging.

4) I hereby solemnly aver and undertake that

a) I will not indulge in any behaviour or act that may be constituted as
ragging under clause 3 of the Regulations.

b) I will not participate in or abet or propagate through any act of
commission or omission that may be constituted as ragging under clause
3 of the Regulations.

5) I hereby affirm that, if found guilty of ragging, I am liable for punishment
according to clause 9.1 of the Regulations, without prejudice to any other criminal action
that may be taken against me under any penal law or any law for the time being in
force.

6) I hereby declare that I have not been expelled or debarred from admission in
any institution in the country on account of being found guilty of, abetting or being part
of a conspiracy to promote, ragging; and further affirm that, in case the declaration is
found to be untrue, I am aware that my admission is liable to be cancelled.

Declared this ____ day of _____ month of ____ year.

Signature of deponent
Name:

VERIFICATION

Verified that the contents of this affidavit are true to the best of my knowledge and no
part of the affidavit is false and nothing has been concealed or misstated therein.

Verified at (place) on this the (day) of (month), (year).

Signature of deponent

Solemnly affirmed and signed in my presence on this the (day) of (month),
(year) after reading the contents of this affidavit.

OATH COMMISSIONER

ANNEXURE II

AFFIDAVIT BY PARENT/GUARDIAN

I, Mr./Mrs./Ms. _____ (full name of parent/guardian) father/mother/guardian of _____ (full name of student with admission/registration/enrolment number) _____, having been admitted to _____ (name of the institution) _____, have received a copy of the UGC Regulations on Curbing the Menace of Ragging in Higher Educational Institutions, 2009, (hereinafter called the "Regulations"), carefully read and fully understood the provisions contained in the said Regulations.

2) I have, in particular, perused clause 3 of the Regulations and am aware as to what constitutes ragging.

3) I have also, in particular, perused clause 7 and clause 9.1 of the Regulations and am fully aware of the penal and administrative action that is liable to be taken against my ward in case he/she is found guilty of or abetting ragging, actively or passively, or being part of a conspiracy to promote ragging.

4) I hereby solemnly aver and undertake that

a) My ward will not indulge in any behaviour or act that may be constituted as ragging under clause 3 of the Regulations.

b) My ward will not participate in or abet or propagate through any act of commission or omission that may be constituted as ragging under clause 3 of the Regulations.

5) I hereby affirm that, if found guilty of ragging, my ward is liable for punishment according to clause 9.1 of the Regulations, without prejudice to any other criminal action that may be taken against my ward under any penal law or any law for the time being in force.

6) I hereby declare that my ward has not been expelled or debarred from admission in any institution in the country on account of being found guilty of, abetting or being part of a conspiracy to promote, ragging; and further affirm that, in case the declaration is found to be untrue, the admission of my ward is liable to be cancelled.

Declared this _____ day of _____ month of _____ year.

Signature of deponent
Name:
Address:
Telephone/ Mobile No.:

VERIFICATION

Verified that the contents of this affidavit are true to the best of my knowledge and no part of the affidavit is false and nothing has been concealed or misstated therein.

Verified at _____ (place) on this the _____ (day) of _____ (month), _____ (year).

Signature of deponent

Solemnly affirmed and signed in my presence on this the _____ (day) of _____ (month), _____ (year) after reading the contents of this affidavit.

OATH COMMISSIONER

प्रबंधक, भारत सरकार मुद्रणालय, फरीदाबाद द्वारा मुद्रित
एवं प्रकाशन नियंत्रक, दिल्ली द्वारा प्रकाशित 2009
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AMENDED ORDINANCE II (A): DEGREE OF DOCTOR OF PHILOSOPHY (Ph.D.)

1. Admission to Ph.D Programme:

- (a) The student intake will be regulated in each Department as per the availability of seats. Admission to the Ph.D. programme will be made twice a year, preferably in the beginning of each semester.
- (b) All the available seats shall be notified 'category-wise' by the Departments in advance.
- (c) 15% seats in each session shall be reserved for Scheduled Caste (SC), 7.5% for Scheduled Tribe (ST), 27% for the Other Backward Classes (OBC), and 3% for the Persons With Disabilities (PWD) (horizontally).

Eligibility:

A candidate shall be eligible for admission to the Ph.D. programme, if he/she:

- (i) Has qualified Master's Degree in the subject concerned / allied / cognate subjects with at least 55% marks, in aggregate
- (ii) The provision of relaxation of 5% in marks in eligibility condition will be applicable for SC/ST/PWD candidates.

The candidates shall appear for a written test conducted by the University to be followed by an interview to be conducted by the concerned Department, which shall carry weightage of 80% and 20% respectively. The candidates who have qualified UGC/CSIR/JRF/NET/SLET or are Teacher Fellowship holders or have passed M. Phil programme with course work recognized by the U.G.C. as per UGC Regulations (Minimum Standards and Procedure for award of M.Phil./Ph.D. Degree, 2009) shall be exempted from appearing for the written test. Such applicants will, however, be required to appear for the personal interview. In case of the candidates exempted from the written test, the interview shall carry 100% weightage.

On the basis of the results of the written test and/or interview the School Board and/or Board of Studies on the recommendation of concerned Departmental Research Committee will finalize admission to the Ph.D programme provisionally.

2. Departmental Research Committee (DRC):

In each Department, academic matters related to the Ph.D. programme shall be supervised by a Departmental Research Committee consisting of the following:

- (i) Head of the Department (Chairman); (Ex-officio)
- (ii) All the Professors of the department concerned; (Ex-officio)
- (iii) Associate Professors in the Department subject to a maximum of two by rotation according to seniority;
- (iv) Two Assistant Professors in the Department qualified to be research (Ph.D) Supervisor(s) by rotation according to seniority;
- (v) *An external expert to be nominated by the Vice-Chancellor.*

Where Departments have strength of less than ten teachers, all faculty members eligible to be research (Ph.D) supervisors will be members of the Departmental Research Committee. The term of the members of the Departmental Research Committee, except the ex-officio members, will be for a period of two years.

Provided that where no teacher is eligible to be the Head, the Teacher-in-charge if eligible to be research(Ph.D)supervisor will convene the meetings of the DRC as its convener, failing which the members of the DRC will elect one of the members present at the meeting as Chairperson of the committee for the said meeting.

3. Research Supervisor:

The Board of Studies and/or School Board may, at the time of registration/appropriate time, and on the recommendation of the Departmental Research Committee (DRC) shall—

- (a) Appoint a full-time regular teacher of the University, possessing at least three years teaching/research experience after obtaining Ph.D. degree, as Supervisor to guide and supervise the work of the student.
- (b) May appoint a full-time regular/retired teacher of the University/Scientist working in regular capacity or retired, possessing at least three years teaching/research experience after obtaining Ph.D. degree, as Co-Supervisor to guide and supervise the work of the student as per the nature and need of research work.
- (c) A Professor may supervise not more than eight, Associate Professor six and Assistant Professor four Ph.D. students at any point of time with the following provisions:

- (i) The number of scholars as specified in (c) above shall include the scholars being jointly or fully guided by him/her from this University and from other University/Institution/Deemed to be University/College/Institution of National importance as well, and
 - (ii) No teacher, who has less than two years to superannuate from the University service shall be eligible for supervision.
- (d) However, in such cases where teachers are retiring or leaving and where redistribution/reallocation of their Ph.D students is required for the abovementioned or any other reason, the Ph. D. students will be adjusted among the eligible existing teachers of the department by relaxing the norms by the Departmental Research Committee (DRC)/Board of Studies (BOS).
- (e) Provided further that the Board of Studies and/or School Board may on the recommendations of the DRC appoint Joint Supervisor from this university or from other university/institution if he/she possesses requisite qualifications of a supervisor, in any particular case.

Provided further that in case a Supervisor, under whose guidance a thesis has been prepared in part or in full, ceases to be a teacher of the University, he/she may, subject to his/her availability and recommendation of the Departmental Research Committee, be allowed to continue guiding the scholar by the School Board and/or Board of Studies as Joint Supervisor of the student concerned.

4. Course Work:

- (a) There shall be a compulsory Course Work of minimum one semester duration as a pre-requisite for confirmation of registration of students admitted provisionally. The course work will consist of one Course on research methodology and the remaining Course(s) shall be as prescribed by the School Board/Board of Studies/Departmental Research Committee. Every such pre-requisite course shall carry 20 credits.
- Provided, however, that a student may with the permission of DRC be allowed to add or substitute course(s) from his/her own department or from any other department within the period of three weeks from the commencement of the semester in accordance with the spirit of Choice Based Credit System (CBCS).
- No student shall be allowed to add, substitute and/or drop a course after these deadlines.
- Provided also that if a student has taken more number of courses than the prescribed number and has secured the grade higher than 'F' in each course, then the best grades

of the required number of courses shall be taken into account for calculation of CGPA for the purpose of deciding his/her case for confirmation to the Ph.D. programme.

Definitions

- 4.1. "Course" means a Semester Course.
- 4.2. "Credit"(c) is the weightage assigned to a course in terms of contact hours.
- 4.3. "Grade" means a letter grade assigned to a student on the basis of evaluation of a course on a ten point scale.
- 4.4. "Grade point" (g) means the numerical equivalent of a letter grade assigned to a student in the ten point scale.
- 4.5. Semester Grade Point Average (SGPA) means the grade point average of a student calculated in the following manner:

$$SGPA = \frac{(g1 \times c1) + (g2 \times c2) + \dots}{\text{Total number of credits of courses for which the students has registered in a semester}}$$

- 4.6. "Cumulative Grade Point Average" (CGPA) means a cumulative index grade point average of a student calculated in the following manner:

$$CGPA = \frac{(g1 \times c1) + (g2 \times c2) + \dots}{\text{Total number of credits of the courses for which the student has registered upto and including the semester for which cumulative index is required.}}$$

- 4.7. "Final Grade Point Average" (FGPA) is the final index of a student in the courses.

- 4.8. The final grade point average of students in the courses is worked out on the basis of the formula indicated below:

$$FGPA = \frac{\sum_{i=1}^n c_i \times g_i}{\sum_{i=1}^n c_i}$$

c_i = Credit of the i^{th} course

g_i = Grade point secured by the student in the i^{th} course

n = total number of courses for which the student has registered

- (b) The evaluation of course work shall be on a 10 point scale, that is:

Grade	Grade Point
A+	9
A	8
A-	7
B+	6
B	5
B-	4
C+	3
C	2
C-	1
F	0

Note :

- 1) There shall be no rounding off of SGPA/CGPA/FGPA.
- 2) The SGPA/CGPA/FGPA obtained by a student is out of a maximum possible 9 points.

- (c) A student for whom pre-requisite courses are prescribed shall be required to clear the Course Work within the first semester. The registration of such students shall be confirmed only if he/she has qualified 20 credits with a minimum CGPA of 6.5 (6.00 in case of SC/ST/Differently abled students). The bifurcation of credits is as under:
- i. 05 credits for Research Methodology, which includes quantitative methods, computer applications, etc.
 - ii. Two subject specific papers of 05 credits each.
 - iii. 05 credits for tools and techniques, which may include instrumentation, communication skills, seminar presentation, review of published research, and other topics as specified in the prescribed manual or style sheet (MLA/APA etc.), field work and other activities specified in the Course Work. Evaluation will be done by the faculty members of the University Department/School concerned.
- (d) There shall be 80% weightage for the Course Work End-semester examinations and 20% weightage shall be given as internal assessment on the basis of assignments/presentations/ projects and other research-based activities during the semester.
- (e) Candidates failing to obtain a minimum CGPA of 6.5 (6.00 in case of SC/ST/Differently abled students) may be allowed to continue with provisional registration for a maximum period of one more semester during which the candidate would be required to fulfill the minimum required CGPA. He/She will be allowed to reappear in next end-semester examination. No further chance will be given to the candidate.

5. Registration and Approval of Topic:

- (a) Consequent upon confirmation of his/her admission in the Board of Studies and/or School Board shall, on the recommendation of the Departmental Research Committee concerned approve the topic of the proposed thesis leading to the award of the Ph.D. degree.
- (b) After approval of the topic of research, the candidate shall deposit the prescribed registration fees and his/her date of registration shall be determined on the basis of the date on which he/she deposited the registration fees.

- (c) No candidate shall be eligible to register for the programme/course if he/she is already registered for any full time programme of study of this University or in any other University/Institution/Deemed to be University/College/Institution of National importance.
- (d) The Board of Studies and/or School Board may cancel the registration of a student for breach of the provisions of clauses given above.

6. Requirements during Registration Period:

- (a) Every research scholar will be required to show continuous progress during the period of his/her registration and it will be monitored by the supervisor of the candidate.
- (b) Every research scholar shall be required to submit half yearly report.
- (c) The supervisor of the research scholar will give his/her assessment about the progress of the scholar as whether satisfactory or not. The Report shall be placed before the Departmental Research Committee for its evaluation in its forthcoming meeting.
- (d) In case two consecutive half-yearly reports are found unsatisfactory, Head of the Department, on the recommendations of the Departmental Research Committee (DRC) may recommend to the Board of Studies for cancellation of the registration.
- (e) The research scholar will present a seminar on his/her research at the completion of each year after his/her registration to Ph.D programme till submission of Ph.D. thesis. This seminar will be organized by the concerned Department.
- (f) Every research student shall pursue full time research as a regular student for a minimum period of two years from the date of registration.
- (g) Candidates already in employment will also have to pursue full time research as a regular student for the minimum period of two years.
- (h) **Supernumerary seats:** To enhance the Industry-University linkage and to increase the collaboration with the Central Institutions/ Laboratories by having MOU with them, collaboration in R&D is required. For this, sometimes the Institutes/Industries want that their eligible employees/scientists are allowed to do Ph.D. In such cases, some supernumerary seats, not more than two, in each department may be created. If there are more than two such sponsored candidates, then best two out of these would be chosen on the basis of merit of entrance test and/or interview. For such cases,

however, the Director/CEO of the institute/industry is required to sponsor such candidates with requisite qualifications only. For such candidates, the course work may be allowed to be imparted in the form of one month capsule course. However, they will have to appear in the final examination with other candidates and would be required, like other candidates, to clear such courses. Residency period will be counted even if he/she is residing/working in his/her own institute where facilities for such research exist. The said Institutions/Industries may sponsor their research scholars who are working in their institute with scholarships. However, such students will be required to attend the regular one semester course work prescribed by the DRC/BOS along with the other candidates and all the rules governing the Ph.D. scholars of the University will be applicable to them. However, for residency condition, such candidates will be governed by the rules similar to the ones for supernumerary seats.

7. Removal of the names:

- (a) The name of a student shall automatically be removed from the rolls of the University if he/she
 - (i) fails in any pre-requisite course
 - (ii) fails to secure a CGPA of 6.5 (6.00 in case of SC/ST students) in the course work
 - (iii) fails to submit the progress reports for two consecutive quarters
 - (iv) fails to deposit the continuation fee within the stipulated time
 - (v) fails to submit his/her thesis within five years from the date of registration to the Ph.D. programme. Provided further that the Vice Chancellor may, on the recommendation of the DRC/BOS grant extension to the scholar to submit the thesis for a maximum period of one year.
- (b) The Board of Studies on the recommendation of the Departmental Research Committee may, however, subsequently accept the request of a candidate whose name has been removed from the rolls of the University to get re-registered and become eligible for submission of his/her thesis, provided he/she submits his/her thesis within one year from the date of such re-registration or within five years of the date of his/her registration, whichever is earlier.
- (c) Before completing the minimum period of two years prescribed in clause 6 (f) above, no Ph.D. student shall, without the prior permission of the Department/Board of Studies/Departmental Research Committee/School Board:

- i. Undertake any employment;
- ii. Join any other regular programme of study; or
- iii. Appear in any examination other than those prescribed by the Department/Centre concerned.

8. Guidelines for the Submission of Thesis:

- (a) No candidate shall be permitted to submit his/her thesis for the Ph.D. degree, unless he/she has pursued research at the University for not less than two years after his/her registration to Ph.D. programme.
- (b) The Ph.D candidate shall publish at least two research papers in refereed journal(s) before the submission of the thesis for adjudication/evaluation, and shall produce evidence in the form of acceptance letter or the reprint.
- (c) Provided that a semester or a year may be declared zero semester or zero year in the case of a student if he/she could not continue with the academic programme during that period due to illness and hospitalization or maternity leave or due to accepting a foreign scholarship/fellowship, subject to the fulfillment of requirements as prescribed. Such zero semester/year shall not be counted for calculation of duration of the programme in case of such a student.
- (d) Pre-Thesis Submission Seminar:
 - i. Prior to the submission of thesis, the student shall present a pre-thesis submission seminar in the department that shall be open to all faculty members and research students for getting feedback and comments, which shall be suitably incorporated into the draft thesis under the advice of the supervisor. The notice of Pre-thesis Submission Seminar shall be issued by the Head of the Department under intimation to the office of the Vice-Chancellor.
 - ii. On successful presentation of Pre-Thesis Submission Seminar, the research scholar is required to submit the thesis within three months from the date of pre-submission seminar failing which he/she shall have to repeat the pre-submission seminar.

- iii. The Ph.D scholar shall submit a copy of the thesis in form of a CD/Pen drive to the Library for plagiarism check and he/she shall be eligible for submission on production of satisfactory report after plagiarism check.
- iv. A candidate shall submit his/her thesis for the Ph.D. degree in the manner prescribed as under:
 - a. The research scholar shall submit four printed/typed hard bound copies of his/her thesis along with the copies of abstract and summary, mentioning the name of the candidate, supervisor etc. along with two soft copies of thesis on separate CDs and/or Pen drives.
 - b. The typing/printing of thesis should be done on both sides of the paper (instead of single side printing) on A-4 size paper in font size 12” in Times New Roman font with line spacing 2. For other details, the research scholar shall adhere to the style sheet/manual (APA, MLA, etc.) as prescribed by the concerned department from time to time.
 - c. The title page of Ph.D thesis would be in the Colour prescribed by the concerned Department/School
 - d. Thesis will be accompanied by a declaration from the candidate countersigned by the Supervisor and Head of the Department in the following format:

Declaration: This is to certify that the material embodied in the present work entitled “-----” is based on my original research work. It has not been submitted in part or full for any other diploma or degree of any University/Institution Deemed to be University and College/Institution of National Importance. References from other works have been duly cited at the relevant places. (Signature of the Candidate with date) (Countersigned by Supervisor and Head of the Department with date)

9. Panel of Examiners:

- a. On the recommendation of the DRC, the BOS shall forward a panel of eight external examiners, at least four of the examiners in the panel shall be from outside the State/Country, from the concerned area of Research to the Controller of Examinations on the prescribed proforma for drawing a panel of examiners. Further the Vice-Chancellor will have the power to add and/or delete any name/s recommended by the BOS. The Vice-Chancellor, may appoint three examiners out

of the panel recommended by the Board of Studies with at least two examiners from outside the State /Country for the examination of the thesis.

10.Evaluation of Thesis:

- (a) The thesis submitted by the candidate for the award of the Ph.D. degree shall be examined by three examiners appointed by the Vice Chancellor out of the panel drawn by the University.
- (b) Each Examiner, after examining the thesis shall submit a report to the Controller of Examination (COE) containing a clear recommendation whether, in his/her opinion:
 - (i) the thesis as such is acceptable and the viva-voce examination of the candidate should be held; or (ii) the thesis should be referred back to the candidate for revision; or (iii) it should be rejected.
- (c) The examiner shall not recommend that the viva-voce examination be held unless he/she is satisfied that the thesis constitutes a contribution to knowledge characterized either by reinterpretation of known facts or development of new knowledge and/or techniques and that the methodology pursued by the candidate is sound and its literary presentation satisfactory.
- (d) If the COE is satisfied that the examiners have unanimously recommended that the viva-voce examination of the candidate be held, he/she shall accordingly *refer it to the Head of the Department to prepare a summary report in consultation with the supervisor(s) concerned for conduct of viva-voce.*
- (e) In case the COE finds that the examiners of the thesis have not recommended unanimously that the viva-voce examination of the candidate be held, or if he/she is satisfied that in the course of either report an adverse opinion of a substantive nature has been expressed materially affecting the validity of the same examiner's otherwise positive recommendation, then the COE shall place the report of the examiners *before the Vice Chancellor for directions.*
- (f) *The Head of the Department/ Chairperson, BOS* may, at its discretion, and shall, if the recommendation of two examiners is positive and that of the third is negative, recommend to the Vice Chancellor for the appointment of a fourth examiner, one not in the service of the University and/or on the Board of Studies of the Department/Centre and/or the School Board to examine the thesis and act according to the recommendation of the fourth examiner;

Provided that a recommendation is not to be considered negative if a revision is recommended and this revised thesis is accepted by the examiner;

Provided, further, that if the thesis after revision is not accepted by the examiner, the original and the revised version of the thesis shall be sent to the fourth examiner and the version approved by the fourth examiner shall be considered final.

Important:

- (1) No thesis shall earn a degree unless there are three positive recommendations;
- (2) Where two recommendations are positive and the third asks for revision, the BOS shall ordinarily get the revision carried out and revised thesis sent to the same examiner.

11. Viva-Voce Examination:

- (a) On satisfactory evaluation of the report the student shall undergo a viva-voce examination, which shall be openly defended.
- (b) The Viva-Voce examination of candidate shall be conducted by a Viva-Voce Board consisting of one of the external examiners of the thesis and the Supervisor. Provided, where none of the examiners, who evaluated the thesis, is in a position to conduct the viva-voce examination, another examiner shall be appointed in his/her place by the Vice Chancellor on the recommendation of concerned Board of Studies through COE.
- (c) Provided that where the Supervisor is unable to be present within a reasonable time to participate in the viva-voce examination, the DRC/BOS may recommend another member of the faculty in his/her place.
- (d) At the viva-voce examination, the Viva-Voce Board shall satisfy itself;
 - i. That the thesis submitted by the candidate is his/her own work, and
 - ii. That the grasp of the candidate of the field of his/her study is satisfactory.
- (e) The Viva-Voce Board may, on the basis of the unanimous opinion of its members, recommend:
 - i. That the candidate be awarded the Ph.D. degree; or
 - ii. That the thesis be referred back to the candidate for revision; or

- iii. That the thesis be rejected and the candidate may not be awarded the Ph.D. degree.
- (f) The manner in which the viva-voce examinations to be conducted shall be as prescribed.
- (g) In case the Viva-Voce Board recommends that the candidate be awarded the Ph.D. degree, Board of Studies shall recommend to the Vice Chancellor that the Ph.D. degree may be awarded to the candidate.
- (h) Along with the Degree, the University shall issue a certificate stating that the degree has been awarded in accordance with the UGC Minimum Standards and Procedure for Awards of M.Phil/Ph.D Degree Regulation, 2009 (as amended from time to time).
- (i) In case the viva-voce Board recommends that the thesis of the candidate be rejected, the Board of Studies shall direct accordingly.
- (j) In case the recommendation of one member of the Viva-Voce Board is positive and of the other negative, the Departmental Research Committee shall refer the case to the Board of Studies for its consideration and recommendation, and take a decision after considering such recommendation.
- (k) A candidate whose thesis has been referred back by the Viva-Voce Board for revision shall be permitted to re-submit it for the award of the degree not later than one year from the date of intimation of the decision of the University to him/her.
- (l) Provided that, in exceptional cases, the Academic Council may, on the recommendations of the Board of Studies/School Board, extend the period by one semester.
- (m) A thesis which has been re-submitted shall normally be examined by the original examiner(s) unless any one of them is, or all of them are, unable or unwilling to act as such, in which case another examiner(s) may be appointed by the Vice Chancellor on the recommendation of Board of Studies.
- (n) No candidate shall be permitted to re-submit his/her thesis for the award of the Ph.D. degree more than once.

12.Publication of Thesis:

If the examiners have recommended that the thesis is suitable/fit for publication, the concerned thesis may be published in book form by the concerned research scholar. If there is difference of opinion between the examiners regarding the publication of the thesis, the case shall be referred to the Committee consisting of the following for consideration and recommendations: i) Dean of the School- Chairman, ii) Head of the concerned Department - Member, and iii) Supervisor of the Scholar – Member.

13.Fee for Ph. D. Programme:

The research scholar shall have to pay the requisite fee prescribed by the University failing which his/her registration shall be cancelled.

The fee may be charged under the heads like—Course Work fee (for those who are required to complete Course Work); Registration Fee (at the time of registration); Annual Fee/continuation fee (Annual Fee will be payable within 15 days of registration and annually thereafter); Annual Laboratory fee for science subjects and other subjects involving laboratory work; Evaluation fee to be charged at the time of submission of Ph.D. thesis; Late fee for delayed payment of annual fee; and any other fees as prescribed by the University.

The fees will be subject to changes as decided by the University from time to time.

Note: Notwithstanding what is contained in the Ordinance, the Academic Council may, in exceptional circumstances and on the recommendations of the Board of Studies/School Board as well as on the merits of each individual case consider, at its discretion and for the reasons to be recorded in writing, relaxation of any of the provisions except those related to CGPA requirements for qualifying the course work.

AMENDED ORDINANCE II: DEGREE OF MASTER OF PHILOSOPHY (M. Phil.)

Master of Philosophy (M. Phil.) Programme shall be conducted by the concerned Departmental Research Committee (DRC).

All matters related to the M. Phil. Programme shall be dealt by the concerned DRC's/Board of Studies (BOS)

1. Admission to M.Phil. Programme:

- (a) The student intake in each Department shall not exceed 10 students subject to availability of eligible faculty in the Department. Admission to the M.Phil. programme will be made once a year in odd semester.
- (b) All the available seats shall be notified 'category-wise' by the Departments in advance.
- (c) 15% seats shall be reserved for Scheduled Caste (SC), 7.5% for Scheduled Tribe (ST), 27% for the Other Backward Classes (OBC), and 3% for the Persons With Disabilities (PWD) (horizontally).

Eligibility:

A candidate shall be eligible for admission to the M.Phil. programme, if he/she:

- (i) Has qualified Master's Degree in the subject concerned / allied / cognate subjects with at least 55% marks, in aggregate from the University and/or a degree recognized by the University for this purpose as its equivalent.
- (ii) The provision of relaxation of 5% in marks in eligibility condition will be applicable for SC/ST/PWD candidates.
- (iii) The cases of students who have passed examination outside the Indian Universities system and who may not have obtained a Master's degree may be considered for admission to the programme subject to the condition that each case shall be examined on its own merit by the Admissions Committee and in accordance with the recommendations of the Equivalence Committee.

The candidates shall appear for a written test conducted by the University to be followed by an interview to be conducted by the concerned Department, which shall carry weightage of 80% and 20% respectively. Candidates who have cleared

NET/JRF/SET/Teacher Fellowship or who have teaching/research experience of more than two years on regular basis shall be exempted from the written test. In such cases the interview shall carry 100% weightage.

On the basis of the results of the written test and/or interview the School Board and/or BOS on the recommendation of the concerned DRC will finalize provisional admission to the M.Phil. programme.

2. Registration:

Registration for courses is the sole responsibility of a student. No student shall be allowed to do a course without registration and no student shall be entitled to any credits in the course unless he/she has been formally registered for the course/paper by the due date to be announced by the University.

3. Course Work:

There shall be a compulsory Course Work of minimum one semester duration. The School Board/Board of Studies/Departmental Research Committee shall prescribe the Course(s)/Papers and specify the methodology and instructional devices to be used. Every such course shall carry such credit as may be approved by the Academic Council on the recommendation of the Board of Studies/ School Board/Departmental Research Committee.

Provided, however, that a student may with the permission of Department/Centre concerned, be allowed to add or substitute course(s) from his/her own department or from other departments following the spirit of Choice Based Credit System (CBCS) within the period of three weeks from the commencement of the semester.

Provided further that a student may, with the permission of Department/Centre concerned, be allowed to drop course(s) latest by the dates prescribed by the Academic Council for Odd and Even Semesters.

No student shall be allowed to add, substitute and/or drop a course after these deadlines. Provided also that if a student has taken more number of courses than the prescribed number and has secured the grade higher than 'F' in each course, then the best grades of the required number of courses shall be taken into account for calculation of CGPA for the purpose of deciding his/her case for completion to the M.Phil. programme.

Definitions

- 3.1. "Course" means a Semester Course.
- 3.2. "Credit"(c) is the weightage assigned to a course in terms of contact hours.
- 3.3. "Grade" means a letter grade assigned to a student on the basis of evaluation of a course on a ten point scale.
- 3.4. "Grade point" (g) means the numerical equivalent of a letter grade assigned to a student in the ten point scale.
- 3.5. Semester Grade Point Average (SGPA) means the grade point average of a student calculated in the following manner:

$$\text{SGPA} = \frac{(g1 \times c1) + (g2 \times c2) + \dots}{\text{Total number of credits of courses for which the students has registered in a semester}}$$

- 3.6. "Cumulative Grade Point Average" (CGPA) means a cumulative index grade point average of a student calculated in the following manner:

$$\text{CGPA} = \frac{(g1 \times c1) + (g2 \times c2) + \dots}{\text{Total number of credits of the courses for which the student has registered upto and including the semester for which cumulative index is required.}}$$

- 3.7. "Final Grade Point Average" (FGPA) is the final index of a student in the courses.
- 3.8. The final grade point average of students in the courses is worked out on the basis of the formula indicated below:

$$\text{FGPA} = \frac{\sum_{i=1}^n c_i \times g_i}{\sum_{i=1}^n c_i}$$

c_i = Credit of the i^{th} course

g_i = Grade point secured by the student in the i^{th} course

n = total number of courses for which the student has registered

4. Duration of the M.Phil. Programme:

The entire M.Phil, programme including M.Phil dissertation shall be completed ordinarily in 2 (two) consecutive semesters. No registration shall be permissible beyond the period of two semesters from the date of admission to the programme. The M.Phil course work shall be completed in the first semester.

Provided that a semester or a year may be declared zero semester or zero year in the case of a student if he/she could not continue with the academic programme during that period due to illness and hospitalization or maternity leave or due to accepting a foreign scholarship/fellowship subject to the fulfillment of requirements as laid down by the regulations. Such zero semester/year shall not be counted for calculation of the duration of the programme in case of such a student.

Provided further that in exceptional cases and for reasons to be recorded in writing the Academic Council may allow a student to submit his/her dissertation during the third consecutive semester from the date of admission.

5. Credit Requirements:

No student admitted to the programme shall be eligible for the award of M.Phil degree unless he/she secures 40 credits in all out of which atleast 20 credits shall be for course work (including Research Techniques/Methodology) and 20 credits for the dissertation.

6. Attendance Requirement:

A student must have at least 75% attendance in order to be eligible for appearing in the end semester examination.

7. Appointment of Supervisor:

The School Board/BOS on the recommendation of the Department/Centre and the DRC shall appoint a member of the faculty of the Department/Centre concerned, possessing a Ph. D. degree, as Supervisor and Joint (Supervisor/s) if the topic of research is inter or multidisciplinary, to guide and supervise the dissertation work of the student at the appropriate time.

Provided that in case a Supervisor under whose supervision a dissertation has been prepared in part or in full ceases to be a teacher of the University, he/she may, subject to his/her availability and recommendations of the Department/Centre concerned, be continued by the DRC as Joint-Supervisor of the student.

8. Topic of Dissertation:

The topic of dissertation shall be approved by the School Board/BOS on the recommendations of the Department/Centre concerned and the DRC on a proposal submitted by the student through his/her Supervisor.

9. Submission of Dissertation and Evaluation:

9.1 *The student shall submit a copy of the dissertation in form of a CD/pen drive to the Librarian/Concerned Officer for plagiarism check and he/she shall be eligible for submission of dissertation on production of satisfactory report on plagiarism.*

9.2 Subject to confirmation by the BOS/School Board, the method of evaluation in the course(s) leading to the M.Phil degree shall be prescribed, and assessment conducted, by the Department/Centre concerned.

9.3 The dissertation shall be examined by one examiner, who shall be a person not on the staff of the University and/or on the Board of Studies of the Department/Centre concerned and/or School Board, to be appointed by the Vice Chancellor from a panel of names approved by the Board of Studies on the recommendations of DRC.

- a) Provided if the report of the Examiner is in negative/unsatisfactory, that after due consideration of the report, the BOS/School Board may recommend the appointment of another examiner (not connected with the University) in manner laid down above.
- b) Provided further that if the recommendation of the second examiner is also in the negative the student concerned shall not be awarded the degree of M.Phil.

9.4 The Courses and dissertation of the student shall be graded on a ten point scale, that is:

Grade	Grade Point
A+	9
A	8
A-	7
B+	6
B	5
B-	4
C+	3
C	2
C-	1
F	0

Note : 1) There shall be no rounding off of SGPA/CGPA/FGPA

2) The SGPA/CGPA/FGPA obtained by a student is out of a maximum possible 9 points.

9.5 The examiner while recommending the approval of the dissertation for the award of M.Phil. degree shall also award grade for the dissertation according to the grading system in clause 9.3 above. The final grade for the dissertation shall be determined by taking the average of the grade awarded by two examiners.

9.6 A student in order to be eligible for the award of M.Phil. degree of the University must have a minimum Cumulative Grade Point Average (CGPA) of 5.5 (inclusive of dissertation and course work).

10. No candidate shall be eligible to register for the M.Phil. programme if he/she is already registered for any full-time programme of study in this University or in any other University/Institution/Deemed to be University/College/Institution of National importance.

11. Removal of Name of an M.Phil Student from the Rolls of the University:

10.1. The name of a student who fails in any course shall automatically stand removed from the rolls of the University.

10.2. The DRC may at its discretion strike off from the rolls of the University, the name of a student:

- a) who fails to secure SGPA/CGPA of less than 5.5 (4.50 in the case of students belonging to SC/ST or differently abled categories); or
- b) for lack of interest and motivation for research after completion of course work.

Annexure-1

CENTRAL UNIVERSITY OF HARYANA
Master of Science in Biotechnology (Semester-wise structure)

Semester I

S. No.	Course code	Course title	L	T	P	C
1.	SIAL BT_01_1_01_CC	Principles of Genetics and Molecular Biology	4	0	0	4
2.	SIAL BT_01_1_02_CC	Biomolecules and Metabolism	4	0	0	4
3.	SIAL BT_01_1_03_CC	Cell Biology	4	0	0	4
4.	SIAL BT_01_1_04_CC	Practical I	0	0	8	4
5.	SIAL BT_01_1_01_GEC	Principle of Biotechnology	4	0	0	4

Semester II

S. No.	Course code	Course title	L	T	P	C
1.	SIAL BT_01_2_05_CC	Tools and Techniques in Biotechnology	4	0	0	4
2.	SIAL BT_01_2_06_CC	Microbial Process Engineering and Technology	4	0	0	4
3.	SIAL BT_01_2_07_CC	Immunology	4	0	0	4
4.	SIAL BT_01_2_08_CC	Practical II	0	0	8	4
5.	SIAL BT_01_1_02_GEC	Bioinformatics and Biostatistics (compulsory)	0	4	0	4
6.	Any of the following two courses		4	0	0	4
	SIAL BT_01_2_01_DCEC	Genomics and Proteomics				
	SIAL BT_01_2_02_DCEC	Microbial growth, enzyme and fermentation kinetics				

Semester III

S. No.	Course code	Course title	L	T	P	C
1.	SIAL BT_01_3_09_CC	Cell and Tissue Culture	4	0	0	4
2.	SIAL BT_01_3_10_CC	Genetic Engineering	4	0	0	4
3.	SIAL BT_01_3_11_CC	Seminar Paper	0	4	0	4
4.	SIAL BT_01_3_12_CC	Practical III	0	0	8	4
5.	Any of the following two courses		4	0	0	4
	SIAL BT_01_3_03_DCEC	Agricultural Biotechnology and IPR				
	SIAL BT_01_3_04_DCEC	Medical Biotechnology				

Semester IV

S. No.	Course code	Course title	L	T	P	C
1.	SIAL BT_01_4_01_SEEC	Dissertation	0	0	24	24

Core Course (CC)
(Exclusive for Biotechnology students)

S. No.	Course code	Course title	L	T	P	C
1.	SIAL BT_01_1_01_C_4004	Principles of Genetics and Molecular Biology	4	0	0	4
2.	SIAL BT_01_1_02_C_4004	Biomolecules and Metabolism	4	0	0	4
3.	SIAL BT_01_1_03_C_4004	Cell Biology	4	0	0	4
4.	SIAL BT_01_1_04_C_0084	Practical I	0	0	8	4
5.	SIAL BT_01_2_05_C_4004	Tools and Techniques in Biotechnology	4	0	0	4
6.	SIAL BT_01_2_06_C_4004	Microbial Process Engineering and Technology	4	0	0	4
7.	SIAL BT_01_2_07_C_4004	Immunology	4	0	0	4
8.	SIAL BT_01_2_08_C_0084	Practical II	0	0	8	4
9.	SIAL BT_01_3_09_C	Cell and Tissue Culture	4	0	0	4
10.	SIAL BT_01_3_10_C_4004	Genetic Engineering	4	0	0	4
11.	SIAL BT_01_3_11_C_4004	Seminar Paper (compulsory)	0	0	8	4
12.	SIAL BT_01_3_12_C_4004	Practical III	0	4	0	4

General Elective Course (GEC)
(Offered to other departments)

S. No.	Course code	Course title	L	T	P	C
1.	SIAL BT_01_1_01_GEC_4004	Principle of Biotechnology	0	4	0	4
2.	SIAL BT_01_1_02_GEC_4004	Bioinformatics and Biostatistics (Compulsory)	0	4	0	4

Discipline Centric Elective Course (DCEC)
(Offered to the students of Biotechnology and other departments)

S. No.	Course code	Course title	L	T	P	C
1.	SIAL BT_01_2_01_DCEC_4004	Genomics and Proteomics	4	0	0	4
2.	SIAL BT_01_2_02_DCEC_4004	Microbial growth, enzyme and fermentation kinetics	4	0	0	4
3.	SIAL BT_01_3_03_DCEC_4004	Agricultural Biotechnology and IPR	4	0	0	4
4.	SIAL BT_01_3_04_DCEC_4004	Medical Biotechnology	4	0	0	4

Skill Enhancement Elective Course (SEEC)
(Offered Exclusively for Biotechnology students)

S. No.	Course code	Course title	L	T	P	C
1.	SIAL BT_01_4_01_SEEC_0066	Dissertation	0	0	24	24

SIAL BT_01_1_01_CC
PRINCIPLES OF GENETICS & MOLECULAR BIOLOGY

The Examiner will set two questions from each of the Units I-IV with eight questions in all. The students shall attempt five questions in all by choosing at least one question from each of the Units I-IV. All questions shall carry equal marks

UNIT - I

Inheritance and Molecular Organizations of Chromosomes: Historical background, Extra chromosomal inheritance, Inheritance of quantitative traits, Sex linked, Sex influenced and Sex limited traits, Viral and bacterial chromosomes, Nucleosome and chromatin structure, Structure of centromere and telomere, Euchromatin and heterochromatin, Polytene and lamp brush chromosomes, Genome complexity.

Linkage, Crossing over and Gene mapping in Eukaryotes: Linkage and recombination of gene, Gene mapping by three point test cross, Tetrad analysis, Positive and negative interference, Molecular mechanism of recombination, Post-meiotic segregation, Mapping through somatic cell hybridization.

UNIT- II

Mutation & Gene Concept: Molecular mechanism of spontaneous mutations, Molecular mechanism of mutations induced by known chemical mutagens, Types of DNA repair, Molecular mechanism of suppression, Somatic mutations, Classical concept and fine structure of gene, Molecular concept of the gene, Pseudogenes, Overlapping genes, Oncogenes, Repeated genes, Gene amplification.

Bacterial and Viral Genetics: Transformation, Conjugation and Transduction, Molecular mechanism of recombination in bacteria, IS and Tn elements in Bacteria, E. Coli recombination system, Bacterial plasmids, Lytic cascade and lysogenic repression.

UNIT- III

DNA Structure: DNA as genetic material, Chemical structure and base composition of nucleic acids, Double helical structures, Different forms of DNA, Forces stabilizing nucleic acid structure, Super coiled DNA, Properties of DNA, Renaturation and Denaturation of DNA, T_m and C_{ot} curves, Structure of RNA.

DNA Replication: General features of DNA replication, Enzymes and proteins of DNA replication, Models of replication, Prokaryotic and eukaryotic replication mechanism, Replication in phages, Reverse transcription.

UNIT- IV

Transcription: Mechanism of transcription in prokaryotes and Eukaryotes, RNA polymerases and promoters, Post-transcriptional processing of tRNA, rRNA and mRNA (5'capping, 3'polyadenylation and splicing), RNA as enzyme-Ribozyme.

Translation: Genetic code, General features, Deciphering of Genetic code, Code in mitochondria, Translational mechanism in prokaryotes and eukaryotes, Post translational modification and transport, protein targeting (signalling), Non ribosomal polypeptide synthesis, Antibiotic inhibitors and translation.

Recommended Books:

1. Gardener et al (2001), Principles of Genetics, 8th Edition, John Wiley, New York
2. Brooker R.J. (1999), Genetics-analysis and Principles. Addison Wesley Longman Inc. California
3. Maloy S R, Cronan Jr. J R and Freifelder D. (1994), Microbial Genetics 2nd Edition, Jones and Bartlett Publishers, London.
4. Hartl, D L (2012). Essential of Genetics, 8th Editions, Jones and Bartlett Publishers, London.
5. Klug WS, Cummings MR, Spencer CA and Palladino MA (2012), Concept of Genetics, 10th Edition, Pearson Education, Singapore.
6. Miglani, GS (2002), Advanced Genetics, Narosa Publishing House, New Delhi.
7. Snustad, Peter D, Summons MJ (2012) Genetics, 6th Edition, Wiley John & Sons.
8. Adams RLP et al (1992), The Biochemistry of Nucleic Acids, 11th Edition, Chapman and Hall, New York.
9. Lewin B. (2004), Gene VIII, Pearson Prentice and Hall, New Delhi.
10. Karp G. (2010), Cell and Molecular Biology-Concept and Experiments, 5th Edition, John Wiley, New York.
11. Lodish et al (2013), Molecular Cell Biology, 7th Edition, W H Freeman Publisher.
12. Malacinski GM and Freifelder D (1998), Essential of Molecular Biology, 3rd Edition, John and Bartlett Publishers, London.
13. Buchanan BB et al (2000), Biochemistry and Molecular Biology of Plants, American Society of Plant Physiologist, Rockville, Maryland, USA.
14. Watson et al (2009), Molecular Biology of Gene, 5th Edition, Pearson Education, New Delhi

SIAL BT_01_1_02_CC
BIOMOLECULES AND METABOLISM

The Examiner will set two questions from each of the Units I-IV with eight questions in all. The students shall attempt five questions in all by choosing at least one question from each of the Units I-IV. All questions shall carry equal marks

UNIT - I

Biomolecules: An Introduction, General structure of biomolecules, Fundamental principles governing structure of biomolecules, Importance of covalent and non covalent bonds.

Carbohydrates: Structure and function of biologically important mono, d and poly-saccharides, Glycoproteins & glycolipids. Metabolism of carbohydrates-Glycolysis, Feeder pathways, Citric acid cycle, Gluconeogenesis, Glyoxylate and Pentose phosphate pathway, and their regulations.

UNIT- II

Protein: Structure of amino acids, non-protein and rare amino acids. A brief account of amino acid biosynthesis and degradation, Urea cycle, Structural organization of protein, Reverse turns and Ramachandran plot, Supra-molecular complexes of proteins, Chemical synthesis of peptides and small proteins. Protein sequencing, Enzymes.

UNIT- III

Lipids: Structure of fatty acids, Classification of lipids, Structure and functions of major lipid subclasses-Acylglycerols, Phospholipids, glycolipids, Sphingolipids, Waxes, Terpenes and Sterols, Fatty acids biosynthesis, degradation and their regulations, Ketone bodies synthesis, biosynthesis of TAG, Cholesterol, Phospholipids and Glycolipids

UNIT- IV

Nucleic Acids: Structure and properties of nucleic acid bases, nucleosides and nucleotides, Biosynthesis and degradation of purines and pyrimidines, Salvage pathway.

Translation: Structure and biochemical roles of fat and water-soluble vitamins and their co-enzymes

Recommended Books:

1. Nelson DL and Cox MM (2013), Lehninger Principles of Biochemistry, 6th Edition, Freeman and Company, New York
2. Conn EE, Stumpf PK, Bruening G and Doi RH (1997) Outlines of Biochemistry, John Wiley and Sons Inc. New York and Toronto.
3. Voet D, Voet JG, and Pratt CW (2013), Principle of Biochemistry, 4th Edition John Wiley and Sons Inc. New York
4. Elliott WH and Elliot DC (1997) Biochemistry and Molecular Biology, Oxford University press Inc. New York
5. Metzler DE (2001), Biochemistry (Vol I and II) Academic Press, London and New York.
6. Berg JM, Tymoczko JL and Stryer L (2012), Biochemistry, 7th Edition WH Freeman Publishers, New York
7. Garret RH and Grisham CM (2010) Biochemistry, 4th Edition, Brooks/Cole, Boston

The Examiner will set two questions from each of the Units I-IV with eight questions in all. The students shall attempt five questions in all by choosing at least one question from each of the Units I-IV. All questions shall carry equal marks

UNIT - I

Structural organization and function of intracellular organelles: Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility

Membrane structure and function: Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, membrane pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes

UNIT- II

Cell division and cell cycle: Mitosis and meiosis , their regulation, steps in cell cycle, regulation and control of cell cycle

Cell signaling: Hormones and their receptors, cell surface receptor, signalling through G-protein coupled receptors, signal transduction pathways, second messengers and regulation of signalling pathways

UNIT- III

Cellular communication: General principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junction, extracellular matrix, integrins, neurotransmission and its regulation

Cancer: Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth

UNIT- IV

Photosynthesis and Respiration: Photosynthetic apparatus, light reaction, cyclic and non cyclic photo induced electron flow, C3 and C4 cycle and their regulation and CAM pathway, photorespiration, dark phase of photosynthesis.

Recommended Books:

1. Alberts B et al (2002), Molecular Biology of Cells, 4th Edition, Taylor and Francis
2. Lodish et al (2013), Molecular Cell Biology, 7th Edition, W H Freeman Publisher.
3. Gilbert SF (2002), Developmental Biology, SF Sinauer Associates Inc.
4. Karp G (2012) Cell and molecular biology: Concept and Experiments. John Wiley, New York
5. Freedman LP (1998) Molecular Biology of Steroid and Nuclear Hormone Receptors, Birkhäuser.
6. Nelson DL and Cox MM (2013), Lehninger Principles of Biochemistry, 6th Edition, Freeman and Company, New York
7. Hardin J, Bertoni G and Kleinsmith LJ (2012), Becker's world of Cell. 8th Edition, Pearson

SIAL BT_01_1_04_CC
PRACTICALS-I

Any fifteen (15)

1. General Laboratory-safety and Bio-safety measures in biotechnology laboratory.
2. Preparation of normal and molar solutions, buffers, pH setting etc.
3. Evaluation of various sterilization methods.
4. To study various parts of microscope and demonstration of microscopic techniques.
5. Quantitative estimation of proteins.
6. Quantitative estimation of reducing sugars and total sugars.
7. Estimation of total phenolic compounds.
8. Thin layer chromatography: sugars
9. Quantitative estimation of plant cell wall carbohydrates
10. Estimation of enzyme activities
11. Calculation of K_m and V_{max} of a given enzyme
12. Genomic DNA and plasmid DNA isolation from plant/bacteria
13. Qualitative and quantitative analysis of DNA.
14. Determination of gram -ve and gram +ve bacteria using gram staining.
15. Study of mitosis in onion root-tip cells.
16. Sub-cellular fractionation by differential centrifugation and demonstration of micrographs of different cell components.
17. Determination of protein sequence of a given polypeptide (Dry lab)
18. Calculating recessive gene frequency, sex -linked alleles frequency and Chi square test.
19. Inheritance patterns in Man – Numericals on Pedigree analysis- Autosomal patterns, X-linked patterns, Y-linked patterns, Mitochondrial inheritance patterns.
20. Gene mapping using three point test cross/tetrad analysis

SIAL BT_01_1_01_GEC PRINCIPLES OF BIOTECHNOLOGY

The Examiner will set two questions from each of the Units I-IV with eight questions in all. The students shall attempt five questions in all by choosing at least one question from each of the Units I-IV. All questions shall carry equal marks

Unit 1

Biotechnology: An overview-definition, Scope and importance of biotechnology, Concepts of recombinant DNA technology and Gene Cloning.

Microbial Biotechnology: A brief account of microbes in industry and agriculture, Metabolic engineering for over production of metabolites.

Unit 2

Plant Biotechnology: Introduction to plant tissue culture and its applications, Gene transfer methods in plants, Transgenic plants (A brief introduction), Chloroplast and mitochondria engineering.

Animal Biotechnology: In-vitro fertilization and embryo transfer in humans and livestock, Transfection techniques and transgenic animals, Animal Cloning.

Unit 3

Medical Biotechnology: (A brief account) Biotechnology in medicine, Vaccines, Molecular diagnostics, Forensic, Gene therapy, Nano Medicine & Drug Delivery Cell & Tissue Engineering, Stem Cell therapy.

Environmental Biotechnology: (A brief account) Role of biotechnology in pollution control, Sewage treatment, Energy management, Bioremediation, Restoration of degraded lands and Conservation of biodiversity.

Unit 4

Nano Science & Technology: An Overview, Insights and intervention into the Nano world, Important Developments, Societal implications & Ethical issues in Nanotechnology, Applications of Nanobiotechnology in different areas.

Intellectual Property Right Issues: PR Bio-business, Biotechnology for developing countries and IPR

Recommended Books:

1. Nelson DL and Cox MM (2013), Lehninger Principles of Biochemistry, 6th Edition Freeman and Company, New York
2. Pelczar, M.J. et. al (2001), Microbiology- Concepts and Applications, International Ed. McGraw Hill Publication, New York
3. Stanbury, P.F., Hall, S., Whitaker, A. (1998), Principles of Fermentation Technology, 2nd edn. Butterworth-Heinemann Ltd
4. Plant Biotechnology – The genetic manipulation of plants (2003) by Slater A., Scott N. and Fowler M., Oxford University Press.
5. Animal Cell Culture Methods In: Methods in Cell Biology, Vol. 57, Ed. Jenni P Mather and David Barnes, Academic Press.
6. Genome-3 (2007) T.A Brown. Garland science, Taylor & Francis, New York.
7. Diagnostic and Therapeutic Antibodies (Methods in Molecular Medicine by Andrew J.T. George (Editor), Catherine E. Urch (Editor) Publisher: Humana Press; edition (2000).
8. Ajayan, P., Schadler, L.S. & Braun, P.V., 2003. Nanocomposite Science and Technology. Wiley-VCH Verlag.

SIAL BT_01_2_05_CC
TOOLS AND TECHNIQUES IN BIOTECHNOLOGY

The Examiner will set two questions from each of the Units I-IV with eight questions in all. The students shall attempt five questions in all by choosing at least one question from each of the Units I-IV. All questions shall carry equal marks

Unit-I

Microscopy: Principles, Resolving Power and applications of Light microscopy, Electron microscopy (SEM, TEM) and Confocal microscopy, Phase contrast microscopy.

Centrifugation: Brief history, Types of centrifugation, theory of centrifugation, Centrifugation techniques, Types of rotors, Density gradient centrifugation in isolation of cells, cell organelles and biomolecules.

Unit-II

Electrophoresis: History, Principles, Application and factor affecting of electrophoresis with detail reference to Agarose, PAGE, PFGE, Capillary electrophoresis, continuous, 2D-PAGE, IEF.

Detection of Nucleic Acids and Proteins: Southern, Western and Northern blotting, PCR, Immuno-blotting, Immuno-electrophoresis, DNA finger printing and ELISA.

DNA Sequencing Techniques: DNA sequencing methods of Sanger, Maxim-Gilbert, Pyro-sequencing, Solid sequencing, Ion-torrent sequencing, SMR etc.

Unit-III

Spectroscopy: Introduction, theory and principles of different types of Spectroscopy: Photometry, UV/VIS Spectrophotometry, Infrared spectroscopy, Atomic absorption spectroscopy, ESR and NMR spectroscopy. Mass spectroscopy (LC-MS, GC-MS). Fluorescent spectroscopy, and their applications in biotechnology.

Chromatography: General principles and techniques of HPLC, FPLC, GLC, Adsorption Chromatography, partition chromatography, IEC, Gel permeation Chromatography, Affinity Chromatography. Applications of Chromatographic techniques in Biology

Unit-IV

Radioisotope Technique: Nature of Radioactivity, characteristics of different radiolabels, detection and measurement in Radioactivity, Nature and types of radiations, preparation of labelled biological samples. Detection and measurement of radioactivity, GM counter, Scintillation counter, Autoradiography, Flow cytometry. Safety measures in handling radioisotopes, RIA, Applications of radioisotopes in biological sciences.

BOOKS RECOMMENDED

1. Freifelder D. (1982), Physical Biochemistry- Application to Biochemistry and Molecular Biology, 2nd Edition, W.H. Freeman and Company, San Francisco.
2. Rietdorf, J. (2010) Microscopy Techniques, Springer, Berlin
3. Walker J. and Wilson K (2010), Principles and Techniques-Practical Biochemistry, 7 th Edition, Cambridge University Press, London.
4. Robyt, J.F. and White, B.J. (1987) Biochemical Techniques: Theory and Practice, Waveland Press
5. Skoog, D.A.; Crouch, S.R. and Holler, F.J. (2006) Principles of Instrumental Analysis, 6thEdn. Brooks/Cole, USA
6. Slater R.J. (1990), Radioisotopes in Biology-A Practical Approach, Oxford University Press, New York.
7. Boyer, R.F. (2006) Modern Experimental Biochemistry, Pearson, New Delhi.

SIAL BT_01_2_06_CC
MICROBIAL PROCESS ENGINEERING AND TECHNOLOGY

The Examiner will set two questions from each of the Units I-IV with eight questions in all. The students shall attempt five questions in all by choosing at least one question from each of the Units I-IV. All questions shall carry equal marks

Unit-I

Biotechnology of fermentation: Methods and types of fermentation, dual/multiple fermentation, continuous fermentation and late nutrient addition, growth kinetics of microorganisms, fermenter systems and fermentation. Types of fermentation process, analysis of batch fed batch and continuous bioreactions

Unit-II

Bioreactors: Basic concepts of bioreactors, parameters of biochemical process, packed bed, fedbatch, bubble column, fluidized bed, trickle bed, CSTR, plug flow reactors, Innovative bioreactors, Reactor Dynamics and reactors with non-ideal characteristics, stability of microbial reactors, analysis of mixed microbial populations, specialized bioreactors (pulsed, fluidized, photo bioreactors etc.)

Bioreactor Control: Manual and automatic control system, on-line and off-line analytical instruments, methods of measurement of process variables, Data analysis and process control.
Energy forming bio-processes for the production of liquid fuel (ethanol), and gaseous fuel (methane), Microbial production of hydrogen.

Unit-III

Industrial microbial products: Production of Alcohols, Acids, Solvents, Antibiotics, Amino Acids, Single Cell Proteins, Bioemulsifiers, Biosurfactants, Antibiotics, Insulin, Steroids, Metabolic Engineering.

Unit-IV

Scale-up Studies: Translation of laboratory, pilot and plant scale data, Criteria for translation between two scale of operation, Scale-up practices, Bases for scale-up methods, Comparison of various scale-up methods, Nongeometric scale-up

Downstream processing: Introduction, removal of microbial cells and solid matters, foam separation, precipitation, filtration, centrifugation, cell disruption, liquid-liquid extraction, chromatography, membrane process, drying and crystallization, effluent treatment

Books Recommended:

1. Pelczar, M.J. et. al (2001), Microbiology- Concepts and Applications, International Ed. McGraw Hill Publication, New York
2. Willey, J.M., Sherwood, L., and Woolverton, C. (2013) Prescott's Microbiology 9th Revised edition, McGraw Hill Higher Education, New York
3. Madigan, M.T., Martinko, J.M., Bender, K., and Buckley, D. (2011) Brock Biology of Microorganisms, 13th Edn., Pearson Education, USA
4. Stanbury, P.F., Hall, S., Whitaker, A. (1998), Principles of Fermentation Technology, 2 ndedn. Butterworth-Heinemann Ltd
5. Cruger, W. and Kruger. (2002), Biotechnology –A Textbook of Industrial Microbiology, 2 nd Edition, Panima Publishing Corporation, New Delhi.
6. Black, J.G. (2012), Microbiology: Principles and Explorations, 8 th Edition, John Wiley and Sons, USA.
7. Pommerville, J.C. (2009) Alcamo's Fundamentals of Microbiology, Jones and Bartlett Publishers.
8. Tortora, G.J., Funke, B.R., Case, C.L. (2012) Microbiology -An Introduction, 11 th Edition, Pearson education Pvt. Ltd. Singapore.

SIAL BT_01_2_07_CC

Immunology

The Examiner will set two questions from each of the Units I-IV with eight questions in all. The students shall attempt five questions in all by choosing at least one question from each of the Units I-IV. All questions shall carry equal marks

Unit-I

Introduction: History, Concept and Scope of Immunology.

Immunity: Innate and Acquired immunity, Passive and Active Immunity, Lymph and organs, Humoral and Cell Mediated immunity, Specificity and Memory, Major Histocompatibility Complex (MHC) and Complements.

Unit-II

Antigen-Antibody interaction: Antibody structure and function, Antigen-Antibody reactions, Antigen type-hapten, Generation of antibody diversity and complement system, Serological reactions, Agglutination, Precipitation, Immuno-electrophoresis, ELISA, RIA, Immuno-electromicroscopy.

Cells of immune system: Hematopoiesis and differentiation, Lymphocyte trafficking, B-lymphocyte, T-lymphocytes, Macrophages, Dendritic cells, Natural killer and lymphokine activated killer cells, Eosinophils, Neutrophils and Mast cells.

Unit-III

Generation of B-cell and T-cell response: Activation of B and T- lymphocytes. Cell mediated cytotoxicity: mechanism of T cell and NK cell mediated lysis, antibody dependent cell mediated cytotoxicity and macrophage mediated cytotoxicity.

Antigen processing and presentation: Antigen processing and presentation, Generation of humoral and cell mediated immune responses, Cytokines and their role in immune regulation, T- cell regulation, MHC- regulation, Immunological tolerance, Hypersensitivity, Autoimmunity, Immunosenescence, Transplantation immunity.

Unit-IV

Hybridoma Technology: Monoclonal antibody production, Myeloma cell lines, Fusion of myeloma cells without antibody producing B-cells, Selection and screening methods for positive hybrids, Production, purification and characterization of monoclonal antibodies without Hybridoma, Genetic manipulation of immunoglobins.

Diseases and Vaccines: T-cell cloning, mechanism of antigen recognition by T-and B-lymphocytes, Genetic control of immune response, autoimmune diseases, immunodiagnosis, AIDS, types of vaccines, Strategies for the development of vaccines for infectious diseases.

Books Recommended:

1. Kuby, RA Goldsby, Thomas J. Kindt, Barbara, A. (2012). Osborne Immunology, 8th Edition, Freeman.
2. Brostoff J, Seaddin JK, Male D, Roitt IM. (2002) Clinical Immunology, 6th Edition, Gower Medical Publishing.
3. Janeway et al., (2012), Immunobiology, 8th Edition, Current Biology publications.
4. Paul (1999). Fundamental of Immunology, 4th edition, Lippincott Raven,
5. Goding (1985) Monoclonal antibodies, Academic Press.

SIAL BT_01_2_08_CC
PRACTICALS-II

Any fifteen (15)

01. Separation of amino acids/ sugars/ lipids by Thin Layer Chromatography.
02. Determination of molar extinction coefficient of tryptophan / tyrosine and Ultra violet absorption spectra of nucleic acids and proteins.
03. Purification of protein/enzyme by Gel filtration/Ion exchange chromatography/Affinity chromatography.
04. Polyacrylamide gel electrophoresis of proteins.
05. Determination of isoelectric point of glycine.
06. Determination of A, B, O and Rh blood groups in human beings.
07. Radial immunodiffusion.
08. Quantitative precipitin assay.
09. Immuno-electrophoresis.
10. Latex agglutination test.
11. Enzyme Linked Immunosorbent Assay (ELISA).
12. Database search using BLAST and Sequence submission protocols
13. Sequence alignments (Pair wise and Multiple), Sequence and structure visualization.
14. Construction of phylogenetic tree and prediction
15. Isolation, culturing and maintenance of microorganisms and study of microbial growth kinetics
16. Estimation of enzyme activities of cellulases, xylanases, amylases etc.
17. Ethanol production from *Saccharomyces cerevisiae* and study of fermentation kinetics
18. To study the design of fermenter and its working
19. Production of extracellular enzymes and its purification by salt and solvent precipitation
20. To study the microbial decolorization of industrial dyes/ analogues

SIAL BT_01_1_03_GEC
BIOINFORMATICS AND BIOSTATISTICS (COMPULSORY)

The Examiner will set two questions from each of the Units I-IV with eight questions in all. The students shall attempt five questions in all by choosing at least one question from each of the Units I-IV. All questions shall carry equal marks

Unit-I

Scope of computers in current biological research: Basic operations, architecture of computer. Introduction of digital computers. Organization, low level and high level languages, binary number system. The soft side of the computer – Different operating systems – Windows, Linux. Introduction of programming in C. Introduction to Internet and its applications.

Introduction of Bioinformatics: History, aims of Bioinformatics, Definition and Concepts, Components of Bioinformatics, Basic tools, Scope of Bioinformatics in molecular biology and Computers, Role of internet in Bioinformatics, Applications of Bioinformatics.

Unit-II

Protein and Nucleic acid databases: DNA-the staff of life, molecular sequence alignments and sequence search (BLAST, FASTA, CLUSTALW), molecular visualization integrated molecular biology database. Protein and Nucleic acid databases, databases accession, database searching, NCBI based study.

Construction of phylogenetic tree and analysis: Predicting structure and function, Molecular Evolution and phylogenetic trees, Methods for Phylogenetic analysis: Sequence Alignment, Construction of Phylogenetic Tree, Softwares (Ssearch, Treeview, Phylip, Rasmol).

Unit-III

Presentation of Data: Frequency distributions, graphical presentation of data by histogram, frequency polygon, frequency curve, and cumulative frequency curves.

Measures of central tendency and dispersion: Mean, Median, Mode and their simple properties (without derivations), and calculation of median by graphs, range, mean derivation, standard deviations, coefficient of variation.

Unit-IV

Test of Significance and Experimental Design: Sampling distribution of mean and standard error, large scale sample tests (tests for an assumed mean and equality of two population means with known S.D.), small sample tests (t-tests for an assumed mean and equality of means of two populations when sample observations are independent, paired and unpaired t-test, t-test for correlation and regression coefficients), t-test for comparison of variances of two populations, chi-square test for independent of attributes, goodness of fit and homogeneity of samples. Principles of experimental designs, completely randomized, randomized block and Latin square designs, simple factorial experiments (mathematical derivation not required), analysis of variance (ANOVA) and its uses.

Books Recommended:

1. Mount, D.W (2002), Bioinformatics: Sequence & Genome Analysis, Cold Spring Harbor Laboratory Press.
2. Lesk, A.M. (2013), Introduction to Bioinformatics, 4th Edn. Oxford University Press, Oxford.
3. Day, R.A. (1996), How to Write and Publish a Scientific Paper, 4th Edition, Cambridge University Press, Cambridge
4. Krane, D.E. (2005), Fundamental Concept of Bioinformatics, Dorling Kindersley Pvt. Ltd.
5. Brown S.M. (2000), A Biologist Guide to Bio-computing and the Internet, A BioTechniques Books Publication, Eaton Publishing, USA.
6. Przytycka, T.M. and Sagot, M.F. (2011) Algorithms in Bioinformatics, Springer My Copy, UK.
7. Gupta, S.P. (2004). Statistical Methods., S. Chand & Sons, New Delhi.

SIAL BT_01_2_01_DCEC GENOMICS AND PROTEOMICS

The Examiner will set two questions from each of the Units I-IV with eight questions in all. The students shall attempt five questions in all by choosing at least one question from each of the Units I-IV. All questions shall carry equal marks

Unit-I

Origin and Evolution of genomics: Origin of genomics, The first DNA genomes, Microcollinearity, DNA based phylogenetic trees, Genomes and human evolution, Evolution of nuclear and organellar (mitochondrial and Chloroplast) genome, The concept of minimal genome.

Molecular maps of genomes and Comparative genomics: Genetic maps, Physical maps, EST and transcript maps, Functional maps, Comparative genomics and collinearity/synteny in maps

Unit-II

Structural and Functional Genomics: Whole genome shotgun sequencing, Clone-by-clone or 'hierarchal stotgun' Sequencing, Microbial genomes (including yeast), Plant genomes (Arabidopsis and rice), Animal genomes (fruit fly, mouse, human), Annotation of whole genome sequence and functional genomics, In silico methods, Insertion mutagenesis (T-DNA and transport insertion), TILLING, Management of data, Gene expression and transcript profiling, EST contigs and unigene sets, Use of DNA chips and Microarrays.

Pharmacogenomics: Use in biomedicine involving diagnosis and treatment of diseases, genomics in medical practice, personalized medicine, DNA polymorphism and treatment of diseases, use of SNP in pharmacogenomics, pharmacogenomics and industry.

Unit-III

Study and Scope of proteomics: Introduction, definition concepts and approaches of proteomics studies and activities.

Quantitative and Qualitative proteome analysis technique: Separation technique- 2D PAGE, 2-DE (BN-PAGE), image analysis, Mass- spectrophotometry, LC-TMS, MALDI, and SALDI

Unit-IV

Protein interaction and Protein complex: Protein interaction, DNA- Protein interaction, Yeast two hybrid and 3-hybrid system and their applications.

Drug Discovery and Development: Current issues, drug targets, Drug efficacy, Drug toxicology, Protein chips and Antibody Microarray, proteomics in cancer research.

Books Recommended:

1. Leister D. (2005) Plant Functional Genomics , Taylor & Francis
2. Weckwerth W. (2006) Metabolomics :Methods and Protocols , Humana Press
3. Lodish H. Berk A. et al (2013) Molecular Cell Biology , W.H. Freeman and Company, New York
4. Primrose S.B. and Twyman R. (2009) Principles of Genome Analysis and Genomics. John Willey and Sons Ltd
5. Dubitzky W., Granzow M., Berrar D.P. (2007) Fundamentals of Data Mining in Genomics and Proteomics. Springer Science-Business Media.
6. Lovric J. (2011) Introducing Proteomics: From concepts to sample separation, mass spectroscopy and data analysis. John Willey and Sons Ltd.
7. Mine Y., Miyashita K., Shahidi F. (2009) Nutrigenomics and Proteomics in Health and Disease: Food Factors and Gene Interaction. Wiley Blackwell

SIAL BT_01_2_02_DCEC
MICROBIAL GROWTH, ENZYME AND FERMENTATION KINETICS

The Examiner will set two questions from each of the Units I-IV with eight questions in all. The students shall attempt five questions in all by choosing at least one question from each of the Units I-IV. All questions shall carry equal marks

UNIT -I

Microbial Growth Kinetics: Thermodynamic principles, Stationary cell growth, Growth yield, Specific growth rate, Product yield, Yield equations, Maintenance energy, Kinetics of balanced growth, Transient growth kinetics, Growth kinetics of batch, fedbatch, plug flow and continuous culture, Comparison of batch and continuous culture system, Product synthesis kinetics, Growth and non-growth associated product synthesis

UNIT-II

Enzyme Kinetics: Classification and Nomenclature of Enzymes. Enzyme kinetics. Factors affecting the rates of enzyme catalysed reactions. Assay of enzyme activity – units of enzyme activity. Multisubstrate reactions. Enzyme – substrate (protein ligand) binding. Methods for measurement of k_m . Enzyme inhibition – Competitive, non-competitive and uncompetitive. Allosteric enzymes, Ribozymes and catalytic antibodies.

UNIT-III

Fermentation kinetics: Methods and types of fermentation, Submerged fermentation, dual/multiple fermentation, continuous fermentation and late nutrient addition, growth kinetics of microorganisms, fermenter systems and fermentation. Solid state fermentation, Effect of environmental parameters on kinetics and growth of product formation and cellular physiology, Process variables and process control, Principles of solid state bioreactor design and operation and product leaching.

UNIT-IV

Mass Transfer in Microbial System: Fluids and its properties, Non-Newtonian fluids, introduction to transport phenomena, Gas-liquid mass transfer, Intra-particle diffusion, Oxygen transfer and utilization in gassed microbial system, mass transfer resistances, Oxygen transfer rate and factors affecting it, determination of oxygen transfer coefficient, oxygen transfer efficiency, transport bottlenecks in bioprocesses, heat transfer in biological processes, heat transfer coefficient correlations.

Recommended Books

1. Nelson DL and Cox MM (2013), Lehninger Principles of Biochemistry, 6th Edition Freeman and Company, New York
2. Pelczar, M.J. et. al (2001), Microbiology- Concepts and Applications, International Ed. McGraw Hill Publication, New York
3. Willey, J.M., Sherwood, L., and Woolverton, C. (2013) Prescott's Microbiology 9th Revised edition, McGraw Hill Higher Education, New York
4. Madigan, M.T., Martinko, J.M., Bender, K., and Buckley, D. (2011) Brock Biology of Microorganisms, 13th Edn., Pearson Education, USA
5. Stanbury, P.F., Hall, S., Whitaker, A. (1998), Principles of Fermentation Technology, 2nd edn. Butterworth-Heinemann Ltd
6. Cruger, W. and Cruger. (2002), Biotechnology –A Textbook of Industrial Microbiology, 2nd Edition, Panima Publishing Corporation, New Delhi.
7. Tortora, G.J., Funke, B.R., Case, C.L. (2012) Microbiology -An Introduction, 11th Edition, Pearson education Pvt. Ltd. Singapore.

SIAL BT_01_3_09_CC CELL AND TISSUE CULTURE

The Examiner will set two questions from each of the Units I-IV with eight questions in all. The students shall attempt five questions in all by choosing at least one question from each of the Units I-IV. All questions shall carry equal marks

UNIT-I

Introduction to plant cell and tissue culture: Historical perspective, Laboratory organization, aseptic manipulations, culture media preparation, Use of plant growth regulators, Single cell culture, Initiation and maintenance of suspension culture- batch and continuous culture, Callus culture, Protoplast culture, Somatic hybridization.

UNIT - II

Plant tissue culture techniques: micropropagation, Meristem culture, Shoot tip culture and production of virus free plants, Somaclonal variations, In vitro production of haploid plants – Androgenesis (anther and pollen culture) and Gynogenesis (ovary and ovule culture), Doubled haploid production through distant hybridization, In vitro and in vivo pollination and fertilization, Embryo culture, embryo rescue, somatic embryogenesis, artificial seeds, germplasm conservation and cryopreservation.

UNIT-III

Animal cell and tissues culture: Historical background, terminology, advantages and limitations of cell & tissue culture, aseptic area, elements of aseptic environment, sterile handling, media sterilization, the substrate, choice of culture vessel, treated surfaces.

Defined media and supplements: physicochemical properties, balanced salt solutions, complete media, role of serum and supplements, serum free media: advantages and disadvantages of serum and serum free media, replacement of serum, development of serum free media.

UNIT-IV

Primary culture and Sub-culturing of animal cells: types of primary cell culture, isolation of the tissue, primary culture, Subculture and propagation, Criteria for subculture, Subculture of monolayer cells, growth cycle and split ratio, propagation and subculture in suspension, dilution and suspension cloning, scaling up in suspension and monolayer, large scale production of cells using bioreactors, microcarriers and perfusion techniques, cell synchronization methods and applications.

Cell line maintenance and characterization: Preservation and maintenance of animal cell lines, Stem cells, cryo-preservation, transport of animal germplasm (i.e. semen, ova and embryos), cell characterization, antigen markers.

Recommended Books:

1. Bhojwani S.S. and Razdan M.K. (2005), Plant tissue culture – Theory and Practice, Elsevier publication.
2. Clynes M. (1998), Animal Cell Culture Techniques, Springer-Verlag Berlin Heidelberg.
3. Davey M.R. and Anthony P. (2010), Plant Cell Culture: Essential Methods 1st Edition, Wiley Publishers.
4. Davis J.M. (2011), Animal Cell Culture: Essential Methods, 1st Edition, Wiley Publishers.
5. Freshney R.I. (2010), Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications, 6th Edition, Wiley-Blackwell.
6. Gamborg O.L. and Phillips G. (2013), Plant Cell, Tissue and Organ Culture: Fundamental Methods (Springer Lab Manuals), Springer.
7. Jha T.B. and Ghosh B. (2005), Plant Tissue Culture: Basic and Applied, Orient Blackswan publishers.
8. John R.W.M. (2000), Animal Cell Culture - A Practical Approach, 3rd edition, Oxford University Press.

SIAL BT_01_3_10_CC GENETIC ENGINEERING

The Examiner will set two questions from each of the Units I-IV with eight questions in all. The students shall attempt five questions in all by choosing at least one question from each of the Units I-IV. All questions shall carry equal marks

UNIT-I

Nucleic Acids: Isolation, Purification, and Yield Analysis, Radiolabelling of nucleic acids: End labelling, nick translation, labelling by primer extension, DNA sequencing.

Enzymes of recombinant DNA technology: Restriction endonucleases, DNA modifying enzymes, Other nucleases, Polymerases, Ligase, kinases and phosphatases.

UNIT-II

Gene cloning and library construction: Gene cloning vectors (Plasmids, Phages, Cosmids, Artificial chromosomes, Shuttle vectors, Expression vectors), Joining of DNA Fragments to vectors, Homo polymer tailing, cohesive and blunt end ligation, adaptors, linkers, Genomic and c-DNA libraries.

Selection, screening and analysis of recombinants: Southern blotting, Polymerase chain reaction, Northern blotting, Western blotting, Nucleic acid microarrays

UNIT-III

Manipulating gene expression: Vector Engineering and codon optimization, host engineering, Strategies of gene delivery, in vitro transcription and translation, expression of cloned genes in bacteria, expression in yeast, expression in insect cells, expression in mammalian cells, expression in plants, Site-directed Mutagenesis, Protein Engineering.

UNIT-IV

Applications of genetic engineering: Animal transgenesis and live-stock improvement, Transgenic plants and applications in crop improvement, Medical applications: Molecular genetic diagnosis of human diseases, gene therapy, DNA vaccines, Biosafety and ethical considerations.

Recommended Books:

1. Altman A. and Hasegawa P.M. (2011), Plant Biotechnology and Agriculture: Prospects for the 21st Century 1st Edition, Academic Press.
2. Brown T.A. (2006), Genomes 3, Garland science, Taylor & Francis, NewYork.
3. Brown T.A. (2010), Gene Cloning and DNA Analysis: An Introduction, 6th Edition, Wiley-Blackwell.
4. Dale J.W., Schantz M.V. and Plant N. (2011), From Genes to Genomes: Concepts and Applications of DNA Technology, Wiley-Blackwell.
5. Saldana H. A. (2014), Genetic Engineering: Basics, New Applications And Responsibilities, Intech publishers.

SIAL BT_01_3_11_CC
SEMINAR PAPER

Every student, who has been enrolled in M.Sc. (Biotechnology) course, shall have to deliver a Seminar on a Recent Topics, as per the programme of the Department of Biotechnology. Seminar will be of 45-minute duration during which the presentation will be followed by questions session by the audience comprising of faculty and students. Every student shall be required to submit the topic of his/her seminar in consultation with the Head of the Department/Faculty members well in advance so that the same may be displayed on the notice board. The speaker has to write an Abstract to be distributed during Seminar in addition to two copies of write-up giving relevant details of the background of the subject, methods used and references/List of sources from where the material for presentation has been collected.

SIAL BT_01_3_12_CC
PRACTICAL III

Any fifteen (15)

1. To study the laboratory organization and aseptic manipulations in plant and animal cell culture lab.
2. Isolation and culturing of animal cells from primary tissue explant.
3. Sub-culturing of monolayer confluent cells.
4. Counting of animal cells using hemocytometer.
5. Staining of monolayer confluent cells using geimsa and crystal violet.
6. To discriminate between viable and non viable cells using trypan blue.
7. Animal cell cloning in microtitration plates.
8. Preparation of Murashige and Skoog medium, stocks of macronutrients, micronutrients, vitamins and hormones, autoclaving, filter sterilization of hormones and antibiotics.
9. Callus culture using various explants, regeneration of shoots and root induction.
10. Anther/ Pollen and Ovary/ Ovule culture.
11. Protoplast isolation and culture.
12. Preparation of artificial seeds through gel entrapment.
13. DNA extraction and DNA estimation from plants
14. Melting temperature determination of DNA
15. PCR analysis and DNA finger printing methods, RAPD, SSR etc.
16. Preparation of genomic DNA library
17. mRNA isolation and preparation of cDNA library
18. Cloning of DNA in plasmid
19. Blue white screening of clones
20. Restriction Digestion of clones and visualization of bands

SIAL BT_01_3_03_DCEC
AGRICULTURAL BIOTECHNOLOGY AND IPR

The Examiner will set two questions from each of the Units I-IV with eight questions in all. The students shall attempt five questions in all by choosing at least one question from each of the Units I-IV. All questions shall carry equal marks

UNIT-I

Conventional and modern tools for Crop Improvement: Conventional methods for crop improvement (Pedegree breeding, Heterosis breeding, Mutation breeding), Limitations of conventional breeding, Plant Genome – Nuclear and cytoplasmic, Significance of organelle genomes, Genome size and sequence components, Molecular markers: Definition, properties, types of molecular markers: Restriction based and PCR based, RFLP, RAPD & AFLP, Development of SCAR and SSR markers, Other markers: CAPS, SNP, Comparison of different marker systems.

UNIT-II

Molecular Breeding: Marker Assisted Selection (MAS), screening and validation, Trait related markers and characterization of genes involved, Mapping genes on specific chromosomes, QTL mapping, Gene pyramiding, Transcript mapping techniques, Development of ESTs, The concept of gene synteny, The concept of map-based cloning and their use in transgenics.

UNIT-III

Transgenics in crop improvement: Genetic engineering for increasing crop productivity by manipulation of Photosynthesis, Nitrogen fixation, Nutrient uptake efficiency, Genetic engineering for biotic stress tolerance (Insects, fungi, bacteria, viruses, weeds). Genetic engineering for abiotic stress (drought, flooding, salt and temperature), Genetic engineering for quality improvement of Protein, lipids, carbohydrates, vitamins & mineral nutrients, Plant secondary metabolites: Control mechanisms and manipulation of alkaloids and industrial enzymes (Shikimate and PHA pathway), Importance of secondary metabolites in medicine and agriculture.

UNIT - IV

Intellectual Property Rights, Biosafety and Ethical Issues: Intellectual property rights (IPR), Patents, trade secrets, copyright, trademarks, Plant genetic resources, GATT & TRIPPS, Patenting of biological material, Patenting of transgenic organisms and genes, Plant breeders rights (PBRs) and farmers rights, Concerns about GM crops – environmental, biosafety and ethics.

Recommended Books:

1. Altman A. and Hasegawa P.M. (2011), Plant Biotechnology and Agriculture: Prospects for the 21st Century 1st Edition, Academic Press.
2. Henry R. J. (2012), Molecular Markers in Plants, Wiley-Blackwell.
3. Jackson J.F. and Linskens H.F. (2003), Genetic Transformation of Plants, Springer.
4. Slater A., Scott N. and Fowler M. (2008), Plant Biotechnology – The genetic manipulation of plants, 2nd edition, Oxford University Press.
5. Stewart C.N. and Touraev, A. (2011), Plant Transformation Technologies, 1st edition, Wiley-Blackwell.

SIAL BT_01_3_04_DCEC

Medical Biotechnology

The Examiner will set two questions from each of the Units I-IV with eight questions in all. The students shall attempt five questions in all by choosing at least one question from each of the Units I-IV. All questions shall carry equal marks

UNIT-I

Classification of genetic diseases: Chromosomal disorders- Numerical disorders e.g. trisomies & monosomies, Structural disorders e.g. deletions, duplications, translocations & inversions, Chromosomal instability syndromes. Gene controlled diseases – Autosomal and X- linked disorders, Mitochondrial disorders.

UNIT-II

Molecular basis of human diseases: Pathogenic mutations. Gain of function mutations: Oncogenes, Huntingtons Disease, Pittsburg variant of alpha 1 antitrypsin. Loss of function - Tumour Suppressor, Genomic, Dynamic Mutations - Fragile- X syndrome, Myotonic dystrophy, Mitochondrial diseases

UNIT-III

Diagnostic techniques: Invasive techniques - Amniocentesis, Fetoscopy, Chorionic Villi Sampling (CVS), Non-invasive techniques- Ultrasonography, X-ray, TIFA, maternal serum and fetal cells in maternal blood, Diagnosis using protein and enzyme markers, monoclonal antibodies, DNA/RNA based diagnosis Hepatitis, CML – bcr/abl, HIV - CD 4 receptor, Microarray technology- genomic and cDNA arrays, application to diseases.

UNIT-IV

Clinical management and Metabolic manipulation: PKU, Familial Hypercholesterolemia, Rickets, ADA, Congenital hypothyroidism, Gene therapy - Ex-vivo, Invivo, Insitu gene therapy, Stratagies of gene therapy: gene augmentation, Vectors used in gene therapy Biological vectors – retrovirus, adenoviruses, Herpes Synthetic vectors– liposomes, receptor mediated gene transfer, Gene therapy trials – Familial Hypercholesterolemia, Cystic Fibrosis, Solid tumors, Cell and tissue engineering: Stem cell Potential use of stem cells – Cell based therapies, Nanomedicine.

Recommended Books:

1. George A.J.T. and Urch C.E. (2000), Diagnostic and Therapeutic Antibodies (Methods in Molecular Medicine) Humana Press.
2. Glick B.R., Patton C.L. and Delovitch T.L. (2013), Medical Biotechnology, 1st edition, ASM Press.
3. Jochen Decker, U. Reischl (2004), Molecular Diagnosis of Infectious Diseases (Methods in Molecular Medicine), Humana Press.
4. Kayser O. and Warzecha H. (2012), Pharmaceutical Biotechnology: Drug Discovery and Clinical Applications, 2nd Edition, Wiley-Blackwell.
5. Strachan T. and Read A. (2010), Human Molecular Genetics, 4th edition, Garland Science publisher.

SIAL BT_01_4_01_SEEC DISSERTATION

Each candidate have to carry out the dissertation work assigned to him/her and should submit bound copies of the research work performed by him/her duly certified by the guide/supervisor. The project report should include abstract, review of literature, introduction, materials and methods, observation & results, discussion, summary & conclusion followed by bibliography. The references should be arranged alphabetically under the format given below:

Referred Journal

Sharma TC, Sharma CT and Sharma T (2006) Expression of alkaline pectinase in *Bacillus* sp. Lett. Appl Microbiol 12:245-350

Book

Demartino, GN (1996) Purification of proteolytic enzyme. In: Cellulolytic enzyme: an advance approach. Maheshwari RJ and James JS eds, Springer Germany.

Thesis

Garg ML (2006) Screening, isolation and identification of thermotolerant *P.aeruginosa* amylase. PhD Thesis, Arunachal Pradesh University, Arunachal Pradesh, India.

Website

www.elsevier.com

Central University of Haryana, Mahendergarh
Department of English & Foreign Languages
Scheme of Courses (M.A. English)
(Implemented w.e.f. Academic session 2015-16)

Semester 1

S. no.	Course Code	Course Title	L	T	P	Credit
1	SLLCH ENG 01 01 C 01 4004	Literary Criticism I	4	0	0	4
2	SLLCH ENG 01 01 C 02 4004	British Poetry-I	4	0	0	4
3	SLLCH ENG 01 01 C 03 4004	British Drama -I	4	0	0	4
4	SLLCH ENG 01 01 C 04 4004	British Fiction I	4	0	0	4
5		Discipline Centric Elective Course *	4	0	0	4
6	SLLCH ENG 01 01 E 04 3003 (General Elective)	Communication Skills	3	0	0	3

L: Lectures T: Tutorial P: Practical Cr: Credits

***Options for Discipline Centric Elective Course in Semester I:**

SLLCH ENG 01 01 E 01 4004: Phonetics

SLLCH ENG 01 01 E 02 4004: Dalit Literature & Aesthetics

SLLCH ENG 01 01 E 03 4004: American Literature

Syllabus M.A. English

Semester 1

Course Title: Literary Criticism-I

Course Code: SLLCH ENG 01 01 C 01 4004

L	T	P	Credits
4	0	0	4

Total Lectures: 60

Objective: –The course intends to provide a critical understanding of the developments in literary criticism from the beginnings to the end of 19th century. Moreover some selected texts/critics are prescribed for detailed study whose contribution to this area constitutes a significant benchmark in each era. It also provides a conceptual framework for developing an understanding of the function and practice of traditional modes of literary criticism.

Prescribed Texts:

Unit - A

Aristotle: *Poetics* (Chapters i-xvi, xxvi)

Unit - B

William Wordsworth: *Preface to Lyrical Ballads*

Unit - C

Matthew Arnold: *The Function of Criticism in the Present Time*

Unit - D

T. S. Eliot: *Tradition and Individual Talent*

Suggested readings:

1. Daiches, David. *Critical Approaches to Literature, 2nd ed.* Hyderabad: Orient Longman, 2001. Print.
2. Lucas, F. L. *Tragedy in Relation to Aristotle's Poetics.* New Delhi: Allied Publishers, 1970. Print.
3. House, Humphrey. *Aristotle's Poetics.* Ludhiana: Kalyani Publishers, 1970. Print.
4. Abrams, M. H. *A Glossary of Literary Terms.* Singapore: Harcourt Asia Pvt. Ltd., 2000. Print.
5. Wellek, Rene. *A History of Modern Criticism: 1750-1950, Vols. I-IV.* London: Jonathan Cape, 1958. Print.
6. Habib, M. A. R. *A History of Literary Criticism: From Plato to the Present.* Oxford: Blackwell, 2005. Print.
7. Ford, Boris (ed). *The Pelican Guide to English Literature, Vols. 4 & 5.* London: Pelican, 1980. Print.
8. Blamire, Harry. *A History of Literary Criticism.* Delhi: Macmillan, 2001. Print.
9. Waugh, Patricia. *Literary Theory & Criticism: An Oxford Guide.* Delhi: OUP, 2006. Print.
10. Nagarajan, M.S. *English Literary Criticism & Theory: An Introductory History.* Hyderabad: Orient Longman, 2006. Print.
11. Arnold, Matthew. *Essays in Criticism.* New York: MacMillan and company, 1865. Print.

Course Title: British Poetry I
Course Code: SLLCH ENG 01 01 C 02 4004

L	T	P	Credits
4	0	0	4

Course objective: This course intends to generate an understanding of poetry as a genre and as a language form. Poetry is an expression, a different language in itself. It is the highest form of expression. The course focuses on the works of pioneer poets from Chaucer to Alexander Pope. Moreover it includes the general awareness of the historical and literary developments in the field of poetry.

Prescribed Texts:

Unit -A

Geoffrey Chaucer: 'The Prologue' to *The Canterbury Tales*

Unit -B

William Shakespeare:

1. SONNET 73
"That Time of Year thou mayst in me Behold"
2. SONNET 116
"Let me not to the Marriage of True Minds"

John Donne:

1. "A Valediction: Forbidding Mourning"
2. "Holy sonnet XIV: Batter My Heart , Three – Person'd God"

Andrew Marvel: "To His Coy Mistress"

Unit -C

John Milton: *The Paradise Lost (Book 1)*

Unit-D

Alexander Pope: *The Rape of the Lock*

Suggested Readings:

1. Muriel A. Bowden (rep. 1982), *A Reader's Guide to Geoffrey Chaucer*, London: Thames & Hudson, 1964.
2. David Aers, *Chaucer (New Readings)*, Kent: The Harvester Press, 1986.
3. Sheila Sullivan, ed., *Critics on Chaucer*, New Delhi, Universal Book Stall, 1994.
4. Robert G. Benson and Susan J. Ridyard (ed.), *New Readings of Chaucer's Poetry (Chaucer Studies)*. D. S. Brewer, 2003.
5. Joan Bennett, *Five Metaphysical Poets*, Cambridge: Cambridge University Press, 1964.
6. Helen Gardner ed., *John Donne: A Collection of Critical Essays (Twentieth Century Views Series)* New Delhi: Prentice Hall India Ltd., 1979.
7. George Williamson, *A Reader's Guide to the Metaphysical Poets*, Yugoslavia: Thomas & Hudson, 1988.

Course Title: British Drama -I
Course Code: SLLCH ENG 01 01 C 03 4004

L	T	P	Credits
4	0	0	4

Total Lectures: 60

Course Objective: Drama combines the literary arts of storytelling and poetry with the world of live performance. As a form of ritual as well as entertainment, it has served to unite communities and challenge social norms, to vitalize and disturb its audiences. In order to understand this rich art form more fully, a sampling of plays, which exemplify different kinds of dramatic structure, will be examined. Students will be encouraged to read widely for enrichment and enjoyment.

Unit A. Christopher Marlowe : *Doctor Faustus*

Unit B. William Shakespeare : *Othello*

Unit C. William Congreve : *The Way of the World*

Unit D. George Bernard Shaw : *Candida*

Suggested Readings:

1. Baldick, Chris. *The Oxford Dictionary of Literary Terms*. USA: OUP, 2009 (3ed.). Print.
2. Abrams, M.H. *A Glossary of Literary Terms*. India: Macmillan, 1970. Print.
3. Chandler, Frank Wadleigh. *Aspects of Modern Drama*. New York: Macmillan, 1914. Print.
4. Bradley, A.C. *Shakespearean Tragedy: Lectures on Hamlet, Othello, King Lear, Macbeth*. New Delhi: Dodo Press, 2009. Print.
5. Harbage, Alfred. *Shakespeare: The Tragedies (A Collection of Critical Essays)*. New Delhi: Pearson, 2005. Print.
6. Adelman, Janet (ed.). *Twentieth Century Interpretations of King Lear*. New Delhi: Prentice Hall India, 1980. Print.
7. Loftis, J. *Comedy and Society from Congreve to Fielding*. Stanford: Calif, 1959. Print.
8. Anderson, Michael. *Anger and Detachment: A Study of Arden, Osborne and Pinter*. London: Pitman, 1976. Print.
9. Hayman, Ronald. *John Osborne (Contemporary Playwrights Series)*. London: Heinemann Educational, 1970. Print.
10. Bentley, Eric. *Bernard Shaw*. London: Limelight Editions, 1985. Print.
11. Innes, Christopher (ed.). *Cambridge Companion to George Bernard Shaw*. Cambridge: Cambridge University Press, 2006. Print.
12. Loomba, Ania. *Post-colonial Shakespeare*. London: Routledge, 1998.

Course Title: British Fiction -I
Course Code: SLLCH ENG 01 01 C 04 4004

L	T	P	Credits
4	0	0	4

Total Lectures: 60

Course Objective: To introduce fiction as a genre of literature through a critical study of the thematic and stylistic aspects of the following prescribed texts.

Unit A

Henry Fielding: *Joseph Andrews*

Unit B

Jane Austen: *Pride and Prejudice*

Unit C

Dickens: *Hard Times*

Unit D

Thomas Hardy: *Jude the Obscure*

References:

1. Chesterton, G.K. *Charles Dickens*. U.K.: House of Stratus, 2001.
2. Gardner, John. *The Art of Fiction*. New York: Alfred A. Knopf, 1984.
3. Kettle, Arnold. *An Introduction to the English Novel Vol. I*. London: Hutchinson, 1974
4. Lubbock, Percy. *The Craft of Fiction*. U.S.A.: Create Space, 2010.
5. Rimmon-Kenan, Shlomith. *Narrative Fiction*. London: Routledge: 2002.
6. Williams, Ioan. *The Criticism of Henry Fielding*. Routledge and Kegan Paul Books, 1970.
7. Williams, Raymond. *Culture and Society: 1780-1950*. New York: Columbia University, Press, 1958.
8. Lucas, George. *The Theory of Novel*. London: Merlin Press, 1971.

Course Title: Phonetics
Course Code: SLLCHC01 01 E 01 4004
Option A

L	T	P	Credits
4	0	0	4

Total Lectures: 60

Objective: –The course intends to provide a brief introduction of phonetics to the students. The emphasis here would be on correct pronunciation of English words.

Prescribed Topics:

Definition, aim and scope of Phonetics

Air Stream Mechanism; Organs of Speech

Classification and description of Speech Sounds I: Consonants

Classification and description of Speech Sounds II: Vowels

Phonetic Transcription and the International Phonetic Alphabet

Phonology

The Syllable

Varieties of English Pronunciation

The Vowels and the Consonants of English

Consonant Clusters in English

The Concept of General Indian English

Word – Accent;

Accent and Rhythm in Connected Speech

Intonation

Assimilation and Elision

Practice in Phonetic Transcription

Suggested Readings:

1. Yule, G., *The Study of Language*, Cambridge, Cambridge University Press, 2009.
2. Radford, A., *Linguistics: An Introduction*, Cambridge, Cambridge University Press, 1999.
3. Culler Jonathan, Saussure, *London Fontna Modern Classics*, 1978.
4. Balasubramanian, T. *A Textbook of English Phonetics for Indian Students*.
5. Sethi, J. and Dhamija, *Course in Phonetics and Spoke English*, New Delhi.

6. Syal and Jindal, Introduction to Linguistics, Grammar and Semantics, revised Ed., N. Delhi, Prentice Hall of India, 2007.
7. Lyons, J., Language and Linguistics, Cambridge, CUP 1982.
8. Roach, P., English Phonetic and Phonology, Prentice Hall of India, 1995.
9. Gimson, A.C., Introduction to the Pronunciation of English, London, Arnold, 1988.
10. Fromkin, Rodman and Hyams, An Introduction to Language 7th Ed., 11 Thomson Wadworth, Thomsan Asia, Singapore, reprinted in India 2004.
11. Conrad and Leech, A Student Grammar of Spoken and Written English, London, Longman.
12. Bauer, L., Morphology CUP, 2002.

Course Name: Dalit Literature and Aesthetics

Course Code: SLLCH ENG 01 01 E 02 4004

(Option B)

Total Lectures: 60

L	T	P	Credits
4	0	0	4

Course Objectives: The course intends to make the students familiar with the intent and contents of Dalit Literature and aesthetics. The prescribed texts represent different genres to provide comprehensive understanding of Dalit context and the paradigms of dalit literature.

Unit A: Dalit Autobiographies

Omprakash Valmiki: *Joothan: An Untouchable's Life*

Unit B: Novels

Kancha Ilaiah: *Untouchable God*

Unit C: Poetry

Namdev Dhasal, "Hunger"

Daya Pawar, "Blood-wave"

Arjun Dangle, "I Will Belong to It"

Keshao Meshram, "The Barriers"

Sharankumar Limbale, "White Course"

Unit D: Essays

Sharatchandra Muktibodh, "What is Dalit Literature?," *Poisoned Bread*. Arjun Dangle, ed. Hyderabad: Orient Blackswan, 2009. 270-273.

B.R. Ambedkar. "Annihilation of Caste". Valerian Rodrigues, ed. *The Essential Writings of B.R. Ambedkar*. New Delhi: Oxford UP, 2002. Pp. 263-305.

Suggested Readings:

1. Ahmad, Imtiaz and Upadhyay. *Dalit Assertion in Society Literature and History*. Hyderabad: Orient Blackswan, 2010.
2. Bama. *Sangati: Events*. OUP, 2008.
3. ---. *Vanmam (Vendetta)*. OUP, 2008.
4. Dangle, Arjun. Ed. *No Entry for the New Sun: Translations from Modern Marathi Dalit*. Orient Blackswan, 1992.

5. ---. ed. *Poisoned Bread*. Hyderabad: Orient Blackswan, 2009.
6. Datta, Prithvi and Chandra Shobhi. *The Flaming Feet and Other Essays: The Dalit Movement in India*. University of Chicago Press, 2011.
7. Gajarawala, ToralJatin. *Untouchable Fictions: Literary Realism and the Crisis of Caste*. Fordham University Press, 2012.
8. Ganguly, Debjani. *Caste and Dalit Lifeworlds: Postcolonial Perspectives*. Orient Longman, 2008.
- Jaffrelot, Christopher. *Dr.Ambedkar and Untouchability: Analysing and Fighting Caste*. C. Hurst & Co. Publishers, 2005.
9. Ilaiah, Kancha. *Why I am Not a Hindu: A Sudra Critique of Hindutva Philosophy, Culture and Political Economy*. Samya, 2005.
10. Kumar, Raj. *Dalit Personal Narratives*. Hyderabad: Orient Blackswan, 2010.
11. Limbale, Sharankumar. *Towards an Aesthetic of Dalit Literature*.trans. Alok Mukherjee.
12. Orient Blackswan, 2004.
13. ---. *Hindu: A Novel*. Samya Publications, 2010.
14. Omvedt, Gail. *Dalit Visions*.OrientBlackswan, 2006.
15. ---. *Ambedkar: Towards an Enlightened India*. Penguin, 2008.
16. Rao, Anupama. *The Caste Question: Dalits and the Politics of Modern India*. Permanent Black, 2009.
17. Rege, Sharmila. *Writing Caste: Writing Gender*.Delhi: Zubban 2006.
18. Sattanathan, A.N. *Plain Speaking: A Sudra's Story*. Permanent Black, 2007.

Course Title: American Literature

Course Code: SLLCH ENG 01 01 E 03 4004

(Option C)

Total Lectures: 60

L	T	P	Credits
4	0	0	4

Course Objective: To introduce American literature as a distinct branch of English literature through a critical study of the thematic and stylistic aspects of the following prescribed texts.

Unit – A

Ernest Hemingway: *A Farewell to Arms*

Unit – B

Edward Albee: *Who is Afraid of Virginia Woolf*

Unit –C

- i. **Walt Whitman:** One's Self I Sing", "There was a Child Went Forth", "When Lilacs Last in the Dooryard Bloom'd".
- ii. **Emily Dickinson:** "This is My Letter to the World", "Success is Counted Sweetest", "Because I could not stop for Death".
- iii. **Robert Frost:** "Mending Wall", "The Road Not Taken", "Stopping By Woods on a Snowy Evening"

Unit –D

i. Emerson: *The American Scholar*

ii. Thoreau: *Civil Disobedience*

Suggested Reading:

1. Barrett, M. O. *The Irrational Man*.
<http://www.philosophymagazine.com/others/MO_Barrett_Irrational.html>. 20 August 2011.
2. Camus, Albert. *The Myth of Sisyphus*. <http://www.sccs.swarthmore.edu/users/00/pwillen1/lit/msysip.htm>>. 14 January 2005.
3. Fisher, William J. *The American Literature of the Nineteenth Century: An Anthology*. New Delhi Eurasia Publishing House Pvt Ltd, 1970.
4. Jacob, J. *History of American Literature*. New Delhi: Sublime Publishers, 2005.
5. Milton, Jane, Caroline Polmear and Julia Fabricius. *A Short Introduction To Psychoanalysis*. New Delhi: Sage Publications, 2004.
6. Schneider, Dorothy Schneidercarl J. *An Eyewitness History Of Slavery In America*. N. A.: Checkmark, 2000.

Course Title: Communication Skills

Course Code: SLLCH ENG 01 01 E 04 3003
(GEC Elective)

Total Lectures: 00

L	T	P	Credits
3	0	0	3

Course Objective: To enable the students to acquire phonetics skills required for 'Oral skills'

Unit – A Phonetics

1. Theory: Linguistics and Phonetics
2. Phonetics and Phonology
3. The Organs Mechanism
4. Speech Sounds – Vowels and Consonants
5. Consonant cluster in English
6. Phonetic Symbols

Unit – B Remedial Grammar

Objectives: The objective of the paper will be to introduce corrective measures to students, to eradicate grammatical errors in speech and to eradicate grammatical errors in writing.

Course Contents:

Theory: The article, Parts of Speech, Linking Verbs, Negative Sentences, Questions, Agreement or Concord Verbs, Transitive/ Intransitive, Regular/Irregular, Tense and their use, Helping verbs, Verbs and Adverbs, Question Tags,

Unit - C Conversational English

Objective: To introduce different social situations and to develop Conversational skills

Fieldwork: Visit to the various places offering different situations and practicing conversation in actual Situations. Student must be asked write dialogues relating to the situations.

Unit Contents:

- A. Language and Society, Styles and Registers.
- B. English in Situations:
 - a) Greetings
 - b) Asking to Way
 - c) In the Post office
 - d) Catching a train
 - e) Buying a dress
 - f) Booking a room at a hotel
 - g) At the bank
 - h) Making a Telephone call
 - i) At the temple
 - j) Asking the time: Time Expression.
 - k) Receiving and seeing off a guest.
 - l) Buying Guidebook
 - m) At the travel agency
 - n)At the air port
 - o) At the customs
 - p) At the Police station
 - q) At the international air port
 - r) Making an apology

Books Recommended:

1. *English in situations* by R.O. Nelll (oup).
2. *What to say when* Ed: Vioin Huggins (BBO London).
3. *Success with English: The Penguin courses.*
4. *Course Book* by Geoffriy, The Penguin Books
5. *Success with English: The Penguin course: A first Reader: by Alexander Baird at all* (Penguin Books)
6. *An Introduction to the Pronunciation of English*
7. *A Text Book of English; Phonetics for Indian Students* by T. Balasubrahmanian (Macmillan India)

**CHOICE BASED CREDIT SYSTEM COURSE
DETAILS**

M.Sc. MICROBIOLOGY



**DEPARTMENT OF MICROBIOLOGY
CENTRAL UNIVERSITY OF HARYANA,
MAHENDERGARH, HARYANA**

Central University of Haryana
Master of Science in Microbiology
(Choice-Based Credit System)
Curriculum Structure 2015-17

Semester	Core/ Elective	Paper Code	Title of the Paper	Max Marks	Credit Hours
I	CC	SIAL MB 01 01 01 C	Principles of Microbiology	100	(4+0)
	CC	SIAL MB 01 01 02 C	Microbial Physiology and Metabolism	100	(4+0)
	GEC	SIAL BC 1 1 02 GE 4004	Principles of Biochemistry	100	(4+0)
	CC	SIAL MB 01 01 03 C	Bacteriology	100	(4+0)
	CC	SIAL MB 01 01 04 C	Practical -I	200	(0+4)
II	CC	SIAL MB 01 02 05 C	Virology	100	(4+0)
	DCEC**	SIAL MB 01 02 01 DCEC	Mycology & Phycology	100	(4+0)
	DCEC**	SIAL MB 01 02 02 DCEC	Plant Pathology	100	(4+0)
	CC	SIAL MB 01 02 06 C	Food and Dairy Microbiology	100	(4+0)
	CC	SIAL MB 01 02 07 C	Microbial Genetics	100	(4+0)
	CC	SIAL MB 01 02 08 C	Practical-II	200	(0+4)
	CC	SIAL MB 01 02 09 C	Seminar	50	(1+0)
III	CC	SIAL MB 01 03 10 C	Medical Microbiology and Immunology	100	(4+0)
	DCEC**	SIAL MB 01 03 03 DCEC	Environmental Microbiology	100	(4+0)
	DCEC**	SIAL MB 01 03 04 DCEC	Soil & Agricultural Microbiology	100	(4+0)
	CC	SIAL MB 01 03 11 C	Industrial Microbiology	100	(4+0)
	GEC	SIAL BC 1 3 04 GE 4004	Molecular Biology	100	(4+0)
	CC	SIAL MB 01 03 12 C	Practical-III	200	(0+4)
IV	GEC	SIAL BT 01 01 02 GE	Biostatistics & Bioinformatics	50	(2+0)
	SEEC	SIAL MB 01 04 01 SEEC	Dissertation	200	(0+22)

CC- Core Course

GEC- Generic Elective Course

*Paper code from other programme(s)

**Choose any one in given semester

Discipline Centric Elective Course (DCEC)-Offered to the students from Microbiology and other Departments

Skill Enhancement Elective Course (SEEC)-Exclusive for Microbiology students

GEC for SEM I and III are offered by Department of Biochemistry and for SEM IV is offered by Department of Biotechnology

Generic Elective Course (GEC)- Offered to students from other Departments by our department

Semester	Core/ Elective	Paper Code	Title of the Paper	Total Credit Hours
I	CC	SIAL MB 01 01 01 GEC	Introduction to Microbiology	(4)
	CC	SIAL MB 01 01 02 GEC	Microbial Energetics & Biosynthesis	(4)
II	CC	SIAL MB 01 02 03 GEC	Food Microbiology	(4)
III	CC	SIAL MB 01 03 04 GEC	Soil Microbiology	(4)

M.Sc. (Microbiology)
(SEMESTER-I)
SIAL MB 01 01 01 C Principles of Microbiology

Unit I

History of development of Microbiology in 20th century; The spontaneous generation controversy; Germ theory of disease; Microbes and fermentation; Physical and chemical methods of sterilization; Microscopy - light, confocal and electron.

Unit II

Binomial Nomenclature; Haeckel's three kingdom classification; Basic principles and techniques used in bacterial classification; Use of DNA and r-RNA sequencing in classification of microorganisms; Woese's three kingdom classification system and its utility - archaea, eubacteria, eukarya; Organization of prokaryotic and eukaryotic cell in detail; Different groups of acellular microorganisms - viruses, viroids and prions.

Unit III

General features of microorganisms - Bacteria, Algae, Fungi and Protozoa; Classification of bacteria; Bacterial growth and metabolism; Microbes in different environment; Microbes in extreme environment - special features of the thermophilic, methanogenic and halophilic archaea; Photosynthetic bacteria, Cyanobacteria; Microbes in other extreme conditions - deep ocean and space.

Unit IV

Scope of Microbiology; Biogeochemical cycles; Microbial interactions - mutualism, symbiosis, commensalisms, predation, parasitism, amensalism, competition; Bioluminescence; Biodegradation; Biofilms; Cleaning oil spills; Microbes in composting; Biocontrol agents; Bioremediation; Bioleaching; SCP; Microbial enzymes and fermented foods; Human, animals and plant diseases and their causative agents; Aeromicrobiology.

Suggested readings:

1. Atlas RM (1997). Principles of Microbiology, Wm C Brown Publishers, USA.
2. Brock TD (1961). Milestones in Microbiology, Infinity Books.
3. Madigan MT, Martinko JM, Parker J (2015). Brock Biology of Microorganisms, 14th edition, Pearson Education Ltd, Prentice-Hall, Englewood Cliffs, NJ, Inc USA.
4. Pelczar MJ, Chan ECS, Kreig NR (1993). Microbiology: Concepts and Application, 5th edition, Tata McGraw Hill, New Delhi.
5. Stanier RY, Ingraham JL, Wheelis ML, Painter PR (1976). General Microbiology, 4th edition, MacMillan, New Jersey, USA.

M.Sc. (Microbiology)
(SEMESTER-I)
SIAL MB 01 01 02 C Microbial Physiology and Metabolism

Unit I

Nutritional categories of microorganisms based on carbon and energy sources; Metabolite transport - passive and facilitated, primary and secondary active transport, group translocation (phosphotransferase system), symport, antiport and uniport, electrogenic and electroneutral transport, transport of iron; Microbial Growth - Definition balanced and unbalanced growth, growth curve, the mathematics of growth, generation time, specific growth rate, batch and continuous culture, synchronous growth, diauxic growth curve; Effect of physical and chemical factors on growth.

Unit II

Brief account of photosynthetic and accessory pigments - chlorophyll, bacteriochlorophyll, rhodopsin, carotenoids, phycobiliproteins; Autotrophy - oxygenic, anoxygenic photosynthesis; Autotrophic generation of ATP; Fixation of CO₂; Calvin cycle pathway. Chemolithotrophy - Sulphur, iron, hydrogen, nitrogen oxidations, methanogenesis, luminescence.

Unit III

Respiratory metabolism - Embden-Mayer Hoff pathway, Entner Doudroff pathway, Pentose phosphate pathway, Krebs cycle, Branched TCA cycle, Reverse TCA cycle, Glyoxalate pathway, Oxidative and substrate level phosphorylation, Gluconeogenesis, Pasteur effect; Fermentation of carbohydrates - homo and heterolactic fermentations; Halophiles and ATP synthesis.

Unit IV

Biosynthesis of peptidoglycan, polysaccharides, major amino acids, polyamines, lipids, nucleotides - purines and pyrimidines; Assimilation of nitrogen; Dormancy and germination; Microbial Differentiation, Sporulation and morphogenesis, Cell division cycle in *E. coli* and yeast.

Suggested Readings:

1. Doelle HW (1969). Bacterial Metabolism, Academic Press, USA.
2. Gottschalk G (1979). Bacterial Metabolism, Springer Verlag, New York, USA.
3. Moat AG (1979). Microbial Physiology, John Wiley & Sons, New York, USA.
4. Moat AG, Foster J W, Spector M P (2009). Microbial Physiology, 4th edition, Wiley India Pvt Ltd, Country.
5. Sokatch JR (1969). Bacterial Physiology and Metabolism, Academic Press, USA.

M.Sc. (Microbiology)
(SEMESTER-I)
SIAL MB 01 01 03 C Bacteriology

Unit I

Organization of Bacterial Cell - Structure and function of cell wall, cell membrane, cytoplasm, flagella, endoflagella, fimbriae, glycocalyx, capsule, endospore; Growth and Nutrition - cultivation of aerobic, anaerobic and accessing non-culturable bacteria; Maintenance and preservation of bacterial cultures; Components of media and different types of culture media.

Unit II

Bacterial Classification - Basis of bacterial classification, conventional, molecular and recent approaches to polyphasic bacterial taxonomy; evolutionary chronometers; rRNA oligonucleotide sequencing; signature sequences; and protein sequences; differences between eubacteria and archaeobacteria.

Unit III

Important archaeal groups according to Brock's 2009 and Bergey's Manual of Systematic Bacteriology; Archaeobacteria - General characteristics, phylogenetic overview, genera belonging to Nanoarchaeota (*Nanoarchaeum*), Crenarchaeota (*Sulfolobus*, *Thermoproteus*) and Euryarchaeota [Methanogens (*Methanobacterium*, *Methanocaldococcus*), thermophiles (*Thermococcus*, *Pyrococcus*, *Thermoplasma*) and Halophiles (*Halobacterium*, *Halococcus*)].

Unit IV

Eubacteria – Non-Proteobacteria and Proteobacteria – Morphology, metabolism, ecological significance and economic importance of following groups:

Gram Negative - Non proteobacteria (*Aquifex*, *Thermotoga*, *Deinococcus*, *Thermus*, *Chlorobium*, *Chloroflexus*, *Chlamydiae*, *Spirochaete*), Alpha proteobacteria (*Rickettsia*, *Coxiella*, *Caulobacter*, *Rhizobium*, *Hyphomicrobium*, *Agrobacterium*), Beta proteobacteria (*Neisseria*, *Burkholderia*, *Thiobacillus*), Gamma proteobacteria (*Enterobacteriaceae* family, Purple sulphur bacteria, *Pseudomonas*, *Vibrio*, *Beggiatoa*, *Methylococcus*, *Haemophilus*), Delta proteobacteria (*Bdellovibrio*, *Myxococcus*), Epsilon proteobacteria (*Helicobacter*, *Campylobacter*).

Gram Positive - Low G+C or Firmicutes (Mycoplasmas, *Clostridium*, *Heliobacterium*, *Lactobacillus*, *Lactococcus*, *Staphylococcus*, *Streptococcus*, *Leuconostoc*, *Bacillus*), High G+C or Actinobacteria (*Arthrobacter*, *Bifidobacterium*, *Corynebacterium*, *Frankia*, *Mycobacterium*, *Nocardia*, *Streptomyces*, *Thermomonospora*, *Propionibacterium*, *Cyanobacteria*).

Suggested readings:

1. Atlas RM (1997). Principles of Microbiology, Wm C Brown Publishers, USA.

2. Madigan MT, Martinko JM, Parker J (2015). Brock Biology of Microorganisms, 14th edition, Pearson Education Ltd, Prentice-Hall, Englewood Cliffs, NJ, Inc USA.
3. Pelczar MJ, Chan ECS, Kreig NR (1993). Microbiology: Concepts and Application, 5th edition, Tata McGraw Hill, New Delhi.
4. Stanier RY, Ingraham JL, Wheelis ML, Painter PR (1976). General Microbiology, 4th edition, MacMillan, New Jersey, USA.
5. Vandenmark PV, Batzing BL. The Microbes - An Introduction to their nature and Importance, Benjamin Cummings, San Francisco, USA.
6. Whitman WB, Goodfellow M, Kämpfer P, Busse HJ, Trujillo ME, Ludwig W, Suzuki K (2012). Bergey's Manual of Systematic Bacteriology, 2nd edition, Springer-Verlag, New York.

M.Sc. (Microbiology)
(SEMESTER-I)
SIAL MB 01 01 04 C Practical -I

(Microbiology; Microbial Physiology and Metabolism; Biochemistry; Bacteriology)

Microbiology: Microscopic examination of bacteria, actinomycetes, algae, fungi and protozoa; Differential staining methods; Study of shape and arrangement of bacterial cells; Preparation of microbiological media; Sterilization: Principles and operations; Preparation of specific media for isolation of bacteria, actinomycetes and fungi from natural sources; Sampling and quantification of microorganisms in air, soil and water.

Microbial Physiology and Metabolism: Determination of viable number of bacterial cells in a given sample; Determination of bacterial growth by turbidity measurements (Bacterial growth curve); To study the microscopic measurements; To study the types of growth (synchronous, diauxic, batch); To study the effect of incubation temperature on the growth of microorganisms; To study the lethal effect of temperature; To study the effect of different pH on the growth of microorganisms; To study the effect of salt concentration on the growth of microorganisms; Preparation of selective and differential media for the growth of microorganisms; Fermentation of different carbohydrates.

Biochemistry: Preparation of standard and buffer solutions; Use of simple techniques in laboratory (Spectrophotometry-verification of Beer's law, relation between O.D. and percentage transmission; Centrifugation); Estimation of sugars, Estimation of Proteins by Lowry's method; Estimation of DNA and RNA by diphenylamine and orcinol methods; Determination of enzyme activity and study of enzyme kinetics.

Bacteriology: Methods of isolation, purification and maintenance of bacteria from different environments (air, water, soil, milk and food); Staining of bacteria and actinomycetes; Use of selective media; Enrichment culture technique – isolation of symbiotic nitrogen fixing bacteria; Isolation of symbiotic nitrogen fixing bacteria from nodules; Morphological, physiological and biochemical characterization of isolated bacterial cultures.

M.Sc. (Microbiology)
(SEMESTER-I)

SIAL MB 01 01 01 GEC Introduction to Microbiology

Unit I

History and Development of various fields of Microbiology in 20th century; The spontaneous generation vs Biogenesis of microorganisms; Microbes - causative agents of disease; Microbes- fermentation and putrefaction; Preparation of microbiological media; Physical and chemical methods of sterilization. Microscopy - Light and Electron Microscopes.

Unit II

Microbial classification - Haeckel's classification- lower and higher protista; Woese's three kingdom classification systems – Archaea, Eubacteria, Eukarya; Organization of archaea, bacteria and eukaryotic cell; Different types of acellular microorganisms- Viruses, viroids and prions.

Unit III

General features and classification of Bacteria, Algae, Fungi and Protozoa; Bacterial growth and metabolism; Photosynthetic bacteria; Photoheterotrophs; Chemolithotrophs and Chemoheterotrophs; Microbes in Extreme Environment – Characteristic features of the thermophilic, methanogenic and halophilic archaea; Microbes in other extreme conditions – Deep ocean, arctic and antarctic region and space.

Unit IV

Scope of Microbiology - Cycle of matter in nature; Microbial interactions – Symbiosis and parasitism; Biodegradation and Bioremediation; Biofilms; Microbes in composting; Biofertilizers and Biopesticides; Microbes and Industry - SCP, microbial enzymes and fermented foods. Human diseases and their causative agents; Vaccines and antibiotics; Phytopathogenic bacteria.

Suggested readings:

1. Brock TD (1961). Milestones in Microbiology, Infinity Books.
2. Madigan MT, Martinko JM, Parker J (2015). Brock Biology of Microorganisms, 14th edition, Pearson Education Ltd, Prentice-Hall, Englewood Cliffs, NJ, Inc USA.
3. Pelczar MJ, Chan ECS, Kreig NR (1993). Microbiology: Concepts and Application, 5th edition, Tata McGraw Hill, New Delhi.
4. Stainier RY, Ingraham JL, Wheelis ML, Painter PR (1976). General Microbiology, 4th edition, MacMillan, New Jersey, USA.

M.Sc. (Microbiology)
(SEMESTER-I)

SIAL MB 01 01 02 GEC Microbial Energetics and Biosynthesis

Unit I

Classification of microorganisms based on carbon and energy sources; Metabolite Transport - Different types and their mechanisms; Microbial Growth - Balanced and Unbalanced growth, salient features of growth curve, generation time, specific growth rate during batch and continuous culture systems; synchronous growth, diauxic growth curve; Effect of chemicals and other environmental factors on growth.

Unit II

Photophosphorylation by bacteria - photosynthetic and accessory pigments; Carbohydrates - anabolism; Autotrophy, oxygenic, anoxygenic photosynthesis - autotrophic generation of ATP; fixation of CO₂, Calvin cycle. Chemolithotrophy - Sulphur, iron, hydrogen, nitrogen oxidations, methanogenesis.

Unit III

Embden-Mayer Hoff pathway, Entner-Doudroff pathway, Pentose phosphate pathway, Glyoxalate pathway, Krebs cycle, Oxidative and substrate level phosphorylation, Reverse TCA cycle, Gluconeogenesis, Pasteur effect; Fermentation of carbohydrates - Homo and heterolactic fermentations by microbes.

Unit IV

Biosynthesis of amino acids, polyamines, nucleotides - purines and pyrimidines; Regulation of microbial metabolism; Assimilation of nitrogen; Biosynthesis of Lipids; Biosynthesis of peptidoglycan and other cell wall polysaccharides; Dormancy and germination; Microbial differentiation; Sporulation and morphogenesis, Cell division cycle in microbes.

Suggested Readings:

6. Doelle HW (1969). Bacterial Metabolism, Academic Press, USA.
7. Gottschalk G (1979). Bacterial Metabolism, Springer Verlag, New York, USA.
8. Moat AG (1979). Microbial Physiology, John Wiley & Sons, New York, USA.
9. Moat AG, Foster J W, Spector M P (2009). Microbial Physiology, 4th edition, Wiley India Pvt Ltd, Country.
10. Sokatch JR (1969). Bacterial Physiology and Metabolism, Academic Press, USA.

M.Sc. (Microbiology)
(SEMESTER-I)
SIAL BC 1 1 02 GE 4004 Biochemistry

Unit I

Scope and Importance of Biochemistry; Fundamental principles governing life; Structure of water; Acid base concept and buffers; pH; Hydrogen bonding; Hydrophobic, Electrostatic and Vander Waal forces; General introduction to physical techniques for determination of structure of biopolymers.

Unit II

Classification, structure and function of carbohydrates; Biomembranes and lipids; Structure and function of amino acids and vitamins; Structure and function of proteins; Types of nucleic acid, their structure and functions.

Unit III

Enzymes: classification, mechanism of action; Factors affecting enzyme action; Immobilized enzymes; Hormones; Thermodynamic principles and biological processes, Bioenergetics.

Unit IV

Metabolism of carbohydrates; Photosynthesis and respiration; Oxidative phosphorylation; Lipids; Proteins and nucleic acids; DNA replication, transcription and translation in prokaryotes and eukaryotes; Recombinant DNA Technology.

Suggested readings:

1. Devlin TM (2010). Textbook of Biochemistry with Clinical Correlations, 7th edition, John Wiley and Sons Inc, USA.
2. Lehninger AL, Nelson DL, Cox MM (2008). Principles of Biochemistry, 5th edition, W. H. Freeman, New York, USA.
3. Mathews CK, van Holde KE, Ahern KG (2000). Biochemistry, 3rd edition, Benjamin Cummings, San Francisco.
4. Robert K, Murray MD, Granner DK, Mayes PA, Rodwell VI Harper's Biochemistry, 29th edition, McGraw-Hill/Appleton and Lange, New York.
5. Shukla P, Pletschke BI (2013). Advances in Enzyme Biotechnology, Springer-Verlag Berlin Heidelberg, Germany.
6. Stryer L (2002), Biochemistry, 5th edition, W.H. Freeman and Co Ltd, New York, USA.

M.Sc. (Microbiology)
(SEMESTER-II)
SIAL MB 01 02 05 C Virology

Unit I

Discovery and general characteristics of viruses; Capsid symmetry; Enveloped and non-enveloped viruses; Isolation, purification and cultivation of viruses; Viral taxonomy - classification and nomenclature of different groups (animal viruses and plant viruses) of viruses; Basic understanding of viroids, virusoids, satellite viruses and prions.

Unit II

Diversity and classification of bacteriophages; One step multiplication curve; Lytic and lysogenic phages (lambda phage); Concept of early and late proteins; Regulation of transcription in lambda phage; Phage therapy.

Unit III

Salient features of viral nucleic acid - Unusual bases (TMV, T4 phage), overlapping genes (ϕ X174, Hepatitis B virus), alternate splicing (HIV), terminal redundancy (T4 phage), terminal cohesive ends (Lambda phage), partial double stranded genomes (Hepatitis B), long terminal repeats (Retrovirus), segmented genomes (Influenza virus), non-segmented genomes (Picornavirus), capping and tailing (TMV); Modes of transmission of plant and animal viruses; Viral multiplication and replication strategies: Interaction of viruses with cellular receptors and entry of viruses; Replication of viruses as per Baltimore classification - assembly, maturation and release of virions.

Unit IV

Disease caused by human, animal and plant viruses – Polio, influenza, rabies, common cold, AIDS, hepatitis, chikungunya, dengue, ebola, foot and mouth disease, blue tongue disease, mad cow disease, bud necrosis, tobacco mosaic disease and cauliflower mosaic disease; Introduction to oncogenic viruses; Types of oncogenic DNA and RNA viruses; Mechanism of disease causation by plant viruses; Antiviral compounds and their mode of action; Interferon and their mode of action; Use of viral vectors in cloning, expression, and gene therapy.

Suggested Reading:

1. Dimmock NJ, Easton AL, Leppard KN (2007). Introduction to Modern Virology, 6th edition, Blackwell Publishing Ltd, UK.
2. Carter J, Saunders V (2007). Virology: Principles and Applications. John Wiley and Sons, New York.
3. Flint SJ, Enquist, LW, Krug, RM, Racaniello, VR, Skalka, AM (2004). Principles of Virology, Molecular biology, Pathogenesis and Control, 2nd edition, ASM press, Washington DC.
4. Wagner EK, Hewlett MJ (2004). Basic Virology, 2nd edition, Blackwell Publishing, UK.
5. Mathews REF (2004). Plant Virology, Hull R. Academic Press, New York.
6. Versteeg J (1985). A Color Atlas of Virology, Wolfe Medical Publication, New York.

M.Sc. (Microbiology)
(SEMESTER-II)
SIAL MB 01 02 01 DCEC Mycology and Phycology

Unit I

Cellular Organization of algal and fungal cells in detail; Fungi - Occurrence and distribution, somatic structure, hyphal growth, nutrition, heterothallism; Recent classification of fungi; Reproduction in fungi - asexual, sexual and parasexual cycle.

Unit II

Life cycle and economic importance of fungal genera representing the following phyla: Chytridiomycota; Blastocladiomycota; Neocallimastigomycota; Microsporidia; Glomeromycota; Ascomycota and Basidiomycota.

Unit III

Algae - occurrence and distribution, thallus structure, characteristics, nutrition, classification and reproduction; Algae as pollution indicators and eutrophication agent; Role of algae in bioremediation; Algae in global warming and environmental sustainability; Cyanobacteria and selected microalgae in agriculture as biofertilizer; Importance of algae in production of algal pigments, biofuels, hydrogen production and important bioactive molecules. Lichens and Mycorrhiza - occurrence, structure, types and importance.

Unit IV

Fungal metabolites and their potential applications in food, agriculture, industry and environment; Fungi as symbionts; Biocontrol agents; Role of fungi in deterioration of biomolecules and biomaterials; Mycotoxins.

Suggested Readings:

1. Alexopolus CJ, Mims CW, Blackwell M (2002). Introductory Mycology, 4th edition, Wiley India Pvt. Ltd, India.
2. Barsanti L, Gualtieri P (2005). Algae, Anatomy, Biochemistry & Biotechnology, CRC press, Taylor & Francis, Florida, USA.
3. Carlile MS, Watkinson SC, and G. Gooday (2001). The Fungi, 2nd edition, Academic Press, New York.
4. Graham LE, Graham JM, Wilcox LW (2009). Algae, 2nd edition, Benjamin Cummings, San Francisco.
5. <http://nt.ars-grin.gov/fungalatabases/>
6. Landecker ME (1996). Fundamentals of the fungi, 4th edition, Benjamin Cummings, San Francisco.
7. Moore D, Robson GD, Anthony P, Trinci J (2011). 21st Century Guidebook to Fungi, Cambridge University Press, UK.
8. Sumbali G (2005). The Fungi, 2nd edition, Narosa Publishing India House, India.
9. The Index Fungorum- <http://www.indexfungorum.org/>.

M.Sc. (Microbiology)
(SEMESTER-II)
SIAL MB 01 02 02 DCEC Plant Pathology

Unit-I

Introduction and history of plant pathology; Definitions and concepts of plant diseases; Biotic and abiotic factors responsible for plant diseases; Interaction of microorganisms with plants and their effect on plant growth.

Unit-II

Growth, reproduction, survival and dispersal of important plant pathogens; Production of various enzymes, toxins and other metabolites by pathogens for causing disease; Role of environment and host nutrition on disease development; Diseases of some important cereals, vegetables and crops - Crown gall, downy mildew; Symptoms of important viral diseases and their control.

Unit-III

Host parasite interactions - recognition and infection, symptomatology, disease development- role of enzymes, toxins, growth regulators; defense strategies, oxidative burst; Phenolics, phytoalexins, PR proteins, elicitors and their effects on host plants

Unit-IV

Plant disease resistance – Pathogen Associated Molecular patterns, Pattern Recognition Receptors, PTI, Effectors, ETI, 'R' genes; Mechanism of genetic variation in pathogens; Disease control in plants - physical, chemical methods; Use of biocontrol agents - bacteria and fungi; Molecular markers for disease resistance in plants; Transgenic approach for plant protection - applications and constraints.

Suggested Readings

1. Agrios GN (2005). Plant Pathology, 5th edition, Academic Press, New York.
2. Dickinson M (2003). Molecular Plant Pathology, BIOS Scientific Publishers, London.
3. Mukerji KG, Garg KL (1988). Biocontrol of Plant Diseases (Vol. I) CRC Press, Inc., Boca Raton, Florida, USA.
4. Sigee DC (1993). Bacterial Plant Pathology, Cell and Molecular aspects, Cambridge University Press, UK.
5. Upadhyay RK, Mukherjee KG (1997). Toxins in Plant Disease Development and Evolving Biotechnology. Oxford & IBH.

M.Sc. (Microbiology)
(SEMESTER-II)
SIAL MB 01 02 06 C Food & Dairy Microbiology

Unit I

Natural flora and source of contamination of foods; Intrinsic and extrinsic factors that affect growth and survival of microbes in foods; Microbial spoilage of vegetables, fruits, meat, eggs, milk, bread, butter, and canned foods.

Unit II

Principles of food preservation; Physical methods of food preservation - temperature (low, high, canning, and drying), irradiation, hydrostatic pressure, high voltage pulse, microwave processing and aseptic packaging; Chemical methods of food preservation - salt, sugar, organic acids, SO₂, nitrite and nitrates, ethylene oxide, antibiotics and bacteriocins; Food sanitation - HACCP, indices of food sanitary quality and sanitizers.

Unit III

Fermented foods - Dairy starter cultures and fermented dairy products (yogurt, acidophilus milk, curd, kefir, kumiss, cheese, dosa, sauerkraut, soy sauce and tempeh); Probiotics and prebiotics - Health benefits, types of microorganisms used, probiotic foods available in the Indian market.

Unit IV

Food-borne diseases (causative agents, foods involved, symptoms and preventive measures) - Food intoxications caused by *Staphylococcus aureus*, *Clostridium botulinum* and mycotoxins; Food infections caused by *Bacillus cereus*, *Vibrio parahaemolyticus*, *Escherichia coli*, *Salmonella*, *Shigella*, *Yersinia enterocolitica*, *Listeria monocytogenes* and *Campylobacter jejuni*; Conventional and recent methods for detection of food-borne pathogens.

Suggested Readings

1. Frazier WC, Westhoff DC (1992). Food Microbiology, 3rd edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi, India.
2. Gould GW (1995). New Methods of Food Preservation, Blackie Academic and Professional, London, UK.
3. Jay JM, Loessner MJ, Golden DA (2005). Modern Food Microbiology, 7th edition, CBS Publishers and Distributors, Delhi, India.
4. Lund BM, Baird Parker AC, Gould GW (2000). The Microbiological Safety and Quality of Foods. Vol. 1-2, ASPEN Publication, Gaithersburg, MD.
5. Tortora GJ, Funke BR, Case CL (2008). Microbiology: An Introduction, 9th edition, Pearson Education, New York, USA.

M.Sc. (Microbiology)
(SEMESTER-II)
SIAL MB 01 02 07 C Microbial Genetics

Unit I

Mendel's work on transmission of traits; Genetic variation; Prokaryotic, eukaryotic and viral genome - Structure and Functions; Extrachromosomal DNA; Mitosis and meiosis; Linkage and crossing over; Molecular mechanism of crossing over; Structure, classification and replication of plasmids.

Unit II

Molecular basis of mutations - Induced *versus* spontaneous mutations; Gene mapping by recombination and complementation; Fine gene structure analysis; Cloning genes by complementation and marker rescue; DNA repair mechanisms; Mutation and microbial evolution.

Unit III

Gene transfer in bacteria - conjugation, transformation and transduction; Regulation of gene transfer by conjugation; Mapping the bacterial genomes using Hfr strains; Transfer systems in gram positive bacteria; Ti plasmid and applications; Transformation - molecular basis of natural transformation; Transduction- Generalized *versus* specialized transduction; Mapping bacterial genes by transduction; Tetrad analysis in fungi; Positive and negative gene regulation and attenuation in different operons; Riboswitches.

Unit IV

Genes involved in the lytic and lysogenic cycle of lambda phage; Replication and packaging of filamentous phages M13; Benzer's experiments to construct phage genetic linkage maps; Transposons and gene regulation; Yeast Ty-1 transposon; Methods of gene cloning and sequencing; Genome transplantation (Synthetic genome).

Suggested Reading

1. Birge EA (1981). Bacterial and Bacteriophage Genetics, Springer Verlag, Germany.
2. Gardner JE, Simmons MJ, Snustad DP (1991). Principles of Genetics, John Wiley & Sons, New York, USA.
3. Klug WS, Cummings MR (2012). Concepts of Genetics 10th edition, Benjamin Cummings, San Francisco.
4. Lewin B (2008). Gene, Vol IX, John Wiley & Sons, New York, USA.
5. Maloy A, Friedfelder D (1994). Microbial Genetics, Narosa Publishing house, New Delhi, India.
6. Snyder L, Chapness W (2013). Molecular Genetics of Bacteria, 4th edition, ASM Press, USA.
7. Watson JD, Hopkins NH, Roberts JW, Steitz JA, Weiner AM (1987). Molecular Biology of the Gene, 4th edition, Benjamin Cummings, San Francisco.

M.Sc. (Microbiology)
(SEMESTER-II)
SIAL MB 01 02 08 C Practical- II

(Virology; Mycology & Phycology; Plant Pathology; Food and Dairy Micro; Microbial Genetics)

Virology: Study of virus architecture using electron microphotographs of TMV, poliovirus and adenovirus; Study of virus architecture using models of TMV and any virus having icosahedral symmetry; Discussion as to how animal viruses are cultivated in various media like embryonated eggs and cell cultures; Study of the cytopathic effects of viruses using electron microphotographs; Bacteriophage assay using the plaque technique; Salient symptoms of viral diseases using colored slides – small pox, chicken pox, herpes, foot and mouth disease of cattle, genital warts, tobacco mosaic, tomato leaf curl; Good laboratory practices while handling the viruses in the laboratory.

Mycology and phycology: Isolation and identification of fungi from different environmental samples; Study yeast dimorphism; Isolation and identification of algae from different habitats; Growth of algae under lab conditions; Study of nutritional requirement of mycelial fungi and yeasts; Cultivation of fungi in submerged and solid state; Production of enzymes, organic acids and other metabolites by fungi; Collection and study of basidiomycetous fungi.

Plant pathology: Isolation, characterization and frequency of occurrence of fungi present in cultivated plants; Isolation and characterization of bacteria and fungi present on different diseased/infected plant samples; To study occurrence of disease by inoculation with bacterial or fungal pathogens; Measuring plant disease intensity under controlled conditions; Isolation of bacteria from infected vegetables and fruits; Biochemical and physiological tests for detection of pathogens in fruits and vegetables; Study of soil borne pathogens.

Food microbiology: Isolation of lactic acid bacteria (LAB) from curd or milk sample; Detection of number of bacteria in milk by SPC; Determination of quality of milk sample by methylene blue reductase test (MBRT); Microbiological examination of different food samples; Production of Sauerkraut by microorganisms; Determination of antibacterial activity of lactic acid bacteria using agar well diffusion method; Statutory, recommended and supplementary tests for microbiological analysis of various foods - Baby foods, canned foods, milk and dairy products, eggs, meat, vegetables, fruits, cereals, surfaces, containers and water.

Microbial genetics: Inactivation of microorganisms by different mutagens; Production, isolation and characterization of mutants; Isolation and characterization of plasmids; Transformation of *E.coli* using isolated plasmid DNA.

M.Sc. (Microbiology)
(SEMESTER-II)
SIAL MB 01 02 03 GEC Food Microbiology

Unit I

Food and Microorganisms- Historical developments, Microorganisms important in food - Molds, yeast and bacteria - general characteristics, classification and importance; Factors affecting growth of microorganisms - Nutrient content, inhibitory substances and cell structures.

Unit II

Spoilage of different foods - Microorganisms associated with plants, soil, animals, water and air; Chemical composition of various foods and their spoilage- Vegetables, fruits, cereals, sugar and its products, milk and its products, meat and meat products, poultry, fish and sea foods. Principles of Food preservation - Types of preservation methods used – Physical, Chemical and Biological.

Unit III

Food fermentation - Production methods of bread, cheese, fermented vegetables and dairy products; Production of vinegar, wine, beer and oriental fermented foods on industrial scale, Microbes as a single cell protein (quorn and pruteen); Production of Mushroom and some indigenous Indian fermented foods.

Unit IV

Food borne infections and intoxications - Bacterial and non-bacterial infection - *Brucella*, *Bacillus*, *Clostridium*, *Escherichia*, *Salmonella*, *Shigella*, *Staphylococcus*, *Vibrio*, *Yersinia*, fungi, viruses, nematodes and emerging food-borne pathogens; Foodborne outbreaks; Laboratory testing procedures and preventive measures; Food sanitation in manufacture and retail trade.

Suggested Readings:

1. Adams MR, Moss MO (2005). Food Microbiology, 2nd edition, Royal Society of Chemistry Publication, Cambridge.
2. Frazier WC, Westhoff DC (2007). Food Microbiology, Tata McGraw Hill Publishing Company Ltd, New Delhi.
3. George J Banwart (1989). Basic Food Microbiology, AVI publication, New Delhi.
4. Jay JM (2008). Modern Food Microbiology, 6th edition, Aspen Publishers, Inc, Gaithersburg, Maryland.
5. Peppler HJ, Perlman D (1979). Microbial Technology, 2nd edition, Academic Press, USA.
6. Ray B (2005). Fundamental Food Microbiology, 3rd edition, CRC Press, New York, USA.

M.Sc. (Microbiology)
(SEMESTER-III)

SIAL MB 01 03 10 C Medical Microbiology & Immunology

Unit 1

Normal microflora of the human body and its importance: normal microflora of skin, throat and gastrointestinal tract; Collection, transport and culturing of clinical samples (sputum, urine, blood, stools) for microbiological analysis; Human microbiome.

Unit II

Causative agents, symptoms, mode of transmission and control of diseases caused by *Staphylococcus aureus*, *Streptococcus pyogenes*, *Haemophilus influenzae*, *Mycobacterium tuberculosis*, *Escherichia coli*, *Salmonella typhi*, *Vibrio cholerae*, *Helicobacter pylori*, *Bacillus anthracis*, *Clostridium tetani*, *Treponema pallidum* and TORCH group of pathogens; Causative agents, symptoms, mode of transmission and control of diseases dermatomycoses, histoplasmosis, candidiasis, malaria and kala-azar; Mechanism of action of various antimicrobial agents - inhibitors of nucleic acid synthesis, cell wall synthesis, cell membrane function and protein synthesis.

Unit III

Concept of innate and adaptive immunity; active and passive immunity; humoral and cell-mediated immunity; Structure, characteristics and functions of T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell and Dendritic cell; Immune Organs – Bone Marrow, Thymus, Lymph node, Spleen, GALT and MALT; Characteristics of an antigen (Foreignness, Molecular size and Heterogeneity); Haptens ; Epitopes (T and B cell epitopes); T-dependent and T-independent antigens; Adjuvants; Types and properties of antibodies; VDJ rearrangements; Monoclonal antibodies; Principles of Precipitation, Agglutination, Immunodiffusion, Immuno-electrophoresis, Immunofluorescence, ELISA, ELISPOT and Western blotting.

Unit IV

Organization of MHC locus (Mice and Human); Structure and functions of MHC I and II molecules; Antigen processing and presentation (cytosolic and endocytic pathways); Components of the complement system; Activation pathways (classical, alternative); Biological consequences of complement activation, 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, autoimmunity, hypersensitivity and immune deficiencies; Characteristics of tumours antigens and immune response to tumour antigens.

Suggested Reading:

1. Ananthanarayan R, Paniker CKJ (2009). Textbook of Microbiology, 8th edition, University Press Publication, India.

2. Brooks GF, Carroll KC, Butel JS, Morse SA, Mietzner TA (2010). Jawetz, Melnick and Adelberg's Medical Microbiology, 25th edition, McGraw Hill Publication,
3. Abbas AK, Lichtman AH, Pillai S (2007). Cellular and Molecular Immunology, 6th edition, Saunders Publication, Philadelphia.
4. Goldsby RA, Kindt TJ, Osborne BA, Kuby J (2007). Immunology, 6th edition, W.H. Freeman and company, New York, USA.
5. Murphy K, Travers P, Walport M (2008). Janeway's Immunobiology, Garland Science Publishers, 7th edition, New York, USA.
6. Willey JM, Sherwood LM, Woolverton CJ (2008). Prescott, Harley and Klein's Microbiology, 7th edition, McGraw Hill Higher Education, USA.

M.Sc. (Microbiology)
(SEMESTER-III)
SIAL MB 01 03 03 DCEC Environmental Microbiology

Unit-I

Introduction and scope of environmental microbiology; An overview of microbial activities in microbial niches in biosphere; Microbiology of water, air and environment in relation to human, animal and plant health and their activities.

Unit-II

Microbiology of natural waters; Environmental pollution – beneficial and deleterious role of microorganisms; Microflora of various soil types, rhizosphere and phyllosphere; Remedial measures of specialized habitats by using microorganisms - water bodies, mangroves, coral reefs and mined area; Brief account of microbial interactions; Biofertilizers and vesicular mycorrhizae (VAM); Microorganism in extreme environments.

Unit-III:

Microbial technology in waste treatment; Solid and liquid wastes characterization - physical, chemical and biological; Aerobic, anaerobic, primary, secondary and tertiary treatments - trickling filters, activated sludge, oxidation ponds *etc*; Utilization of solid wastes for production of food (SCP, mushroom, yeast), fuel (ethanol, methane) and fertilizer (composting); Waste management and resource recovery in metal, petroleum and bioenergy fields; Biofuels and biorefineries.

Unit-IV:

Value addition in fossil fuels and coal gas by use of microorganisms; Microbial interaction in rumen and gastrointestinal tract; Biodeterioration and bioremediation by microorganisms; Biotransformation of xenobiotic compounds.

Suggested Readings

1. Arnold E, Maier RM, Pepper IL, Gerba CP (2009). Environmental microbiology, 2nd edition, Academic Press, USA.
2. Atlas RM, Bartha R (1998). Microbial Ecology: Fundamentals and Applications, 4th editions, Benjamin Cummings, San Francisco.
3. Baker KH, Herson DS (1994). Bioremediation, McGraw Hill Inc., New York.
4. Campbell R (1983). Microbial ecology, Blackwell Scientific Publications, London, UK.
5. Maier RM, Pepper IL, Gerba CP (2000). Environmental microbiology, Academic Press, USA.
6. Ralph MA (1997). Environmental microbiology, John Wiley and Sons Inc., New York, USA.

M.Sc. (Microbiology)
(SEMESTER-III)
SIAL MB 01 03 04 DCEC Soil and Agriculture Microbiology

Unit – I

History of Development of soil microbiology; Soil microbiota and their interactions; Unculturable soil microbiota; Soil microbial ecology; Microorganisms in soil fertility; Influence of soil and environmental factors on microflora; Microbial population in manure and composts; Soil amendments and microbial dynamics.

Unit – II

Microorganisms in biogeochemical cycles; Microbial transformations of carbon, nitrogen, phosphorus, sulphur, iron and manganese; Biodegradation of pesticides and other organic wastes; Production of biogas; Production of manure using organic waste; Methods to improve soil structure and soil health by microorganisms.

Unit – III

Interrelationships between plants and microorganisms – Rhizosphere (Quantitative and qualitative studies – R:S ratio), Rhizoplane, spermosphere, phyllosphere microorganisms; Nitrogen fixation by soil bacteria - symbiotic, non-symbiotic, associative symbiotic and endophytic organisms, process of nitrogen fixation; Molecular biology of Nitrogen fixation; PGPR (plant growth promoting rhizobacteria), siderophore producers and biocontrol agents.

Unit –IV

Biofertilizers – Mycorrhizal inoculants, Mass cultivation of microbial inoculants; Green manuring; Microbial products and plant health; Microbial Pesticides: development and their significance.

Suggested readings:

1. Alexander M (1985). Introduction to Soil Microbiology, 3rd edition, Wiley Eastern, New Delhi.
2. Atlas RM, Bartha R (1998). Microbial Ecology: Fundamentals and Applications, 4th editions, Benjamin Cummings, San Francisco.
3. Paul EA (2007). Soil Microbiology, Ecology and Biochemistry, 3rd edition, Academic Press, New York, USA.
4. Sylvia D, Fuhrmann J, Hartel P, Zuberer D (2005). Principles and Applications of Soil Microbiology, 2nd edition, Pearson Education, USA.
5. van Elsas JD, Trevors JT, Wellington EMH (1997). Modern Soil Microbiology. Marcel Dekker, New York, USA.

M.Sc. (Microbiology)
(SEMESTER-III)
SIAL MB 01 03 11 C Industrial Microbiology

Unit I

Introduction and scope of industrial microbiology; Biology of industrially important microbes (metabolic pathways and control mechanisms); Isolation and selection of industrially important microorganisms; Genetic improvement of microbes by using classical and r-DNA techniques; Preservation and maintenance of microbial cultures.

Unit II

Microbial substrates - Media formulation, optimization of media; Cell growth kinetics - Kinetics of substrate utilization, biomass production and product formation in batch, fed batch and continuous cultivations; Types of fermentation processes - solid state, static and submerged fermentations; Design of laboratory bioreactor; Types of bioreactor - Stirred tank reactor, bubble column reactor, Airlift reactor, Packed bed reactor and Fluidized bed reactors; Scale-up principles; Downstream processes; Fermentation economics.

Unit III

Types of microbial products; Production of biomass: Baker's Yeast, mushrooms, single cell proteins, biopesticides and biofertilizers; Production of primary metabolites: Ethanol, organic acids, amino acids, vitamins; industrial enzymes and bioplastics

Unit IV

Production of secondary metabolites: Antibiotics (penicillin, cephalosporins, streptomycin), pigments, Microbial transformation, Production of metabolites of non-microbial origin like Insulin, Interleukins and growth hormones using rDNA technology. Development of designer microbes for food, energy and health care products.

Suggested readings:

1. Casida LE (1968). Industrial Microbiology, New Age Publishers, New Delhi.
2. Crueger W, Crueger A (1991). Biotechnology. A Textbook of Industrial Microbiology, 2nd edition, Sinauer Associates, USA.
3. Shuler ML, F Kargi (2004). Bioprocess Engineering - Basic Concepts, 2nd edition, Prentice Hall, New Jersey, USA.
4. Stanbury PF, A. Whitaker SJ (1999). Principles of Fermentation Technology, 2nd edition, Butterworth-Heinemann, UK.

M.Sc. (Microbiology)
(SEMESTER-III)
SIAL BC 1 3 04 GE 4004 Molecular Biology

Unit I

History of molecular biology; Nucleic acids as hereditary material; Structure of nucleic acid; Secondary and tertiary structure of nucleic acids; Types of RNA - rRNA, tRNA and mRNA; structure of ribosomes; Nucleases; Restriction and modification; DNA replication and DNA polymerases of *E.coli*. DNA sequencing

Unit II

Transcription; RNA polymerases; Types of promoters; Reverse transcriptase and RNA replicase; Genetic code; Translation; Gene regulation at transcriptional and translational level; Operon - positive and negative control; Attenuation; Molecular mechanism of mutation; Mechanism of DNA repair.

Unit III

Molecular organization of eukaryotic genome - Structure of genomes, chromatin; Types of DNA polymerases, DNA replication; Types of RNA polymerases - Transcription, structure of primary transcript; Ribozyme, RNA processing and alternate splicing; Structure of ribosomes and translation in eukaryotes; Development and differentiation; Molecular evolution.

Unit IV

Cell division cycle - Check points in cell cycle; apoptosis and its pathways; Oncogenes - Retroviruses, Tumor suppressor p53, Telomere shortening, *Ras* oncogenes; Oncoproteins and gene expression; Genetic instability and cancer.

Suggested readings:

1. Alberts B, Bray D, Lewis J, Raff M, Roberts K, Watson JD (1989). Molecular Biology of the Cell, 2nd edition, Garland Publishing, New York, USA.
2. Brown TA (2003). Genomes, 2nd edition, John Wiley and Sons Inc, New York, USA.
3. Lewin B (2009). Gene, Vol X, John Wiley & Sons, New York, USA.
4. Lodish H, Berk A, Zipursky S, Matsudaira P, Baltimore D, Darnell JE (1999). Molecular Cell Biology, 4th edition, W.H. Freeman and Company, USA.
5. Watson JD, Hopkins NH, Roberts JW, Steitz JA, Weiner AM (1987). Molecular Biology of the Gene, 4th edition, Benjamin Cummings, San Francisco.

M.Sc. (Microbiology)
(SEMESTER-III)
SIAL MB 01 03 12 C Practical III

(Medical Microbiology & Immunology; Environmental Microbiology; Soil & Agricultural Microbiology; Industrial Microbiology and Molecular Biology)

Medical microbiology and Immunology: Study composition, preparation and use of common selective differential media commonly used in medical microbiology – MacConkey agar, EMB agar, Hektoen enteric agar, Deoxycholate citrate agar (DCA); Staining techniques used in medical microbiology - Gram's staining and Ziehl-Neelsen staining for acid fast bacilli (AFB); Study resident microflora of the skin; Widal test; Antibiotic susceptibility testing using Kirby-Bauer method; Determine minimal inhibitory concentration (MIC) of an antibiotic using double dilution technique or E-test strips. **Immunology:** Determine total leucocyte count (TLC) of a given blood sample; Determine differential leucocyte count (DLC) of the blood sample, study cell morphology in blood; Identification of human blood groups - ABO and Rh factor; Immunodiffusion by Ouchterlony method; Immunoelectrophoresis; Dot-ELISA; Demonstration of Western blotting.

Environmental microbiology: Screening for microorganisms from soils and industrial effluents; Analysis of natural waters, waste waters and organic waste in relation to water pollution; Quality control tests for water; Waste treatment and anaerobic digestion; Demonstration of waste water treatment processes such as activated sludge biofilters and fluidized bed process; Isolation and screening of thermotolerant microbes from environmental samples for hydrolytic enzymes; Metagenomic analysis of any environmental sample and study the microbial diversity; Bioremediation of effluents from alcohol and textile industry using microbial cultures; To study dye and industrial effluent treatment by the microbial cultures.

Soil & agricultural microbiology: Determination of soil microbial population; Isolation of different bacterial and fungal organisms important in recycling of C, N, P, S in soil; Soil microbial biomass; Decomposition studies in soil, Soil enzymes; Measurement of important soil microbial processes such as ammonification, nitrification, N₂ fixation, S oxidation, P solubilization and mineralization of other micro nutrients; Study of rhizosphere microflora effect on plant growth.

Industrial microbiology: Isolation of industrially important microorganism from different sources using specific substrates; Design and formulation of media for microbial fermentations; Growth curve studies and determination of yield coefficient of *Saccharomyces cerevisiae* on various substrates; To study the design of fermenter and its working; To study the various methods of biomass production and its measurement; Production of ethanol using sugar by yeast isolate; Vinegar production using immobilized bacterial culture; Production of citric acid using sucrose by fungi using static, submerged and solid state conditions; Production of extracellular enzymes.

Molecular biology: Isolation of genomic DNA and RNA from bacteria; Isolation of plasmid DNA from bacterial culture; Study restriction profile of isolated DNA and plasmid samples; Transformation of *E.coli* using isolated plasmid DNA by chemical method and electroporation, determine their transformation efficiency; *Agrobacterium*-mediated gene transformation; Amplify gene of interest by Polymerase Chain Reaction, its cloning and expression; DNA isolation from soil sample and study microbial diversity using 16s rDNA universal primers

M.Sc. (Microbiology)
(SEMESTER-III)
SIAL MB 01 03 04 GEC Soil Microbiology

Unit I

Development of Soil Microbiology; Distribution of microorganisms in soil; Role of microorganisms in soil fertility; Types of microbes in different soils; Influence of soil and environmental factors on soil microbiota; Unculturable soil microbiota.

Unit II

Plant-microbe interactions; Microbiology of rhizoplane, rhizosphere and phyllosphere; Biogeochemical cycles, Nitrogen fixation - symbiotic, non-symbiotic, associative symbiotic nitrogen fixation by bacteria; Microbial transformation of phosphorus, iron, sulphur and micronutrients in soil and their importance.

Unit III

Chemical composition of different soil types and their affect on soil health and plant growth; Biodegradation of plant residues by soil microbes; Soil organic matter and soil enzymes; PGPR (plant growth promoting rhizobacteria); Siderophores and antimicrobial compounds.

Unit IV

Microbial Inoculants – Biofertilizer - Mass cultivation of microbial biomass; Nitrogen fixing bacteria and cyanobacteria; Green manuring; Microbial Pesticides and other biocontrol agents- Production and their significance - *Bacillus thuringiensis*, Bt based commercial products, *Trichoderma* based antifungal agents.

Suggested readings:

1. Alexander M (1985). Introduction to Soil Microbiology, 3rd Edition, Wiley Eastern Ltd, New Delhi.
2. Rangaswami G (1979). Recent advances in Biological Nitrogen Fixation, Oxford and IBH, New Delhi.
3. Subba Rao NS (1995). Soil Microorganisms and Plant Growth, Oxford and IBH Publishing Co. Pvt Ltd, New Delhi.

M.Sc. (Microbiology)
(SEMESTER-IV)
SIAL BT 01 01 02 GE Biostatistics and Bioinformatics

Unit I

Principles and practice of statistical methods in biological research; Samples and populations; Probability distributions - addition and multiplication theorems; Baye's theorem; Binomial, Poisson, and Normal distribution; Data presentation - Types of data, methods of data representation.

Unit II

Measures of central tendency - Mean, Median, Mode; Measures of dispersion - Range, Mean deviation and Coefficient of variation, Standard deviation, Standard error; Correlation and regression; Statistical inference - Hypothesis testing, Significance level, Test of significance for large and small samples; Parametric tests; Non parametric tests; Experimental design; Use of common biostatistics softwares.

Unit-III

Bioinformatics basics; Application in research; Present global bioinformatics scenario; Databases - characteristic of bioinformatics databases, navigating databases, information retrieval system and database collaboration; Sequence databases - nucleotide sequence databases, protein sequence database, information retrieval system e.g. Entrez and SRS; Structure databases - Structure file format, Protein structure database PDB, MMDB, FSSP, SCOP, BRENDA, AMENDA and FRENDA; Pathway databases e.g. CAZy.

Unit-IV

Tools - Need for tools, data mining tools, data submission tools e.g. nucleotide submission tools and protein sequence submission tools; Data analysis tools - nucleotide sequence analysis and protein sequence analysis tools e.g. BLAST & FASTA; Prediction tools - multiple nucleotide alignment, phylogenetic tree, gene prediction, protein structure and function prediction; Modeling tools - 2D and 3D protein modeling.

Suggested Readings:

1. Baxevanis AD, Ouellett BFF (2005). Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, 3rd Edition, John Wiley and Son Inc., New York, USA.
2. Casella G, Berger RL (2001). Statistical Inference (The Wadsworth and Brooks/Cole Statistics/ Probability Series), Brooks/Cole Pub Company, Belmont, CA.
3. Grant GR, Ewens WJ (2001). Statistical Methods in Bioinformatics: An Introduction. Springer Verlag, New York.
4. Gupta SC, Kapoor VK (2014). Fundamentals of Mathematical Statistics, S Chand and sons, India.
5. Gupta SP (2009). Statistical Methods, 28th edition, S Chand and Sons, India.
6. Jagota A. (2000). Data Analysis and Classification for Bioinformatics, Bioinformatics by the Bay Press.

7. Lesk MA (2008). Introduction to Bioinformatics, 3rd edition, Oxford Publication, UK.
8. Mount DW (2004). Bioinformatics Sequence and Genome Analysis, 2nd edition, CSHL Press, New York.
9. Spiegel MR, Schiller JJ, Srinivasan RA (2000). Schaum's Outline of Probability and Statistics, McGraw-Hill Trade, New York, USA.
10. Srinivas VR (2005). Bioinformatics A modern Approach, PHI publisher, India.
11. Tramontano A (2006). Introduction to Bioinformatics, 1st edition, Chapman and Hall/CRC, London, UK.