

**Scheme & Syllabus for Ph.D. in
Civil Engineering**

Ph.D. Course Work

**Department of Civil Engineering
W.e.f. Session 2020-21**



School of Engineering & Technology

**CENTRAL UNIVERSITY OF HARYANA
MAHENDERGARH-123031
HARYANA**

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Central University of Haryana, Mahendergarh

Department of Civil Engineering, School of Engineering and Technology

Ph.D. Course Work (w.e.f. session 2020-21)

Programme : Ph.D.
Department : Civil Engineering

Teaching Scheme				Contact Hours /Week		
Sr. No.	Subject code	Course title	Credits	L	T	P
1	SoET- 020101C4206	Research Methodology	6	4	2	0
2	SoET- 020102C2002	Research and Publication Ethics	2	2	0	0
Elective Courses (Specialization based – any two subjects)						
3	SoET- CE 020101 E4004	Condition Assessment and Retrofitting of Structures	4	4	0	0
4	SoET- CE 020102 E4004	Pavement Materials and Construction Practices	4	4	0	0
5	SoET- CE 020103 E4004	Fluvial Hydraulics and Flood Control	4	4	0	0

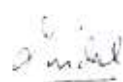
L = Lecture, T = Tutorial, P = Practical, & C = Credits

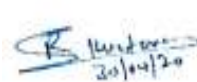





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RESEARCH METHODOLOGY

Course code : SoET- 020101C4206

L	T	P	Credit
6	0	0	6

Unit –I

Introduction of Research Methodology: Concept of research and its applications: characteristics features, objectives, scope, reliability and validity of research, Scientific process: Meaning and Definition, Steps involved in research process, a brief history of scientific process.

Formulation of research problem: Objectives of research problem. Research Design-Meaning, Need and features of good research design, defining problem, preparing research design analysis and interpretation of data, Basic Principles of Experimental Techniques. Importance and relevance of ethics and values in science and technology

Unit II

Scientific Methodology: Meaning, Scope, Primary sources of literature survey- journal, patents etc. Secondary sources of literature survey - books, reference books, text books. Paper Writing and preparation of Dissertation: Basic concepts of paper writing - Steps of paper writing, Methods of presentation, Precautions in preparing the research Dissertation – Concepts of bibliography and annexure, Discussion of results, Drawing conclusions, Giving suggestion and recommendation of concerned persons.

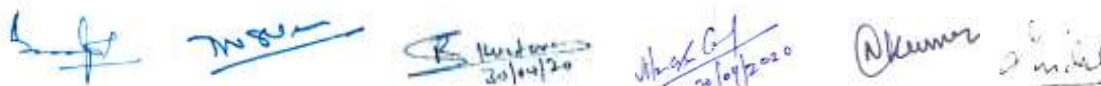
UNIT III

Computer Applications: a. Spreadsheet tool: Introduction to spread-sheet applications, features & functions, using formulae & functions, data storing, features for statistical data analysis, generating charts/graphs & other features. [Tools: Microsoft Excel, Open office and similar or other advanced tools] b. Presentation tool: Introduction to presentation tool, features & functions, creating presentations, customising presentation. [Tools used: Microsoft Power point, Open Office or any other tool] c. Web Search: introduction to internet, Use of Internet & www, using search engines using advanced search tools. d. Thesis writing & Scientific editing tools.

UNIT IV

Measurement Scales and Evaluation: Concepts of Measurement Scales; Primary Levels of Measurement; Classification of Measurement Scales; Validity and Reliability Analysis
Scholarly Writing Characteristics of Scholarly Writing; Standard Guidelines; Critical Reviews; Research Proposals; Research Reports; Thesis/Dissertations; Research Papers; Impact Factor of Journals; Citation and Acknowledgement; Plagiarism and Self-Plagiarism; Reproducibility and Accountability

Note: Following are to be practiced in Computer Lab.: Spreadsheet application, features and functions, using formulas and functions, data storing, features for statistical data analysis, use of

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SPSS generating chart's/graph and other features. Document and Presentation tool: features and functions, Using Latex, Open-office and MS office, creating presentations, master page, adding animation, customizing animation, creating handouts. Web search: introduction to internet, using search engine, relevance of search terminology, Advanced search.

Suggested Readings:

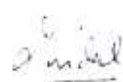
1. Bowen, W. G. and Rudenstine, N. L. *In pursuit of the Ph.D.* Princeton University Press, 1992.
2. Davis, G. B. and Parker, C. A. *Writing the Doctoral Dissertation: A Systematic Approach.* 3rd Edition, Barron's Educational Series, 2012.
3. Gash, S. *Effective Literature Searching for Research.* 2nd Revised ed., Gower, 1989
4. Kothari, C. R. and Garg, G. *Research Methodology: Methods and Techniques.* 4th Multi-Colour Edition, New Age International Publishers, 2019.
5. Kumar, R. *Research Methodology: A Step-by-step Guide for Beginners.* 4th ed., Sage Publications, 2014.
6. Lester, J. D. and Lester, J. D. Jr., *Writing Research Papers: A Complete Guide.* 15th ed., Longman, 2014.
7. Madsen, D. *Successful Dissertations and Theses.* 1st ed., Jossey-Bass, 1983.
8. Mauch, James E. and Park, N. *Guide to the Successful Thesis and Dissertation: A Handbook for Students and Faculty.* 2nd ed., Marcel Dekker, Inc., 1989.
9. Schloss, P. J. and Smith, M. A. *Conducting Research.* Prentice-Hall, 1999.
10. Sternberg, D. *How to Complete and Survive a Doctoral Dissertation.* St. Martin's Press, 1981.
11. Turabian, K. L. *A Manual for Writers of Term Papers, Thesis, and Dissertations.* University of Chicago Press, 1973.

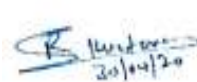












RESEARCH AND PUBLICATION ETHICS

Course code : SoET- 020102C:2002

L	T	P	Credit
2	0	0	2

This course has 6 modules mainly focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands on sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research and p metrics and plagiarism tools introduced in the course

THEORY

RPE 01: PHILOSOPHY AND ETHICS (3 HRS)

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

RPE 02: SCIENTIFIC CONDUCT (5 HRS)

1. Ethics with respect to science and research
2. Intellectual honest and research integrity
3. Scientific misconducts: falsification, fabrication, and plagiarism.
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data.

RPE 03: PUBLICATION ETHICS (7 HRS)

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

PRACTICE

RPE 04: OPEN ACCESS PUBLISHING (4 HRS)

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright and self-archiving policies.
3. Software tool to identify predatory publications developed by SPPU

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4. Journal finder/ journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

RPE 05: PUBLICATION MISCONDUCT (4 HRS)

A. Group Discussions (2 hrs)

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

B. Software tools (2 hrs)

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

RPE 06: DATABASES AND RESEARCH METRICS (7 HRS)

A Databases (4 hrs)

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

B. Research Metrics (3 hrs)

Impact Factor of journal as per journal citation report, SNIP, SJR, IPP, Cite Score.

Metrics: h-index, g index, i10 index, altmetrics

Suggested Readings:

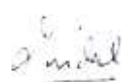
1. Kimmel, Allan J. *Ethical Issues in Behavioral Research: Basic and Applied Perspectives*. John Wiley & Sons, 2009.
2. Kitchener, K. S. *Foundations of Ethical Practice, Research, and Teaching in Psychology*. Lawrence Erlbaum Associates Publishers, 2000.
3. Oliver, P. *The Student's Guide to Research Ethics*. Open University Press, Philadelphia, 2010.
4. Shamoo, Adil E. and Resnik, David B. *Responsible Conduct of Research*. Oxford University Press, 2009.
5. Stanley, B. Joan Sieber, E. and Nelton, Gary B. eds. *Research ethics: A psychological approach*. U of Nebraska Press, 1996.
6. Todorovich, M., Kurtz, P. & Hook, S. *The Ethics of Teaching and Scientific Research*. Prometheus Books, 1977

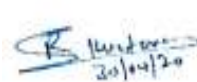












CONDITION ASSESSMENT AND RETROFITTING OF STRUCTURES

Course Code: SoET - CE 0201014004

L	T	P	Credit
4	0	0	4

Course Outcome

CO1: Understand the background of repair, strengthening, retrofitting and rehabilitations of reinforced concrete structures.

CO2: Understand the concept of distress mapping in the reinforced concrete structures.

CO3: Understand the strategies of surface repair and retrofitting techniques.

CO4: Attain knowledge of rehabilitation of existing building.

UNIT-I

Deterioration of Concrete Buildings: Embedded Metal Corrosion, Disintegration Mechanisms, Moisture Effects, Thermal Effects, Structural Effects, Faulty Construction.

Evaluation of Concrete Buildings: Visual Investigation, Destructive Testing Systems, Non-Destructive Testing Techniques, Semi-Destructive Testing Techniques, Chemical Testing.

UNIT-II

Surface Repair & Retrofitting Techniques: Strategy & Design, Selection of Repair Materials, Surface Preparation, Bonding repair Materials to Existing concrete, Placement Methods, Epoxy Bonded Replacement Concrete, Preplaced Aggregate Concrete, Shotcrete/Gunite, Grouting, Injection Grouting, Micro concrete.

UNIT-III

Strengthening Techniques: Strengthening Techniques, Beam Shear Capacity Strengthening, Shear Transfer Strengthening between Members, Column Strengthening, Flexural Strengthening, and Crack Stabilization

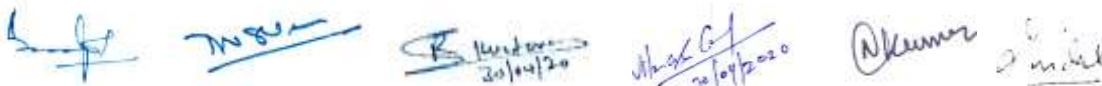
Seismic Rehabilitation: Guidelines for Seismic Rehabilitation of Existing Buildings, Seismic Vulnerability and Strategies for Seismic Retrofit.

UNIT-IV

Earthquake resistant design: Introduction to IS 1893:2002, Behaviour of buildings and structures during past earthquakes and lessons learnt goals of earthquake resistant design. Linear static procedure for seismic load calculation – IS 1893-2002, Design the 5 storey earthquake resistant structures.

Suggested Readings:

1. ATC- 40: *Seismic Evaluation and Retrofit of Concrete Buildings*, Vol. 1 & 2, 1997.
2. Bohni, H. *Corrosion in Concrete Structures*. CRC Press, 2005.

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3. Bungey, S., Lillard, G. and Grantham, M.G., *Testing of Concrete in Structures*. Taylor and Francis, 2006.
4. Emmons, P.H., *Concrete Repair and Maintenance*. Galgotia Publication, 2012.
5. *FEMA 273; NEHRP Guidelines for the Seismic Rehabilitation of Buildings*, 1999.
6. Malhotra, V.M. and Carino, N.J. *Handbook on Non-destructive Testing of Concrete*. CRC Press, 2004.
7. Priestley, M.J.N., Seible, F. and Calvi, G.M, *Seismic Design and Retrofit of Bridges*. John Wiley, 1996.

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P. H. E.

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F. S.

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PAVEMENT MATERIALS AND CONSTRUCTION PRACTICES

Course Code: SoET - CE 0201024004

L	T	P	Credit
4	0	0	4

Course Outcome

CO1: Attain knowledge of different materials used for pavement construction.

CO2: Exhibit knowledge of practices involved in the construction of different pavements.

CO3: Exhibit a theoretical knowledge of various design methods of pavements.

CO4: Understands various aspects of quality control during the construction of pavements.

Unit I

Aggregates, Soil & Bitumen Classification, physical and strength characteristics, Proportioning of aggregates, Aggregate texture and skid resistance, polishing of aggregates. Classification, Structural and Constructional problems in soil subgrade, Identification and strength tests, Soil-moisture movement, Sub-soil drainage, Soil stabilization. Bitumen sources and manufacturing, Bitumen constituents, structure and Rheology, Mechanical and engineering properties of bitumen, Tests on bitumen, Emulsions – Properties, types, modifications, Durability of bitumen, Adhesion of bitumen, Modified bitumen.

Unit II

Bituminous Mixes Desirable properties of mixes, Design of bituminous mixes, Tests on bituminous mixes, Fillers, Theory of fillers and specifications.

Unit III

Cement Concrete Mixes Constituents and their requirements, Physical, plastic and structural properties of concrete, Factors influencing mix design, Design of concrete mixes.

Unit IV

Road Construction Bituminous road construction procedures and specifications, Quality control requirements. Concrete Road construction: Construction methods, Quality control requirements, Joints in cement concrete pavements, Reinforced cement concrete road construction.

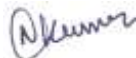
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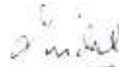
1. Khanna, S.K. and Justo, C.E.G. *Highway Engineering*. Nem Chand Jain & Bros, 2005.
2. Krebs, Robert, D. and Walker, R. D. *Highway Materials*. McGraw Hill Book Co., 1971.
3. Read, John, David Whiteoak, and Robert N. Hunter. *The shell bitumen handbook*. Thomas Telford, 2003.
4. Relevant latest IRC and IS code of 2019
5. Yao J., Zhou Z., and Zhou H. *Highway Engineering Composite Material and Its Applications*. Springer Singapore, 2019.














Fluvial Hydraulics and Flood Control

Course code: SoET- CE 020103 E4004

Course Outcome

CO1: To understand the fundamental concepts relevant to river mechanics, regime channels, sediment transport and sediment load.

CO2: To attain the students to understand the processes that governs sediment transport and behaviour of river flow.

CO3: Apply the knowledge in estimation of floods

CO4: To utilize the knowledge of the reservoir and channel flood routing for the reservoir planning and flood management.

UNIT I

Reservoir Sedimentation and Control: Scope and significance of reservoir sedimentation, properties of sediments. Basic concepts of sedimentation, bed load, suspended load sediment inflow, sediment out flow, trap efficiency, retention time.

Incipient motion of sediment particles: Competent velocity, lift concept, tractive force concept; critical tractive force; Shield's analysis, White's analysis.

Unit II

Bed load transport and saltation: Bed load equations- Du-Boy's equation, Shield's equation, general comments on bed load equation; saltation-mechanism of saltation, saltation in air, transport rates in saltation, Regimes of flow: Description of regimes of flow; ripple and dune regime, anti-dune regime; characterization of ripples, dunes and anti-dunes.

Change of stream bed in floods, degradation, aggradation Equilibrium depth of scour in channel connection, scour, types of scour, scour at bridge piers, scour prevention measures.

Unit III

Flood estimation methods: Standard Project Flood and Probable Maximum Flood, Indian standard and CWC guidelines for design flood estimation for different structure, Flood Peak estimation, Rational Method, Empirical Equations, Flood Peak Formulae, Flood Frequency Analysis, Gumble's Method,

Unit IV

Flood routing: Routing methods, Hydrologic Channel and Reservoir Routing, Muskingham method, the working value method, Hydrologic, Modified Pul's method,

Flood Management: Flood Control measures, Flood protection works.

Suggested Readings:

1. Chang H. Howard, *Fluvial Processes in River Engineering*, John Wiley & Sons, 1988.
2. Chow, V.T., Maidment, D.R., and Mays, L.W., *Applied Hydrology*, McGraw Hill, 2010

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3. Garde, R.J. *River Morphology*, New Age International Publishers, 2006
4. Garde, R.J. and Ranga Raju, K.G., *Mechanics of Sediment Transportation and Alluvial Stream Problems*, Wiley Eastern Limited, 2005.
5. K. Subramanya, *Engineering Hydrology*, TMH, New Delhi, India, 2020
6. Mccuen, R.H., *Hydrologic Analysis and Design*, Pearson, 2005
7. Pierre Y. Julien, *River Mechanics*, Cambridge University Press, 2018

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