

MEDI-CAPS
UNIVERSITY

Department of Civil Engineering

CURRICULUM AND SYLLABUS **(2024-2025)**

Ph.D Civil Engineering



Civil Engineering

Ph.D (CE)

CURRICULUM AND SYLLABUS



Vision Statement of University

Be an internationally acclaimed University recognised for its excellent teaching, research, innovation, outreach and creating top class technocrats and professionals who can serve the mankind as multi skilled global citizen.

Mission Statement of University

- Establish state-of-the-art facilities for world class education and research.
- Conduct scholarly research and creative endeavors that impact quality of life.
- Attract quality staff and students to cater for diverse needs and preferences and widen participation.
- Build a foundation for students to be successful at all levels through high-quality, innovative programs.
- Collaborate with institute, industry, and society to address current issues through research and align curriculum.
- Involve in societal outreach programs to identify concerns and provide sustainable ethical solutions.
- Encourage life-long learning and team-based problem solving through an enabling environment.

Vision of the Department

To emphasize deep understanding of fundamental principles, development of creative ability to handle the challenges of Civil Engineering, and the analytical ability to solve problems which are interdisciplinary in nature.

Mission of the Department

1. To offer an exceptional curriculum including in-depth coverage in three technical sub-disciplines of civil engineering: structural engineering, Construction Management and Environmental engineering, as well as broad coverage in Computer Aided Design.
2. To engage students in creating innovative design solutions of civil engineering problems that include realistic constraints such as economic, environmental, sustainability, social, ethical, health and safety.
3. To provide research experiences, allowing students to work closely with members of the faculty.
4. To employ highly dedicated faculty members who are effective teacher scholars committed to maintaining a learner-centered environment with emphasis on student mentoring.



Department of Civil Engineering

Program Education Objectives (PEOs)

Program Purpose

The purpose of the doctorate Civil Engineering program at Medi-Caps University is to provide the key knowledge base related to Civil Engineering to prepare students for careers professionals in the field of Civil Engineering and related areas.

- PEO 1** To develop professionals who utilize fundamental knowledge, analytical and problem-solving skills related to Civil Engineering and related areas to articulate and make decisions critically and creatively based on research evidence and experiences in professional practice.
- PEO 2** To develop professionals who competently provide solutions for the advancement of knowledge through the application of appropriate tools and techniques.
- PEO 3** To develop professionals who continue to acquire advanced knowledge in pursuing lifelong learning and display commitment to the community and profession through effective communication with peers by adhering to legal, ethical, and professional codes of practice.

Department of Civil Engineering

Programme Outcomes (POs)

Research Scholars will

- PO 01** Have a strong foundation in the fundamentals of basic as well as current scientific theories and their applications in real life.
- PO 02** Be capable in designing and carrying out scientific experiments related to Civil engineering and related areas, as well as accurately recording and analyzing the results of such experiments.
- PO 03** Have proficiency in analytical reasoning, critical thinking and problem solving, as applied to scientific problems.
- PO 04** Have ability of communicating the results of scientific work in oral, written and electronic formats to both scientists and masses at large.
- PO 05** Have skills to explore new areas of research in fields of science and technology.
- PO 06** Have an ability to adopt ethical practices in developing scientific solutions for the Environmental issues and key issues being faced by our society in energy, health and safety.
- PO 07** Have ability to utilise research for addressing social, economic, and environmental problems.
- PO 08** Have ability to extend his/her research experiences in socio-economic and cultural development.
- PO 09** Be able to function as a member of an interdisciplinary problem-solving team.
- PO 10** Have ability of developing innovative and cost-effective techniques and products.



Department of Civil Engineering

Programme Specific Outcomes (PSOs)

Research Scholars will

- PSO 1** Have knowledge, understanding and expertise in the area of Civil Engineering and allied fields.
- PSO 2** Be capable of developing eco-friendly construction processes and impact of the same on health and environment.
- PSO 3** Be capable of handling the instruments and software that are commonly used in most Civil Engineering fields.
- PSO 4** Have opportunities to excel in academics, research or industry in the area of Civil Engineering.



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Medi-Caps University Indore (M.P.)
DEPARTMENT OF CIVIL ENGINEERING
Choice Based Credit System-Scheme of Ph.D CE (2024 Batch)

Scheme for Civil Engineering

PhD CE Course Work, Session: July-Dec 2024

Sr. No	Course Code	Courses	L	T	P	Hrs	Credits
1	MU6RD01	Research and Publication Ethics	2	0	0	2	2
2	EN6RD01	Research Methodology	4	0	0	4	4
3	MU6RD03	Review of Published Research	0	0	4	4	2
4	CE6CWXX	Elective	4	0	0	4	4
		Total	10	0	0	10	10

Elective Courses:

CE6CW01 Environmental Engineering

CE6CW02 Advanced Concrete Technology

CE6CW03 Environmental Hydraulics



Course Code	Course Name	Hours per			Total Hrs.	Total Credits
		L	T	P		
MU6RD01	Research and Publication Ethics	2	0	0	2	2

Unit-I

Philosophy, Ethics and Paradigm of Research: Introduction to Philosophy: definition, nature and scope, concept, branches. Ethics: definition, moral Philosophy, nature of moral judgments and reactions. Philosophy of scientific research, research paradigm, approaches and components of research paradigm, artifacts, values and beliefs.

Unit-II

Scientific Conduct: Ethics with respect to science and research, Ethics in Measurement Practices, Ethics aspects of Funding policies, Intellectual property rights, Intellectual honesty and research integrity, Scientific misconducts: Whistle blowing, Falsification, Fabrication and Plagiarism (FFP), Image manipulation, violation of copy right act. Redundant publication: duplicate and overlapping publications, salami slicing. Selective reporting and misrepresentation of data.

Unit-III

Publication Ethics: Definition, introduction and importance, responsibilities of authors, best practices/standards setting initiatives and guidelines: COPE, WAME, etc. Conflicts of interest, privacy and confidentiality. Publication misconducts: definition, concepts, problems that lead to unethical behavior and vice versa, types. Editorial and review ethics, Violation of publication ethics, authorship and contributor-ship, Withdrawal of articles, Data protection legislation. Identification of publication misconduct, complaints and appeals. Predatory publishers and journals.

Unit-IV

Open Access Publishing: Open access publications and initiatives. SHERPA/RoMEO online resource to check publisher copyright and self-archiving policies. Software tools to identify predatory publications developed by SPPU. Journal finder/Journal suggestion tool viz. JANE, Elsevier finder, Springer journal suggester, etc.

Unit-V

Database and Research Metrics:

Database: Indexing database. Citation database: Web of Science, Scopus, etc.

Research Metrics: Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score. Metrics: h-index, g-index, i10 index, altimetric.

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

Group Discussions and Case Study: Subject specific ethical issues, FFP, Authorship. Conflicts of interest. Complaints and appeals: examples and fraud from India and abroad.

Textbook:

1. Chaddah Praveen (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 978-9387480865.
2. Day RA (1979) How to write and publish a scientific paper. ISI press, Philadelphia.
3. Committee on Publication Ethics (COPE): Guidelines on good publication practice (<https://publicationethics.org/resources/guidelines>)
4. Moore A (2013) What's in a peer review report. Bio Essays.

Reference Book:

1. The Ethics of Teaching and Scientific Research By Miro Todorovich; Paul Kurtz; Sidney Hook.
2. Research Ethics: A Psychological Approach By Barbara H. Stanley; Joan E. Sieber; Gary B. Melton.
3. Research Methods in Applied Settings: An Integrated Approach to Design and Analysis By Jeffrey A. Gliner; George A. Morgan Lawrence Erlbaum Associates, 2000.
4. Ethics and Values in Industrial-Organizational Psychology By Joel Lefkowitz Lawrence Erlbaum Associates, 2003.
5. Bird, A. (2006). *Philosophy of Science*. Routledge.
6. Mac Intyre, Alasdair (1967) *A short History of Ethics*. London.
7. National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2009). *On being a Scientist: A Guide to Responsible Conduct in Research; Third Edition*, National Academies Press.
8. Resnik, D. B. (2011), What is ethics in research & why is it important. *National Institute of Environmental Health Sciences*, 1-10. Retrieved from <http://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm>.
9. Beall, J. (2012), Predatory publishers are corrupting open access. *Nature*, 489 (7415), 179-179. <http://doi.org/10.1038/489179a>.
10. Indian National Science Academy (INSA), Ethics in Science Education, Research Governance (2019), ISBN: 978-81-939482-1-7. http://www.insaindia.res.in/pdf/Ethics_Book.pdf.



Subject Code	Subject Name	Hours per Week			Total Hrs.	Total Credits
		L	T	P		
EN6RD01	Research Methodology	4	0	0	4	4

Unit-I Introduction to Research Techniques

Meaning of research, objectives of research, motivation in research, types of research- empirical and experimental research, algorithmic research, simulation research, mathematical modeling approach, characteristics and prerequisites of research, significance of research, research process, Sources of research problem, criteria of identifying the problem, necessity of defining the problem, formulation of a research problem, errors in selecting research problem, technique involved in defining the problem, Report and paper writing.

Unit II Statistical analysis

Statistical analysis, Measures of central tendency and dispersion, mean, median, mode, range, mean and standard deviations, computing correlation in variables, linear and non-linear regression.

Unit III Probability and Probability distributions

Probability: classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes 'Theorem and independence. Probability distributions: binomial, poison, geometric, negative binomial uniform exponential, normal and log normal distribution.

Random Variables: Discrete, continuous and mixed random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, probability and moment generating function, median and quintiles, Markov inequality, correlation and regression, independence of random variables.

Unit IV Sampling & Distributions

The Central Limit Theorem, distributions of the sample mean and the sample variance for a normal population, Chi-square, t and F distributions, problems. Hypothesis Testing: Basic ideas of testing hypothesis, null and alternative hypotheses, the critical and acceptance regions, two types of error, tests for one sample and two sample problems for normal populations, tests for proportions, Chi-square goodness of fit test and its applications. Software and Tools to be learnt: Statistical packages like SPSS and R.

Unit V Simulation and Soft Computing Techniques

Introduction to soft computing, Artificial neural network, Genetic algorithm, Fuzzy logic and their applications, Tools of soft computing, need for simulation, types of simulation, simulation language, fitting the problem to simulation study, simulation models, verification of simulation models, calibration and validation of models, Output analysis. Introduction to any one simulation tool e.g. MATLAB, NS2, ANSYS, Cadence etc. (Department Specific).

Textbook

1. R. Panneerselvam, "Research Methodologies," PHI.
2. C.R. Kothari: Research methodology, Methods and Techniques, New Age Publication.
3. S.M. Ross, A First Course in Probability, 8 th Edition, Prentice Hall.

Reference Books:

1. Best John V. and James V Kahn: Research in Education, Wiley eastern.
2. S.P. Sukhia, P.V. Mehrotra, and R.N. Mehrotra: Elements of Educational Research, PHI publication.



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3. K. Setia: Methodology of Research Education, IEEE publication.
4. Jerry Banks, John S. Carson, Barry.L. Nelson David. M. Nicol, “Discrete-Event System Simulation”, Prentice-Hall India.
5. V.K. Rohatgi, A.K. Md.E.Saleh,” An Introduction to Probability and Statistics”, John Willey.



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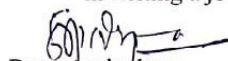
Sub: SoP for the Course "Review of Published Research"

Course Code	Course Name	L	T	P	C
MU6RD03	Review of Published Research	0	0	4	2

Evaluation Process:

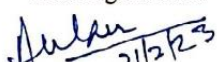
Task/ Process	Week	Scheduled Date	Marks Considered for Term work	Remark
Supervisor Allotment	1 st Week	20-24 Feb 2023		
Research proposal submission	2 nd & 3 rd Week	27 Feb-10 Mar 2023	10	
Presentation-I	4 th -5 th Week	13-24 th Mar 2023	15	Supervision fixation Collect 15 papers, read, write a brief proposal, and make a presentation for 15 minutes.
Presentation – II	6-9 th Week	27 Mar – 21 Apr 2023	15	Collect additional 15 papers, read, write a draft Review paper and make a presentation for 15 minutes.
Presentation – III	10-13 th Week	24 Apr-19 May 2023	20	Collect the remaining additional papers, read, write a complete Review paper, do a plagiarism check and make a presentation for 30 minutes.
Final Presentation (IV), Report (Soft copy must)	14-16 th Week	22 May–02 June 2023	40	Presentation for 30 minutes Assessment by RAC


- **Coordinator:** Allotted supervisor
- **Assessment Committee:** RAC
- **Objectives:** To get familiarize the areas of possible Research, finalise a topic and to have a knowledge on how to write a research paper by doing a literature survey.
- **Outcome:** A suitable topic that could be continued as a Research Topic, Experience in writing a journal paper.



Dean Agriculture

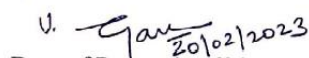

Dean Pharmacy

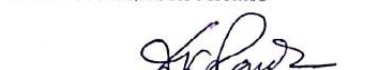

Dean Engineering


Dean Management


Dean Science


Dean AHSS


Dean of Research Affairs


Pro-Vice Chancellor 21/2/2023

VC Chancellor


21/2/23



Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	T	P		
CE6CW01	Environmental Engineering	4	0	0	4	4

Unit-I: Water Pollution

Characteristics of sewage (i.e. Physical, Chemical, Biological), Flow chart of Treatment, Primary Treatments namely Screening, aerated Grit Chamber, Sedimentation Tank. Activated Sludge Process, Trickling Filter Process (contact beds), oxidation pond and ditch, Tertiary Treatment. Advance wastewater treatment techniques. Septic tank, Sludge treatment, Sewage sickness, sludge disposal.

Unit-II: Air Pollution, Measures & Mitigation

Introduction, Sources of Air pollution, Types of Air Pollutants (i.e. Primary and secondary), Effects of air pollution, Air quality Standards, Measurement & controls of air pollutant

Unit-III: Noise Pollution and its Control

Introduction, Human Acoustics, Sources and their effects, Measurement of noise and its propagation, Control methods, noise pollution rules and standards.

Unit-IV: solid waste treatment and disposal

Introduction, solid waste, characteristics, solid waste processing (composting, incineration and pyrolysis), solid waste energy recovery, disposal of solid waste, Waste Valorization technique.

Unit-V: Environmental Impact Assessment

Introduction, Utility and Scope of EIA , Significant Environmental Impacts , Stages of EIA , Environmental Inventory methods of Impact identification (i.e. Matrix , Network and Checklist).

Textbooks:

1. N. N. Basak, Environmental Engineering, Tata McGraw Hill.
2. G. S. Birdie, Water Supply & Sanitary Engineering, Dhanpati Rai Publication
3. Rangwala, Water Supply & Sanitary Engineering (Environmental Engineering), Charotar Publishing House Pvt. Ltd.

References Books:

1. Dr. P. N. Modi, Water Supply Engineering, Standard Book House
2. S. K. Garg, Water Supply Engineering, Khanna Publishers
3. Balram Pani, Text Book of Environmental Chemistry, I K International Publishing House.



Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	T	P		
CE6CW02	Advance Concrete Technology	4	0	0	4	4

UNIT I

Cement & its properties, Structure of Hydrated Cement paste, volume of hydrated product Rheology of Concrete, Properties of fresh concrete, Compaction of concrete, Curing of concrete, Maturity of concrete.

UNIT II

Chemical Admixtures:- Mechanism of chemical admixture, plasticizers & super Plasticizers, their effect on concrete property in fresh & hardened state, retarder, accelerator.

Mineral Admixtures:- Fly Ash, Silica fume, GCBS, and their effect on concrete property in fresh state and hardened state.

UNIT III

Properties of hardened concrete, strength characteristic, shrinkage, creep, permeability & durability of concrete, chemical attack, acid attack, efflorescence, IS 456-2000 requirement for durability .

UNIT IV

Concrete at low & high temp., Under water concreting, shotcrete, air entrained concrete, self compacting concrete, high performance concrete, high Volume fly Ash concrete concept.

UNIT V

Mix design-factors affecting mix design, design of concrete mix by BIS method using IS 10262, Provisions in revised IS 10262-2004, Non destructive testing of concrete.

Reference Books

1. M.L. Gambir, Concrete Technology, Tata Mc. Graw Hill Book Co.
2. P. kumar Mehta & Paulo J.M., Monteiro, CONCRETE, Mc. Graw Hill Education (India) Pvt. Ltd.
3. A.M. Neville & J.J. Brooks, Concrete Technology, Pearson.
4. A.M. Nobile, Concrete Technology, ELBS London.
5. N. Krishna Raju, Concrete mix design, Sehgal Publication.
6. IS 10262-2004
7. M.S. Shetty, Concrete Technology, S. Chand.
8. A.R. Santhakumar, Concrete Technology, Oxford University Press.
9. J.Prasad, C.G. Nair, Non Destructive test and evaluation of materials, MC Graw Hill.
10. Peurifoy R.L., Construction planning Equipment & methods, Tata Mc. Graw Hill.
11. Aitcin PC, High performance Concrete, E. and FN London.



Course Code	Course Name	Hours Per Week			
		L	T	P	Credits
CE6CW03	Environmental Hydraulics	4	0	0	4

UNIT I

Concepts of fluid, Basic properties of fluids, dynamic and kinematic viscosity, Newton's law of viscosity, Fluid pressure, variation of Fluid pressure with depth, pressure head, atmospheric, gage, vacuum pressure, relationship with diagram, Kinematics of Flow: Types of flow-ideal & real, steady & unsteady, uniform & non uniform, one, two and three dimensional flow, path lines, streak lines and streamlines, continuity equation for one and three dimensional flow, rotational & irrotational flow. Euler's equation of motion along a streamline, Bernoulli's equation, application of Bernoulli's equation.

UNIT II

Crop water requirements, water application methods, surface, sub-surface, sprinkler & drip irrigation systems. Duty of water, factors affecting duty and methods to improve duty, suitability of water for irrigation, crops and crop seasons, principal crops and their water requirement, crop ratio and crop rotation, intensity of irrigation, Water logging, its causes and effects.

UNIT III

Introduction to hydrology, Hydrologic cycle, Precipitation, Measurement of rainfall, Rain-gauge network, Estimation of missing rainfall data, Computation of average rainfall, Presentation and interpretation of rainfall data, Evaporation, Infiltration and infiltration indices, Runoff, Computation of run-off, Hydrograph analysis, Unit hydrograph, S-Hydrograph

UNIT IV

General Hydraulic Principles, Head loss formulae- Darcy-Weisbach formula, Hazen – Williams's formula, Series and Parallel connection of Pipes, Equivalent Pipes, Reservoirs, Pumps and Valves (check valve, flow control valve and pressure reducing valve) in Water distribution systems. Analysis of branched Water Distribution Networks. Formulation of Equations for looped Water Distribution Networks.

UNIT V

Analysis of flow in looped networks using Hardy Cross, Newton-Raphson method, Introduction of Gradient method. Node flow analysis of water distribution networks: Node head-flow relationships, Application of NFA technique to serial networks. Minimum required capacity of service reservoir, Design of branched water distribution networks using Critical Path Method, Use of path concept and minimum spanning tree concept for identification of primary and secondary pipes of looped WDNs. Application of CPM for looped WDN design

Text Books:

1. Hydraulics and fluid mechanics, 8th ed.: Dr. P. N. Modi and S. M. Seth, Standard book house.



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2. Introduction to fluid mechanics and fluid machines, 2nd ed.: S. K. Som and G. Bishwas, Tata McGraw Hill Publishing Company.
3. Irrigation & Water Power Engg. by Punmia & Pandey B.B.Lal
4. Engg. Hydrology by K. Subhramanya - Tata Mc Graw Hills Publ. Co.

Reference Book:

1. Bhawe, P. R. and Gupta R., Analysis of Water Distribution Networks, Narosa Publishing Co, New Delhi.
2. Streeter V.L., Bedford K. and Wylie E.B., "Fluid Mechanics", McGraw Hill Book Company Ltd., New York, 1998.
3. Fluid Mechanics & Hydraulics Machine AK Jain Khanna Publisher