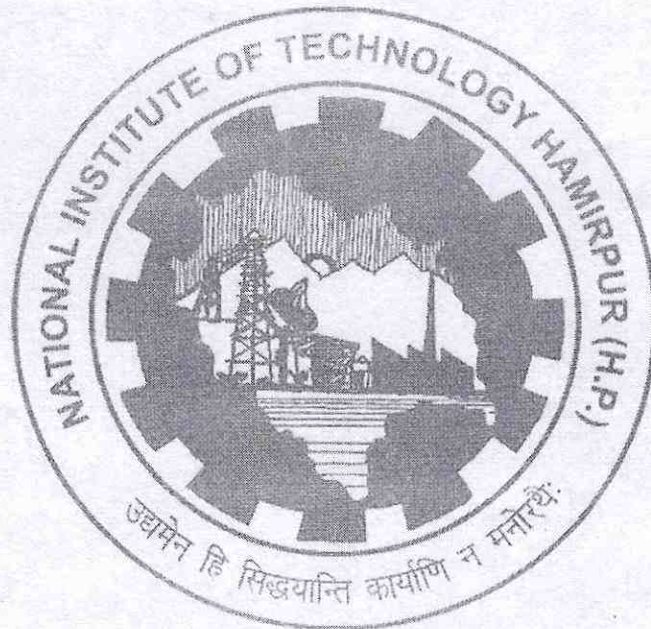


Master of Technology
In
Civil Engineering (Environment)

Course Structure & Syllabus
(w.e.f. Academic Year 2023-24 and onwards)



Department of Civil Engineering
National Institute of Technology Hamirpur
Hamirpur (HP) - 177005, India

Course Structure of M.Tech. Civil Engineering (Environment)

SEMESTER-I

S. No.	Course No.	Course Name	Teaching Schedule			Hours/ Week	Credit
			L	T	P		
1.	CE-691	Environmental Impact Assessment	4	0	0	4	4
2.	CE-692	Air Pollution and Control	4	0	0	4	4
3.	CE-693	Advanced Water Treatment	4	0	0	4	4
4.	CE-7MN	Programme Elective-I	4	0	0	4	4
5.	CE-7MN	Programme Elective-II	4	0	0	4	4
6.	CE-694	Environmental Engg. Lab-I	0	0	4	4	2
Total			20	0	4	24	22

Programme Elective-I & II: List of Programme Electives is given in the Annexure.

SEMESTER-II

S. No.	Course No.	Course Name	Teaching Schedule			Hours/ Week	Credit
			L	T	P		
1.	CE-601	Solid & Hazardous Waste Management	4	0	0	4	4
2.	CE-602	Advanced Wastewater Treatment	4	0	0	4	4
3.	CE-603	Disaster Management	4	0	0	4	4
4.	CE-7MN	Programme Elective-III	4	0	0	4	4
5.	CE-7MN	Programme Elective-IV	4	0	0	4	4
6.	CE-604	Environmental Engg. Lab - II	0	0	4	4	2
Total			20	0	4	24	22

Programme Elective-III & IV: List of Programme Electives is given in the Annexure.

SEMESTER-III

S. No.	Course No.	Course Title	Hours/Week	Credit
1.	CE-800	M.Tech. Dissertation	---	20
Total				20

SEMESTER-IV

S. No.	Course No.	Course Title	Hours/Week	Credit
1.	CE-800	M.Tech. Dissertation	---	20
Total				20

Total Credit of the Programme = 84

Annexure

List of Programme Electives

Programme Elective-I

CE-791	Industrial Waste Management
CE-713	Computation Techniques in Civil Engineering
CE-715	Environmental Chemistry
CE-732	Geo-environmental Engineering

Programme Elective-II

CE-792	Introduction to Climate Change
CE-793	Environmental Management
CE-718	GIS and Its Application in Civil Engineering
CE-736	Hazardous Waste and Remediation of Contaminated Sites

Programme Elective-III

CE-701	Bioremediation-Principles and Applications
CE-702	Design of Treatment Plants and Equipment
CE-722	Environmental Hydrology

Programme Elective-IV

CE-703	Environmental Toxicology and Health
CE-723	Microbiology and Ecology
CE-726	River Engineering
CE-786	Transportation Environment Interaction

Course Name :Environmental Impact Assessment	
Course Code : CE-691	
Course Type : Core	
Contact Hours/Week: 4L	Course Credits: 04
Course Objectives	
<ul style="list-style-type: none"> • To understand the concepts of ecology, sustainable development and EIA. • To explore current EIA process in India. • To acquire knowledge about various methods for conducting EIA, Environmental Legislation & Environmental Audit 	
Course Content	
<p>Environmental management- problems and strategies - Review of political, ecological and remedial actions - future strategies - multidisciplinary environmental strategies decision making and concepts of sustainable development. Concept of environmental audit - Life Cycle Analysis (LCA) - Environmental Management System - Introduction to ISO 14000, OSHA and Clean Development Mechanism (CDM) & Carbon credits. Introduction to various major natural disasters - flood, tropical cyclone, droughts, landslides, heat waves, earthquakes, fire hazards, tsunami etc., Factors for disaster - climate change, global rise in sea level, coastal erosion, environmental degradation, large dams, Legislative responsibilities of disaster management. Environmental legislation of Air, Water & Hazardous Waste - Environment Protection Act-1986 - Regulatory standards of CPCB / GPCB / BIS - EIA need and Notification - Environmental clearance. Introduction and Planning: Evolution of Environmental Impact Assessment - concepts of EIA - EIA methodologies screening and scoping - rapid and comprehensive EIA - General framework of EIA - characterization and site assessment - Environmental inventory - Prediction and assessment of impact - Impact assessment methodologies like adhoc method, checklist, overlap, network, model and index method. Decision methods of evaluation of alternatives - development of decision matrix - Public participation in environmental decision making - Objective of public participation -Technique for conflict management and dispute resolution- Verbal communication and Public Hearing in EIA studies - Status of EIA in India - Some typical case studies of EIA industrial and infrastructure projects.</p>	
Course Outcomes	
<p>Upon successful completion of the course, the students will be able to</p> <p>CO 1: Understand the importance & concepts of carrying out EIA.</p> <p>CO 2: Acquire knowledge about current EIA process in India.</p> <p>CO 3: Acquire knowledge about various methods & data requirements for conducting EIA.</p> <p>CO 4: Analyze Impact's associated with various components of environment.</p> <p>CO 5: Plan for mitigation of the impacts & monitor the mitigation measures.</p> <p>CO 6: Acquire knowledge about Environmental Legislation & Environmental Audit.</p>	
Books and References	
<ol style="list-style-type: none"> 1. Larry W. Canter, "Environmental Impact Assessment", Tata Mcgraw Hill Co, Singapore, 1996. 2. R. K. Jain, L. V. Urban & G. S. Stacey, "Environmental Impact Analysis", Van Nostrand Reinhold Company, New York. (1977) 3. R. E. Munn, "Environmental Impact Assessment", John Wiley & Sons, Toronto, 1979. 4. Suresh K. Dhameja, "Environmental Engineering and Management", S. K. Kataria & Sons, Delhi. (2004) 5. Relevant MoEF Notifications and CPCB / GPCB Acts & Rules. 	

Course Name :	Disaster Management
Course Code :	CE-603
Course Type :	Core
Contact Hours/Week: 4L	Course Credits: 04
Course Objectives	
<ul style="list-style-type: none"> • To impart knowledge about the disaster Management • To introduce the fundamental concepts relevant to various aspect of disaster • To enable the students to understand the factors that causes the disaster. • To be able to assess risk and vulnerability for natural and man-made hazard 	
Course Content	
<p>Introduction to Natural & Man-made Disasters, Understanding Disasters, Geological and Mountain Area Disasters, Wind and Water Related Natural Disaster, Man Made Disasters, Technologies for Disaster Management role of information technology in Disaster Preparedness, Remote Sensing, GIS and GPS, Use and Application of Emerging Technologies, Application of Modern Technologies for the Emergency communication, Application and use of ICST for different disasters. Rehabilitation, Reconstruction and Recovery: Introduction and basic concept. Disaster Response and Management: Introduction to Response Essential Components, Stakeholders Co-ordination in Disaster Response, Human Behaviour and Response Management and Relief Measures. Disaster Mitigation: meaning and concept, Disaster Mitigation Strategies, Emerging Trends in Disaster Mitigation, Mitigation management, Role of Team and Coordination.</p>	
Course Outcomes	
After learning the course, the students should be able to:	
CO1: Understand disasters, disaster preparedness, role of IT, remote sensing, GIS and GPS,	
CO2: Understand Rehabilitation, Reconstruction and Recovery,	
CO3: Apply knowledge Disaster Response and Management, Risk Assessment and Vulnerability Analysis.	
CO4: Understand Disaster Mitigation	
Books and References	
<ol style="list-style-type: none"> 1. Natural Hazards, Bryant Edwards, Cambridge University Press, U.K. 2. Carter, W. Nick, 1991: Disaster Management, Asian Development Bank, Manila. 3. Sahni, Pardeep et.al. (eds.) 2002, Disaster Mitigation Experiences and Reflections, Prentice Hall of India, New Delhi. 4. Roy, P.S. (2000): Space Technology for Disaster management: A Remote Sensing & GIS Perspective, IIRS (NRSA) Dehradun. 5. Sharma, R.K. & Sharma, G. (2005) (ed) Natural Disaster, APH Publishing Corporation, New Delhi. 6. Singh Satendra (2003): Disaster Management in the Hills, Concept Publishing Company, New Delhi. 7. Taori, K (2005) Disaster Management through Panchayati Raj, Concept Publishing Company, New Delhi. 	

Course Name : Environmental Chemistry Course Code : CE-715 Course Type : Programme Elective I	
Contact Hours/Week: 4L	Course Credits: 04
Course Objectives <ul style="list-style-type: none"> • To equip students with the knowledge of the chemical properties of elements and compounds. • To equip students about the chemical reactions essential for the emergence and existence of the cycling and accumulation of pollutants in the environment. 	
Course Content	
Types of chemical reactions, stoichiometric calculations, solutions, chemical thermodynamics, fundamentals of process kinetics, gas laws, ways of shifting chemical equilibria. Equilibrium calculation, alkalinity, acidity, buffers, buffer index. Solubility equilibrium for slightly soluble salts, effect of other solutes on salt solubility, competing acid-base equilibria, effect of complexions, hydrolysis, computing total soluble species concentration Oxidation-reduction processes, stability diagrams, redox potential. Fundamental of Process kinetics: Reaction rate, order and stoichiometry. Fundamental of surface and colloidal chemistry: surface charge on colloidal particles, electric double layer, adsorption isotherm. Basic concepts of quantitative analytical chemistry. Instrumental methods of analysis.	
Course Outcomes Upon successful completion of the course, the students will be able to CO1: Synthesize and apply concepts from multiple sub-disciplines in environmental chemistry and toxicology. CO2: Use technical and analytical skills to quantify the level and effects of xenobiotic in environmental compartments.	
Books and References <ol style="list-style-type: none"> 1. Chemistry for Environmental Engineer by Sawyer, C.N., McCarty, P.L., and Parkin, G.F., McGraw Hill, New Delhi. 2. Process Chemistry for Water and Wastewater Treatment by Benefield, Judkins and Weand, Prentice Hall. 	

Course Name :Microbiology and Ecology Course Code :CE-723 Course Type :Programme Elective IV	
Contact Hours/Week: 4L	Course Credits: 04
Course Objectives <ul style="list-style-type: none"> • Understand the role of micro-organisms as agents of environmental change. • Recognize micro-organisms as indicators of alteration of an ecosystem. • Understand microbial processes aimed to solve environmental problems. 	
Course Content	
<p>Microorganisms - classification, prokaryotic and eukaryotic cells, structure, characteristics, nucleic acids, DNA and RNA, replication. Recombinant DNA. Viruses, their detection and quantification. Microscopy, Measurements and Isolation of Microorganism, Different Cultures, Media and Techniques of Staining and Enumeration of microorganism.</p> <p>Enzyme and enzyme kinetics, Metabolism, respiration, fermentation, Glycolysis, Krebs's cycle, carbohydrate, protein, lipids, significance of energetics. Chemical composition of cell and nature of organic matter used by microorganisms. Metabolic classification of microorganisms : phototrophs, chemotrophism, applications in environmental engineering</p> <p>Distribution of microorganisms, indicator organisms, coliforms - fecal coliforms - E.coli, Streptococcus fecal is differentiation of coliforms - significance - MPN index, M.F. technique, standards. Microbiology of wastewater treatment processes such as activated sludge process, trickling filter, anaerobic processes.</p> <p>Introduction to Microbiology of Soil and Air and Industrial Microbiology, Microbiology of bioremediation and solid waste treatment</p> <p>Bio-sphere, earth energy budget, Ecosystem, Uniformitarianism, the ecology of population, Ecosystem and communities: Physical and biological properties</p>	
Course Outcomes Upon successful completion of the course, the students will be able to: CO1: Apply knowledge of biology on certain species of micro-organisms in order to use them as bio-indicators. CO2: Apply the metabolic processes of micro-organisms to industrial processes related to environment. CO3: Develop analysis and synthesis skills.	
Books and References <ol style="list-style-type: none"> 1. Environmental Microbiology by Maier R M, Pepper I L and Gerba C P., Elsevier- AP. 2. Microbiology by Pelczar, Jr, M.J., Chan, E.C.S., Krieg, R.N., and Pelczar M. F, Tata McGraw-Hill Publishing Company Limited, New Delhi. 3. Environmental Biotechnology: Principles and Applications by Rittman B, McCarty P L McCarty P, McGraw-Hill. 	