Master of Technology

In

Civil Engineering

Institute Electives

Department of Civil Engineering

National Institute of Technology Hamirpur

Hamirpur (HP) – 177005, India

List of Institute Elective Courses

	Course No	Course Title
Institute Electives	CE-701	Project Management
	CE-702	Disaster Management
	CE-703	Environmental Impact Assessment
	CE-704	Remote Sensing & GIS
	CE-705	Engineering Seismology

Course Name : **Project Management**
Course Code : **CE-701**
Course Type : **Institute Elective**

Contact Hours/Week: **4L** Course Credits: 04

Course Objectives

- Understanding the need of Project Management,
- Understanding planning and scheduling using critical path method,
- Understanding planning and scheduling using PDM, and
- Understanding scheduling of repetitive construction projects.

Course Content

Basics: Work break down structures, bar-charts, network techniques, rules for developing networks, network development-logic of network, **Critical Path Method (CPM):** AOA and AON representation of network, activity times, activity floats, and critical path method. **Programme Evaluation and Review Technique (PERT):** Probability concept in network, optimistic time, pessimistic time, most likely time, lapsed time, deviation, variance, standard deviation, slack critical path, probability of achieving completion time, central limit theorem. **Precedence Diagram Method (PDM**): Precedence networks fundamentals, advantages, logic and precedence networks applications, PDM versus CPM. **Line of Balancing (LOB):** Line of balance methods, time and space buffers, linear interpretation of precedence relationships.

Course Outcomes

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

CO1: Plan and schedule projects by critical path method,
CO2: Plan and schedule project by PDM, and
CO3: Apply LOB to solving problems of repetitive planning.

Books and References

1. Bansal V. K. “Project management: Planning and Scheduling Techniques.”
2. Moder J. J. Philips, C.R. and Davis, E.W. “Project Management with CPM and PERT, and precedence diagramming”
3. Ahuja H.N., Project Management technique in planning and controlling construction projects.

Course Name: **Disaster Management**
Course Code: **CE-702**
Course Type: **Institute Elective**

Contact Hours/Week: **4L** Course Credits: **04**

Course Objectives

- 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 which cause the disasters
- To be able to assess risk and vulnerability for natural and man-made hazard

Course Content

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 IT 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 Behavior and Response Management and Relief Measures; Behavior 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.

Course Outcomes

After learning the course, the students should be able to:

1. Understand disasters, disaster preparedness, role of IT, remote sensing, GIS and GPS,
2. Understand Rehabilitation, Reconstruction and Recovery,
3. Apply knowledge Disaster Response and Management, Risk Assessment and Vulnerability Analysis,
4. Understand Disaster Mitigation.

Books and References

1. Natural Hazards by Bryant Edwards, Cambridge University Press, U.K.
2. Disaster Management by Carter, W. Nick, Asian Development Bank, Manila.
3. Disaster Mitigation Experiences and Reflections by Sahni, Pardeep et.al., Prentice Hall of India, New Delhi.
4. Space Technology for Disaster management: A Remote Sensing & GIS Perspective by Roy, P.S. IIRS (NRSA) Dehradun.
5. Natural Disaster by Sharma, R.K. & Sharma, G. APH Publishing Corporation, New Delhi.
6. Disaster Management in the Hills by Singh Satendra, Concept Publishing Company, New Delhi.
7. Disaster Management through Panchayati Raj by Taori, K, Concept Publishing Company, New Delhi.

Course Name : **Environmental Impact Assessment**
Course Code : **CE-703**
Course Type : **Institute Elective**

Contact Hours/Week: **4L** **Course Credits**: 04

Course Objectives

- 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

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.

Course Outcomes

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

CO 1: Understand the importance & concepts of carrying out EIA.

CO 2: Acquire knowledge about the current EIA process in India.

CO 3: Acquire knowledge about various methods & data requirements for conducting EIA.

CO 4: Analyze the Impact associated with various components of the environment.

CO 5: Plan for mitigation of the impacts & monitor the mitigation measures.

CO 6: Acquire knowledge about Environmental Legislation & Environmental Audit.

Books and References

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 : **Remote Sensing and GIS**
Course Code : **CE-704**
Course Type : **Institute Elective**

Contact Hours/Week: 4L **Course Credits:** 04

Course Objectives

- Understanding the need of CAD and GIS,
- Understanding map projection and working with coordinate systems,
- Understanding vector-based and raster-based data data analysis,
- Review of application areas of GIS in Civil Engineering, and
- Understanding basic principles of remote sensing.

Course Content

Introduction to Remote Sensing, data acquisition and processing, Electromagnetic Radiation (EMR) and its characteristics, Radiation principles, properties of solar radiant energy, atmospheric windows. Interaction in the atmosphere, nature of atmospheric interaction, atmospheric effects of visible, near infra-red thermal and microwave wavelengths, interaction at ground surface, interaction with soils and rocks, effects of soil moisture, organic matter, particles, size and texture, interaction with vegetation, spectral characteristics of individual leaf, vegetation canopies, effect of leaf pigments, radiation geometry. Introduction to GeographicalInformation Systems, Definition of GIS, Difference between GIS and CAD worlds, utility of GIS, various GIS packages and their salient features, essential components of a GIS, scanners and digitizers. Map projection and coordinate systems: Introduction, geographic Grid, Map projection, Coordinate systems. Vector data models and Analysis: vector data and its representation, topological data structure, non- topological vector data structure, TIN, Region, vector data editing and analysis. Raster data models and Analysis: acquiring and handling of raster data storage, function of raster based GIS data analysis. Engineering applications of GIS: applications of GIS in civil engineering.

Course Outcomes

Upon successful completion of the course, the students will be able to
CO1: Understand the principles of remote sensing,
CO2: Understand the principles of geographic information systems,
CO3: Apply remote sensing and GIS to solving problems of Civil Engineering,
CO4: Maximize the efficiency of planning and spatial decision making, and
CO5: Integrate geographically referenced data and develop queries to generate usable information.

Books and References

1. Remote Sensing and Image Interpretation : T.M. Lillensand and R.W. Keifer
2. Principles of Remote Sensing : P.J. Curren
3. Concept and Techniques of Geographical Information systems : C.P. Lo and Albert K.W.Yeung
4. Introduction to Geographical Information systems : Kang-tsung Chang
5. Geographical Information systems- A Management Perspective : Stan Aromoff

Course Name: **Engineering Seismology**
Course Code: **CE-705**
Course Type: **Institute Elective**

Contact Hours/Week: **4** Course Credits: **4**

Course Objectives:

- Equip students with foundational knowledge of engineering seismology
- to understand and analyze global earthquake hazards, seismic phenomena, wave propagation, and predictive modelling.

Course Content

Introduction to earthquake hazards- Global seismicity and seismic risk. History of engineering seismology and earthquake types. Strong ground motions, tsunamis, landslides, liquefaction. Elastic rebound theory, overview of plate tectonics and earthquake source mechanisms. Theory of wave propagation. Types of seismic waves, Wave chanters and Shadow zones. Origin of Universe, layers of earth, Theory of continental drift. Concepts of seismic magnitudes and intensity. Seismic station. Sensors and data loggers, mechanical and digital sensors. Interpretation of seismic records – acceleration, velocity and displacement, Identification of man-made events and natural earthquake. Time and frequency domain characteristic of ground motion. Regional seismicity, earthquakes in India and most important global earthquakes. Seismic zonation – scales, macro and micro, attenuation, recurrence relation. Predictive Models in Earthquake Engineering- Attenuation Relation; Intensity, Duration and Ground Motion Predictive Relation. Earthquake Catalog preparation, Source Map preparation; Homogenization and De-clustering of earthquake data and preparation of Seismotectonic maps. Seismic hazard analysis - deterministic and probabilistic. Site characterization – different methods and experiments. Local site effects, ground motion amplifications. Development of response/design spectrum. Liquefaction hazard assessments. Integration of hazards using GIS. Risk and vulnerability Studies.

Course Outcomes:

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

CO1: Understand global earthquake hazards and the history of engineering seismology.

CO2: Analyze seismic phenomena like strong ground motions, tsunamis, landslides, and liquefaction.

CO3: Interpret seismic wave propagation and seismic records effectively.

CO4: Apply predictive models and conduct seismic hazard analysis.

CO5: Assess site characterization, local site effects, and develop response spectra for seismic design.

Books and References:

1. Earthquake Engineering – From Engineering Seismology to Performance Based Engineering, Edited by Bozorgnia, Y. and Bertero, V.V., CRC Press Washington 2004.
2. Leon Reiter, Earthquake hazard Analysis – Issues and Insights, Columbia University Press New York 1990.
3. Steven L Kramer, Geotechnical Earthquake Engineering Pearson Education, 2003.