IPS Academy, Institute of Engineering & Science
(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)
New Scheme & Syllabus Based on AICTE Flexible Curricula
(B. Tech) Civil Engineering Department

Seventh Semester

S.No.	Course Type	Course Code	Course Title	Hrs./Week			Total Credits
				L	T	P	
1	PCC	CE17	Foundation Engineering	2	1	-	3
2	PCC	CE18	Design of Advanced RCC Structures	2	1	-	3
3	PCC	CE19	Design of Hydraulic Structures	2	1	-	3
4	PEC	CE01	Professional Elective Course-I	3	-	-	3
5	PEC	CE02	Professional Elective Course-II	3	-	-	3
6	LC	CE17(P)	Foundation Engineering Lab	-	-	2	1
7	LC	CE18(P)	Design of Advanced RCC Structures Lab	-	-	2	1
8	PROJ	CE02	Project Phase -I	-	-	8	4
Evaluation of Internship- *Completed in Fifth/Sixth Semester*				-	-	4	2
			Total	**Total Credit**			**23**

- **Professional Elective Course (PEC) -I, CE01 (Any One Course)**
  (a) Advanced Water resources Engineering
  (b) Traffic Engineering
  (c) Advanced Fluid Mechanics
  (d) Urban and Town Planning
  (e) Building Services

- **Program Elective Course (PEC)-II, CE02 (Any One Course)**
  (a) Construction Planning and Management
  (b) Air and Noise Pollution Control
  (c) Integrated Waste Management
  (d) Geo-Informatics Engineering
  (e) Marine Construction

PCC – CE17	Foundation Engineering	2L:1T:2P (5hrs)	4 Credits

Objectives:

The course on Foundation Engineering provides the students necessary geotechnical engineering skills to analyze and design shallow and deep foundation systems under different loading and soil conditions.

Module 1 **(10 Hrs)**

Shallow Foundations: Type of foundations shallow and deep. Bearing capacity of foundation on cohesion less and cohesive soils. General and local shear failures. Factors effecting B.C. Theories of bearing capacity - Prandle, Terzaghi, Balla, Skempton, Meyerh of and Hansan. I.S. code on B.c. Determination of bearing capacity. Limits of total and differential settlements. Plate load test.

Module 2 **(10 Hrs)**

Deep Foundation: Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesion less and cohesive soils. Static and dynamic formulae.. Pile load test, Settlement of pile group, Negative skin friction, under- reamed piles and their design. Piles under tension, inclined and lateral load Caissons. Well foundation. Equilibrium of wells. Analysis for stability tilts and shifts,

Module 3 **(07 Hrs)**

Compaction: Soil compaction phenomenon, Factors affecting compaction. Dry density and moisture content relationship. Zero air voids line, Effect of compaction on soil structure. Standard Proctor test and Modified Proctor test as per IS – 2720. Field . Various equipment for field compaction and their suitability. Field compaction control.

Module 4 **(07 Hrs)**

Consolidation of Soil: Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's theory of consolidation, final settlement of soil deposits, computation of consolidation settlement and secondary consolidation.

Module 5 **(10 Hrs)**

Soil Exploration and General Principles of Machine foundation design : Purpose, importance, methods

of soil exploration, subsurface exploration, trial pits, boring: method of borings. Sampling: Disturbed And Undisturbed Samples, Area ratio, Field tests: SPT, DCPT,SCPT, pressure-meter test, plate load test, field vane shear test, General principles of Machine foundation design

Types of Machines and Machine Foundations, General Requirements of Machine Foundations, Permissible amplitude, Modes of vibration of rigid block foundations

Course Outcomes:

CO1. Study the geotechnical aspects of shallow foundations and the theories involved in it.

CO2. Understand the detailed design related to deep foundations and its practical applications.

CO3. Learn the different practical approaches available for the improvement of soil properties, their porosity and compaction.

CO4. Understand the settlement behavior of different type of soil under different foundation

CO5. Understand the need of soil exploration and to visualize the design considerations involved in foundations subjected to vibration.

Text/Reference Books:

1. Dr. K.R. Arora, "Soil Mech. & Found. Engg." Std. Publishers Delhi.
2. Dr. B.C.Punmia, "Soil Mech. & Found" Laxmi Publications, Delhi.
3. Dr.l Aram Singh, "Modern Geotech Engg" IBT Publishers, Delhi.
4.. C. Venkatramaiah, "Geotech Engg" New Age International Publishers, Delhi
5. S.K. Garg, "Soil Mech. & Found. Engg." Khanna Publishers, Delhi.
6. Relevant I.S. Codes

Suggested List of Experiment:

1. Indian Standard Light Compaction Test/Std. Proctor Test
2. Indian Standard Heavy Compaction Test/Modified Proctor Test
3. Determination of field density by Core Cutter Method
4. Determination of field density by Sand Replacement Method
5. Determination of field density by Water Displacement Method
6. CBR Test
7. Consolidation test
8. 10. Demonstration of Plate Load Test SPT & DCPT

PCC – CE18	Design of Advanced RCC Structures	2L:1T:2P (5hrs)	4 Credits

Objective :

To analyze and design the special RCC structures using standard codal provisions and procedures.

Module 1

Design of Multistory Buildings : Sway and nonsway buildings, Shear walls and other bracing elements.

Module 2

Earth Retaining Structures: Cantilever and counter fort types retaining walls.

Module 3

Water Tanks: Tanks on ground and underground tanks: Square, rectangular, circular tanks, Overhead tanks: square, rectangular, circular & intze tanks**.**

Module 4

Silos and Bunkers: Design of RCC Silos (Circular) and Bunkers (Square, Rectangular and Circular).

Module 5

T-beam & Slab bridges: for highway loading (IRC Loads).

Prestressing concepts materials, systems of prestressing & losses Introduction to working & limit State Design.

Course Outcomes:

CO1. Analyze the behavior of multi-storied and retaining structures and undertake design and detailing for gravity and lateral loads applying relevant codes of practice (IS: 875, IS: 1893, IS: 13920).

CO2. Understanding the behavior of Cantilever and Counter fort Retaining Wall and IS code terminologies involved in design.

CO3. Understand the behavior and undertake the design of liquid storage structures (Water Tanks) in simple configurations applying relevant codes of practice IS: 3370.

CO4. Understand the behavior and undertake the design of storage structures (bunker & silo) in simple configurations applying relevant codes of practice IS: 4995.

CO5. Understand the behavior under vehicle loads and undertake the design of R. C. C. slab and T - beam bridges for highway applying the relevant codes of practice.

Suggested Books: -

1. R.C.C. by O.P. Jain Vol. II
2. R.C.C. by B.C. Punmia
3. Essentials of Bridge engineering – D.J. Victor
4. Bridge Engineering - Ponnuswamy
5. Advanced R.C.C. Design by N.K. RAJU
6. N.Krishna Raju, Prestressed Concrete, Tata Mc Graw Hill, New Delhi.
7. Pre stresses concrete – T.Y. Lin

PCC – CE19	Design of Hydraulic Structures	2L:1T:0P (3hrs)	3 Credits

Pre-requisite(s) – Basic Civil Engineering

Objectives: The objective of this course is to fulfill the essential knowledge of water resources and skills in design of Hydraulic Structures.

Module 1 Earth dams: (10 Hrs)

Types of earth dam, causes of failure and design criteria, soils suitable for earth dam construction, construction methods, foundation requirements, typical earth dam sections, estimation of seepage through and below the dam, seepage control, stability of slopes by slip circle method of analysis, pore pressures, sudden draw down, steady seepage analysis, Types of rock fill dams, rock fill dam merits and demerits.

Module 2 Gravity dams: (10 Hrs)

Design Criteria, forces acting on gravity dams, elementary profile of dam, low and high gravity dams, stability analysis, evaluation of profile by method of zoning, practical profile, construction joints, and galleries in gravity dams.

Module 3 Spillways: (08 Hrs)

Ogee spillway and its design, siphon spillway, shaft spillway, chute spillway and side channel spillway, emergency spillways.

Module 4 Energy dissipaters and gates: (10 Hrs)

Principles of energy dissipation Energy dissipaters based on tail water rating curve and jump height curves Spillway crest gates (i.e. vertical lift gates and radial gates), their design principles and details. Design of canal regulating structures, detailed design of sarda falls, Types of cross drainage works, syphon aqueduct.

Module 5 Hydropower Plants: (10 Hrs) Introduction of Hydropower development, types of hydropower plants, general features of hydro- electric schemes, selection of turbines, draft tubes, surge tanks, penstocks, power house dimensions, pumped storage plants and their details.

Course Outcomes:

Students will be able to

CO1. To understand the design components of earth and rock fill dams and factors affecting the performance of these structures.

CO2. To develop concepts of construction and design of gravity dams.

CO3. To visualize and design of different types of spillways and their applications.

CO4. To understand the basic principles of energy dissipaters, gates and design concept of cross drainage works with their practical utility.

CO5. To understand the various components of a hydro power plant and their applications.

Text/Reference Books:

1. B.C. Punmia, "Irrigation and Water Power Engineering" Laxmi Publications (P) Ltd, 9th Edition, 2009.

2. Santosh Kumar Garg "Irrigation Engineering And Hydraulic Structures" Khanna Publications, 9th Edition, 2011**.**

PEC – CE01 (A)	Advanced Water resources Engineering	3L:0T:0P (3hrs)	3 Credits

Objectives:

To provide advance knowledge of water resource engineering, water management, flood management and various concepts of optimization techniques.

Module 1 **(10 Hrs)**

Optimal Raingauge Network Design, Adjustment of Precipitation Data, Depth Area-Duration Analysis, Design Storm, Probable Maximum Precipitation, Probable Maximum Flood, Flood Frequency Analysis, Probable Maximum Precipitation, Probable Maximum storm

Module 2 **(12 Hrs)**

Flood Management, Flood Routing through Reservoirs, Modified Puls Method, Modified Muskingham Method, Channels Routing Muskingum Method, Introduction to Stochastic Models in Hydrology like AR, ARMA, ARIMA model.

Module 3 **(10 Hrs)**

System Analysis: Water Resources Systems, Optimization Techniques, Linear Programming (LP), Graphical Method, Simplex Method, Use of Linear Programming (LP) in Water Resources, Introduction to Reservoir Operation

Module 4 **(08 Hrs)**

Dynamic Programming, its utility in Water Resource Allocation and other Decision Making Problems, Optimal Operating Policies, Use of DP in Reservoir operation.

Module 5 **(08 Hrs)**

Watershed Hydrology: Geomorphology of Drainage Basins, Landuse and Capabilities, Watershed Management Techniques.

Course Outcomes:

CO1. Ability to understand network, storm design, measurement and presentation of rainfall.

CO 2. Enable the students to understand the flood management, flood routing and introduction of stochastic models in hydrology.

CO 3. The students are exposed to the application of water resources systems, optimization techniques and introduction to reservoir operation.

CO 4. The students obtain the complete knowledge on dynamic programming including its utility, decision making problem and its use in reservoir operation.

CO 5. To understand the concept of hydrology of watershed & it's techniques.

Text/Reference Books:

1. Stochastic Water Resources Technology by N.T. Kottegoda
2. Engineering Hydrology by Subramanian
3. Irrigation & Water Power Engineering By Punmia Lal
4. Irrigation & Hydraulic Structure by S.K. Garg
5. Operation Research by Phillips & Ravindran
6. Operation Research by TAHA
7. Stochastic Hydrology by Jaya Rani Raddy
8. Frequency Analysis, NIH Publication.

PEC – CE01 (B)	Traffic Engineering	3L:0T:0P (3 Hours)	3 Credits

Objectives: To provide fundamental knowledge of various conventional and modern planning & design techniques used for traffic control, traffic management and planning of masstransportation systems.

Module 1

Traffic Characteristics : Road user's characteristics- general human characteristics, physical, mental and emotional factors, factors affecting reaction time, PIEV theory. Vehicular characteristics- Characteristics affecting road design-width, height, length and otherdimensions. weight, power, speed and braking capacity of a vehicle.

Module 2

Traffic Studies : Spot Speed Studies and Volume Studies, Speed and Delay Studies purpose, causes of delay, methods of conducting speed and delay studies, Origin and destination Studies (O & D) : Various methods, collection and interpretation of data, planning and sampling, Traffic Capacity Studies: Volume, density, basic practical and possible capacities, level of service, Parking Studies: Methods of parking studies cordon counts, space inventories, parking practices.

Module 3

Traffic Operations and Control : Traffic regulations and various means of control, One way streets- advantages and limitations, Traffic signals- isolated signals, coordinated signals, simultaneous, alternate, flexible and progressive signal systems. Types of traffic signals, fixed time signals, traffic actuated signals, speed control signals, pedestrian signals, flashing signals, clearance interval and problems on single isolated traffic signal.

Module 4

Street Lighting : Methods of light distribution, Design of street lighting system, Definitions- Luminaire, foot candle, Lumen, utilization and maintenance factors, Different types of light sources used for street lighting, Fundamental factors of night vision.

Module 5

Accident Studies & Mass Transportation: Causes of accidents, accident studies and records, condition

and collision diagram, preventive measures, Expressways and freeways, problems on mass transportation and remedial measures, brief study of mass transportation available in the country.

Course Outcomes:

CO1: To understand different traffic characteristics and how these affect the system designs.

CO2: To comprehend the procedures to conduct traffic studies.

CO3: To visualize different traffic operations and grasp knowledge of various traffic controlfacilities and regulations.

CO4: To develop an understanding for types of traffic lighting systems, terminologies associated and design criteria for lighting systems.

CO5: To learn about different accident studies and understand in brief the existing masstransportation systems.

Reference Books:

1. Traffic Engineering and Transport Planning by L.R. Kadiyali, Khanna Publishers, Delhi
2. Traffic Engineering by Matson, W.S.Smith & F.W. Hurd
3. G.J. Pingnataro, Principles of Traffic Engineering
4. D.R.Drew, Traffic Flaw Theory
5. W.R. Mchsne and R.P. Roess "Traffic Engg"
6. Wohl & Martin, Traffic System Analysis for Engineering & Planners

PEC – CE01 (C)	Advanced Fluid Mechanics	3L:0T:0P (3hrs)	3 Credits

Objectives:

To provide fundamental knowledge of fluid, its properties and behavior under various situation of internal and external flows.

Module 1 **(12 Hrs)**

Pipe Flow Problems: Losses in pipe flow, pipes in series, pipes in parallel, branching pipes, siphons, multi-reservoir problems, pipe net works. Major and minor losses in pipes. Loss due to bend, loss due to elbow bend, loss due to valve fitting, loss due to junction and fittings. The concept of unsteady flow. The concept of water hammer phenomenon. Water hammer (action for gradual and sudden closure). Two conditions for sudden closure for rigid and flexible pipes. Concept of Surge and design of surge tank.

Module 2 **(08 Hrs)**

Boundary Layer Theory: Introduction, Development of boundary layer over a flat plate, boundary layer thickness, displacement, Application of momentum equation to boundary layer flow, local and mean drag coefficients, boundary layer separation and its control.

Module 3 **(10 Hrs)**

Characteristics of Turbulent Flow, temporal velocity, semi empirical theories to estimate shear stress in turbulent flow using Boussinesq's theory, velocity distribution in Turbulent flow, Prandtl's velocity distribution equation, Karman Prandtl velocity distribution equations for smooth and rough boundaries, Equation for mean velocity for pipes, Friction factor for commercial pipes, Moody's diagram, explicit equations for friction factor.

Module 4 **(10 Hrs)**

Steady gradually varied flow, Characteristics of flow profile and methods of computation, Practical problems, gradually varied flow classification, analysis and computations. Steady rapid varied flow, Hydraulic jump analysis and location, introduction to surges in channel, Design of spillways, Energy dissipaters, Channel transitions.

Module 5 **(10 Hrs)**

Practical Problems involving fluid flow around submerged objects; Definitions and expression for drag, lift

drag coefficient, lift coefficients. Karmann's Vortex Street, Effects of free surface and compressibility on drag, Development of lift on cylinder and aerofoil, Polar Diagram.

Course Outcomes:

CO1. Demonstrate the concept of pipe flow and various conditions of pipe flow.

CO 2. Demonstrate the concept of Boundary Layer Theory and to have the concept of different thickness related to boundary layer.

CO 3. Details of Turbulent flow and concept of Moody's diagram.

CO 4. Demonstrate the Concept of unsteady flow and Water Hammer Phenomenon.

CO 5. Demonstrate the concept of Drag and Lift and related equations.

Text/Reference Books:

1. A.K. Jain "Mechanics of fluids", Khanna Publisher., Delhi.
2. Modi, P. N. and S. N. Seth "Hydraulics and Fluid Mechanics", Standard book house, New Delhi.
3. R. K. Bansal – A text book of Fluid Mechanics & Hydraulic

PEC – CE01(D)	Urban and Town Planning	3L (3 hrs.)	3 credits

Objective:

- To achieve sustainable development
- To make the most out of municipal budgets by informing infrastructure and services investments, balancing demands for growth with the need to protect the environment
- To distribute the economic development within a given territory to reach social objectives and creates a framework for collaboration between local governments, the private sector and the public at large

Module 1 **(12 hrs.)**

Urban Planning: Definition; History: Pre-classical, China, Greco-Roman, Medieval Europe, Renassaince Europe, Enlightenment Europe and America; Technical Aspects:Aesthetics, Safety and security, Decay, Reconstruction and renewal, New Master-Planned Cities, Transport, Suburbanization, Environmental factors, Zoning, Light and Sound, Water and Sanitation and Infrastructure; Urban Planners: Responsibilities-Land use planning, Strategic urban planning, Regional Planning, Heritage and Conservation, Urban Revitalization, Master Planning, Transportation Planning, Economic Development, Environmental Planning, Urban Design, Infrastructure Planning; Education and Training, List of Different Urban Planners Nation Wide

Module 2 **(10 hrs.)**

Urban Development: Concept, Policies and Programmes in India, Impact on Metro and Mega Cities

Module 3 **(10 hrs.)**

Land and Real Estate Development: Land Pricing/Valuation, Factors affecting land supply and demand, Real Estate Markets, Method of Development, Environmental Considerations

Module 4 **(08 hrs.)**

Town Planning: History in India, Concepts of landmark, axis, orientation, Definition, Orthodoxies of planning, Sustainability and Rationality in planning

Module 5 **(10 hrs.)**

Planning Theories: Concentric Zone Theory, Sector Theory, Multiple Nuclei Theory, Land Use and Land Value Theory of William Alonso, Ebenezer Howard's Garden City Concept, Green Belt Concept

Course Outcome:

- To imbibe the basic notion about urban planning, its history, technical aspects and understand the role of urban planners in detail
- To get acquainted with the concept of urban development by reviewing its policies and programmes implemented in India and study its impact upon Metro and Mega Cities
- To comprehend the minutes of Land and Real Estate Development
- To gain knowledge of Town Planning together with its Sustainability and Rationality
- To cram the various Planning Theories in detail

List of Text / Reference Books:

1. Hall, P., "Cities of Tomorrow: an intellectual history of urban planning and design in the twentieth century", 2001, Blackwell London
2. Sandercock, L., "Making the Invisible Visible:A Multicultural Planning History", 1998, University of California Press, London
3. Rakodi, C. and Lloyd-Jones, T., "Urban Livelihoods: A People-Centered Approach to Reducing Poverty", 2002, Earthscan, London
4. Datta, A., "The Illegal City: Space, Law and Gender in a Delhi Squatter Settlement", 2012, Ashgate, Burlington
5. Bawa, V.K., "Indian Metropolis: Urbanization, Planning and Management", 1987, Inter-India Publications, New Delhi

PEC – CE01(E)	Building Services	3L (3 hrs.)	3 credits

Objective:

- To make the building comfortable, functional, efficient and safe
- To contribute to the design of building in terms of façade engineering
- To influence the building's architecture, its sustainability and energy demand

Module 1 **(08 hrs.)**

Building Management System: Home Automation and Building Automation; Management Level, Automation Level, Field Level

Module 2 **(12 hrs.)**

Energy Generation, Distribution and Supply: Hydroelectricity, LPG, Marine Energy, Natural Gas, Nuclear Energy, Biomass, Renewable energy, Solar Energy, Tidal lagoon power, Wind Energy

Module 3 **(10 hrs.)**

Escalators and lifts: History, Speed, Configurations, Design Considerations, Components; Security and Alarm System: Access Control, Perimeter Security CCTV, Sensors and Detectors, Intrusion Alarms, Fire Detection System, Fire Extinguisher System

Module 4 **(08 hrs.)**

Façade Engineering; Water, Drainage and Plumbing: Types of Pumps, Types of Drainage Systems in Buildings

Module 5 **(10 hrs.)**

Fire: Fire Safety Strategies, Prevention, Communication, Escape, Containment, Passive Fire Resistance, Active Measures, Extinguishment; HVAC: Heating, Ventilation, Air Conditioning, Energy Efficiency, Air Filtration and Cleaning, Industry and Standards, Lighting: Natural, Artificial-General, Ambient, Accent, Task, Emergency, Security, Construction Site, Circadian Rhythms

Course Outcome:

- To imbibe the basic notion about building management system
- To get acquainted with the concept of energy generation, its distribution and supply
- To comprehend the minutes of escalators and lifts, and security and alarm systems
- To gain knowledge of Façade Engineering and about Water, Drainage and Plumbing
- To cram about Fire, HVAC and Lighting

List of Text / Reference Books:

- Hall, F. and Greeno, R., "Building Services Handbook", 2017, 9th Edition, Routledge
- "Maintenance of Buildings" by A C Panchdhari
- "Building Repair and Maintenance Management" by P S Gahlot
- Maintenance and Repairs of Buildings" by Pijush Kanti Guha

PEC – CE02 (A)	Construction Planning and Management	3L:0T:0P	3 credit

Pre-requisite – Estimating & Costing in Civil Engineering

Objectives: To study about management of Construction Industry & Understand the various elements of the Site and its elements.

Module 1 Introduction

Significance of Construction Planning & Management (CPM), Objectives & Function of CPM. Types of Constructions. Resources for Construction Industry. Construction Team. Engineering Drawings & Interpretation.

Module 2 Network Techniques

Introduction of CPM & PERT, Work Breakdown, classification of Activities. Rules for developing Networks. Network Development & Analysis. Resource Allocation.

Module 3 Cost – Time Analysis in Network Planning

Importance of Time-Cost Analysis, Project Cost Variation of Direct & Indirect Cost with Time, Cost Optimization & its Procedure.

Module 4 Inspection & Quality Control

Need for Inspection & Quality Control, Principles of Inspection, Enforcement of Specifications. Stages of Inspection & Quality Control. Technical Services & Inspection Team. Testing of Structures.

Module 5 Organizing Construction

Principles of Organization, Types of Organization, Communication, leadership & Human Relations. Site Organization, Systems Approach to Planning Accommodation of site staff, contractor's staff, various organization charts and manuals, personnel in construction, welfare facilities, labor laws. Job Layout and its preparation.

Course Outcomes:

Students will be able to

CO1. Understand investigation methodsand principles of construction management.CO2. Understand the selection of Construction equipment's.

CO3. Understandvarious elements of tenders & Contracts.

CO4. Know the different types of specifications and bill used in construction works.CO5. Know about the site Organization &labour laws and safety engineering.

Reference Books -

1. Construction Equipment by Peurify
2. CPM by L.S. Srinath
3. Construction Management by S. Seetharaman
4. CPM & PERT by Weist & Levy
5. Construction, Management & Accounts by Harpal Singh
6. Tendering & Contracts by T.A. Talpasai

PEC – CE02 (B)	Air and Noise Pollution Control	L:T:P (Hrs) 3:0:0	Credits: 3

Objective: To provide a deep insight to the global problem of Air and Noise pollution and its control technologies.

Module 1 **(10 Hrs)**

Introduction and Impacts of Air pollution: Air pollution: Introduction, Structure of Atmosphere, Lapse rate and Inversion, Definition and Causes of Air pollution, Sources and Classification of air pollutants, Mobile and stationary sources of air pollutants, Automobile pollution sources, Impacts of Air Pollution on human beings, plants, animals and properties. Global Impacts - Green house effect, Ozone depletion, Acid rain, Heat island, Dust storms, Photochemical smog, Climate Change. History of Air pollution with case studies.

Module 2 **(10 Hrs)**

Transport of Pollution in Atmosphere: Introduction to meteorology and transport of air pollution: Global winds, Headley cells, wind rose terrestrial wind profile, Effects of terrain and topography on winds, maximum mixing depths, plume rise, effective stack height concept, Plume behavior under different atmospheric conditions, Plume behavior in valley and terrains. Plume behavior under different meteorological conditions, Mathematical models of dispersion of air pollutants: Gaussian Plume Model, Concept of isoplates.

Module 3 **(10 Hrs)**

Air Pollution control: CO, CO_2, H_2S, SO_x, NO_x emissions, and its control. Air Pollution control at source, equipments for control of air pollution. For particulate matter control: Settling chambers, Cyclonic Settling chambers, Fabric filters, Scrubbers, Electrostatic precipitators. For Gaseous pollutants control: absorption, adsorption, combustion and incineration, catalytic converter for automobile pollution control. Working principles advantages and disadvantages, design criteria and examples. Future engines and fuels.

Module 4 **(10 Hrs)**

Air Quality Sampling and Monitoring: Stack sampling, Instrumentation and methods of analysis of SO_2, NOx, CO etc, High Volume air sampler and digital aerosol samplers, legislation for control of air pollution and automobile Pollution, Air Quality Index, Indian Ambient Air Quality Standards, Air (Prevention and

Control of Pollution) Act.

Module 5 **(08 Hrs)**

Noise Pollution and Control: Definition, Source, Causes and Impacts of Noise Pollution. Measurement of Noise: Decibel scale. Monitoring Instrument for Noise pollution: Noise Meters, principle and working. Noise level standards and bearable limits of noise. Noise pollution control at source, pathway and user end.

Course Outcome:

CO1: Introduction to basic concepts causes and impacts of air pollution.

CO2: To provide knowledge regarding transport of air pollution in atmosphere.

CO3: To develop skills relevant for control of air pollution.

CO4: Knowledge of how to estimate the quantity of air pollutant, it's sampling and monitoring.

CO5: To understand the different types of noises, their acceptable levels and how to control noise pollution.

Text/Reference Books:

1. H.C Parkins, Air Pollution Mc Graw Hill Publication
2. Environmental Engineering - H.S. Peavy & D.R. Rowe-Mc Graw Hill Book Company, New Delhi
3. De A.K., Environmental Chemistry, Wiley Eastern Ltd
4. De Nevers, N., Air Pollution Control Engineering, McGraw-Hill (2000).

PEC – CE02 (C)	Integrated Waste management	L:T:P (Hrs) 3:0:0	Credits: 3

Objective:

This course will also cover many other aspects including recovery of biological conversion products from solid waste to compost and biogas, incineration and energy recovery, hazardous waste management and treatment, and integrated waste management.

Module 1 **(08 Hrs)**

Solid Waste Management- Definition, Concept of 4Rs (reduce, reuse, recycle and recover) of waste management, Elements of a waste management system, Current Issues in Solid Waste Management, Integrated Waste Management Hierarchy: Source reduction, Recycling, Waste-to-Energy and Landfilling. Review of waste management under Swachh Bharat Mission and Smart Cities Program.

Module 2 **(08 Hrs)**

Municipal Solid Waste: Waste Composition and Quantities, Collection, Transportation, Segregation, and Processing.

Module 3 **(08 Hrs)**

Disposal of Municipal Solid Waste: Landfill, Biochemical Processes and Composting, Energy Recovery from Municipal Solid Waste. Municipal Solid Waste (MSW) Rules 2016.

Module 4 **(08 Hrs)**

Construction and Demolition (C&D) Waste Management: Overview, Components; C&D Waste Management Rules 2016, Beneficial Reuse of C & D Waste Materials.

Module 5 **(08 Hrs)**

Electronic Waste (E-Waste) Management – Issues & Status in India and Globally, E-Waste Management Rules 2016 and Management Challenges. Hazardous Wastes: Definition, Classification, Risk assessment, Transportation of hazardous waste, Current Management Practices: Environmental audit, Containment, Remedial alternatives.

Books:

1. George Tchobanoglous, Hilary Theisen and Samuel A Vigil, Integrated Solid Waste management, Tata McGraw Hill
2. Ramachandra T.V., Management of Municipal Solid Waste, 2009; by The Energy and Resource Institute, TERI
3. Sasikumar, K, Gopi Krishna, Sanoop, Solid Waste Management; 2009, PHI.

References:

1. Manual on Solid Waste Management, prepared by The Central Public Health and Environmental Engineering Organization(CPHEEO), India
2. MSW Management Rules 2016, Govt. of India, available online at CPCB website
3. Construction and Demolition Waste Management Rules, 2016, MoEF&CC
4. Electronic Waste Management Rules 2016, Govt. of India, available online at CPCB website.
5. Freeman, M. H.1988. Standard Handbook of Hazardous Waste Treatment and Disposal, McGraw-Hill Book Company, New York
6. O P Gupta, " Element of hazardous waste management, Khanna Publishing House.

PEC – CE02 (D)	Geo-informatics Engineering	3L:0T:P (3hrs)	3 Credits

Objectives:

To Introduces fundamental concept of Remote sensing & GIS,GPS techniques for modeling and analysis in civil engineering problem.

Module 1 **(09 Hrs)**

Remote sensing: Basic concept of Remote sensing, Types of Remote Sensing ,Data and Information, Remote sensing data collection, Remote sensing advantages & Limitations, Remote Sensing process. Atmospheric windows, Electromagnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, and vegetation), Resolution, image registration and Image and False color composite, elements of visual interpretation techniques.

Module 2 **(10 Hrs)**

Remote sensing Platforms and Sensors: Indian Satellites and Sensors characteristics, Remote Sensing Platforms, Sensors and Properties of Digital Data, Data Formats: Introduction, platforms- Types of Platforms ,Types and characteristics of sensors, sensor resolutions (spatial, spectral, radiometric and temporal). Basics of digital image processing- introduction to digital data, systematic errors(Scan Skew, Mirror-Scan Velocity, Panoramic Distortion, Platform Velocity , Earth Rotation) and non-systematic [random] errors(Altitude, Attitude), Image enhancements(Gray Level Thresholding, level slicing, contrast stretching),image filtering.

.**Module 3** **(12 Hrs)**

Geographical Information System: Introduction to GIS; components of a GIS; Geographically Referenced Data, Spatial Data- Attribute data , attribute data and Geospatial data Data input-existing GIS data, creating new data; attribute data query, spatial data query, raster data query, Attribute data Management, - Projected Coordinate System, Geographic coordinate System, Datum; Map Projections: Types of Map Projections, Projected coordinate Systems. UTM Zones ; -

Module 4 **(12 Hrs)**

Data Models: Vector an d Raster data model:Non Spatial data model, Representation of simple features – Topology and its importance; coverage and its data structure, Shape file, DBMS, Relational Database, , Grid model, TIN model, Network model, applications; Data collection, capture and Geo processing: Sources,

input methods, editing, re-projection, geometric transformation, map scale, precision and accuracy. Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data conversion. Vector and Raster data models,

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Module 5 **(16 Hrs)**

GPS & Integrated approach of Remote sensing & GIS: Definition, history, components; , GPS Position Location Principles, types and application of GPS; system segmentation – control segment, user segment, space segment, types of receivers, types of signals.

Applications of Remote sensing and GIS: Applications in land use land cover analysis, change detection, Road Planning ,water resources, urban planning, environmental planning, Natural resource management and Traffic management. Location Based Services And Its Applications.

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Course Outcomes:

Students will be able to

CO 1. To understand the fundamental Principal and component of remote sensing

CO 2. Describe the process of data acquisition of satellite images and their characteristics

CO 3. Explain the concepts and fundamentals of GIS

CO 4. Describe the fundamental elements of relational database management systems and access techniques

CO 5. Analysis of GPS equipment GIS & Remote Sensing and their application for solving problems of surveying, mapping in Civil engineering.

Text/Reference Books:

1. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
2. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015
3. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015
4. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) publication
5. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.
6. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.
7. M. Anji reddy, “Remote Sensing and Geographical Information Systems”, 3rd Edition, B.S. Publications, 2006.
8. Bradford W. Parkinson & James Spilker., Global Positioning System: Theory and Applications, Vol I,1996

PEC – CE02 (E)	Marine Engineering	3L:0T:P (3hrs)	3 Credits

Objectives:

The objective of this course is to educate students about marine engineering, ship terms, movement of ships and the various materials used in ship building.

Module 1 **(10 Hrs)**

Introduction to ships & offshore structures: Characteristics of shipbuilding industry; Structural Requirement - Longitudinal strength, Transverse strength, Torsional strength, Local strength; Framing system / stiffening arrangement - Longitudinal framing, Transverse framing; Basic structural components – Stiffeners, Longitudinal, Transverse, Girders & Transverses, Hatch side girder, Hatch end beam, Stringers, Brackets.

Module 2 **(10 Hrs)**

Structural sub assemblies: Flat stiffened panel, Curved stiffened panel, Floors - Longitudinally framed, Transversely framed; Bulkheads - Transverse water tight bulkhead, Non water tight bulkheads, Flat stiffened bulkhead, Corrugated bulkhead, Decks & shells.

Module 3 **(10 Hrs)**

Bottom shell, Side shell, Inner bottom plating: Structural assemblies -Double bottom construction, Wing tanks & duct keels, Fore & Aft end construction, Mid ship sections of various ship types - General cargo carrier, Bulk carrier/OBO, Container ship, Oil tanker, RO-RO ship.

Module 4 **(10 Hrs)**

Structural alignment & continuity: Steel material preparation - Shot blasting, Acid pickling, Plate & Section forming - Mechanical methods, 3-point hydraulic press, Universal press, Line heating, Plate cutting – Mechanical, Thermal - Oxy-fuel, Plasma, Fusion Welding & Power Source, Welding parameters and their effects.

Module 5 **(10 Hrs)**

Fusion Welding Methods – MMAW, GMAW, GTAW, SAW, Electro slag Welding, Electro gas welding, Single side welding, Solid state welding - Friction stir welding, Welding distortions,

Distortion prevention, Distortion mitigation, Welding defects, Non destructive testing.

Course Outcomes:

CO1. To establish a basic understanding of various means of marine and study about different terminologies related to marine engineering and structures.

CO2. To understand structural sub assemblies used in marine engineering.

CO3. To know about the various construction & cargo carrier.

CO4. To understand the various structural alignment & wildings used in marine ship.

CO5. To understand various methods of welding & distortion prevention.

Text/Reference Books:

1. Ship Construction 6th Edition,by D.J. Eyres.
2. Aluminum Welding 2nd Edition Narosa Publishing House, New Delhi ,by N. R. Mandal.
3. Welding Techniques, Distortion Control and Line Heating. Narosa Publishing House, New Delhi, by N R Mandal.
4. Ship Design and Construction, Edited by: Robert Taggart, SNAME publication.
5. Ship construction- Edrich Fernands Publishers: Pro-Navigator books.
6. Notes on ship

Eighth SemesterP

Eighth Semester (Scheme A)

S.No.	Course Type	Course Code	Course Title	Hrs./Week			Total Credits
				L	T	P	
1	PEC	CE03	Professional Elective Course-III	3	-	-	3
2	IOC	Code*	Interdisciplinary Open Course-II	3	-	-	3
3	SBC	CE05(P)	Structural Health Monitoring Skills	-	-	4	2
4	PRO	CE03(A)	Project Phase -II	-	-	16	8
			Total	**Total Credit**			**16**

Eighth Semester (Scheme B)

S.No.	Course Type	Course Code	Course Title	Hrs./Week			Total Credits
				L	T	P	
1	PEC	CE03	Professional Elective Course-III	3	-	-	3
2	IOC	Code*	Interdisciplinary Open Course-II	3	-	-	3
3	SBC	CE05(P)	Structural Health Monitoring Skills	-	-	4	2
4	PRO	CE03(B)	Internship and Project (Industry/Corporate/Academia)	-	-	16	8
			Total	**Total Credit**			**16**

Note:

- **In Eighth Semester, students may opt for 'SCHEME A' or 'SCHEME B'.**

- **Professional Elective Course (PEC)-III, CE03**
  (Any One Course)
  (a) Design of Advanced Steel Structures
  (b) Structural Dynamics
  (c) Design of Prestressed Structures
  (d) Ground Improvement Techniques
  (e) Pavement Design

- **Interdisciplinary Open Course (IOC)-II, (Code* as per below subjects) (Any One Course)**
  - Disaster Management- Forecasting and Mitigation (FT01)
  - Disaster Management- Legislation (FT02)
  - Occupation Health and First Aid (FT03)
  - Principles of Safety Management (FT05)
  - Any MOOC Course, Minimum 12 Weeks, (AICTE/SWAYAM/ Other Relevant Online Learning Platform)

- **Skill Based Courses (SBC),**
  Structural Health Monitoring Skills, CE05(P)
  - Health monitoring of existing structures through "Non Destructive Testing Skills".

PCC-CE801	Digital Professional Skills	0L:0T:4P (4 Hours)	2 Credits

Objectives:

To provide detailed knowledge of various modern tools used in the field of civil engineering.

Each student shall develop a good grasp on the modern tools (e.g. AutoCAD, MX Road, STAAD Pro,Primavera, etc.) used in field of civil engineering and shall submit a detailed report of their work done using one or more of these modern tools.

Course Outcomes:

CO1: To understand different Drafting and Design tools and their applications.

CO2: To understand the importance of these tools in this era of modernization.

CO3: To comprehend the different methodologies involved with different tools.

CO4: To be able to correlate the design and planning procedures with their respective tools.

CO5: To master one or more tools extensively used for design, planning & analysis in the fieldof civil engineering.

PEC – CE803 (A)	Construction Planning & Management	3L:0T:0P (Hrs)	3 Credits

Objectives: The study of methods, tools and techniques for the planning, analysis and monitoring of the project site. Understand the various elements of the contracting and bidding process for construction. Various dispute resolution methodologies.

Module 1

Preliminary and detailed investigation methods of construction, form work and centering. Schedule of construction, job layout CPM, principles of construction management, modern management techniques like CPMPERT with network analysis.

Module 2

Construction equipments Factors affecting selection, investment and operating cost, output of various equipments, brief study of equipments required for various jobs such as earth work, dredging, conveyance, concreting, hoisting, pile driving, compaction and grouting.

Module 3

Tenders & Contracts Different types of Tenders & Contracts, notice inviting tenders, contract document, departmental method of construction, rate list, security deposit and earnest money, conditions of contract, arbitration, administrative approval, technical sanction.

Module 4

Specifications & Public Works Accounts Importance, types of specifications, specifications for various trades of engineering works. Various forms used in construction works, measurement book, cash book, materials at site account, imprest account, tools and plants, various types of running bills, secured advance, final bill.

Module 5

Site Organization & Systems Approach to Planning Accommodation of site staff, contractor's staff, various organization charts and manuals, personnel in construction, welfare facilities, labour laws and human relations, safety engineering.

Problem of equipment management, assignment model, transportation model and waiting line modals with their applications, shovel truck performance with waiting line method.

Course Outcomes:

Students will be able to

CO1. Understand investigation methodsand principles of construction management.

CO2. Understand the selection of Construction equipment's.

CO3. Understandvarious elements of tenders & Contracts.

CO4. Know the different types of specifications and bill used in construction works.

CO5. Know about the site Organization &labour laws and safety engineering.

Reference Books -

1. Construction Equipment by Peurify
2. CPM by L.S. Srinath
3. Construction Management by S. Seetharaman
4. CPM & PERT by Weist & Levy
5. Construction, Management & Accounts by Harpal Singh
6. Tendering & Contracts by T.A. Talpasai

PEC-III, CE03 (A)	Design of Advanced Steel Structures	3L:0T:0P (Hrs)	3 Credits

Objectives

To analyze and design the special Steel structures using standard codal provisions and procedures.

Module 1

Plate girder bridges (Riveted and welded)

Module 2

Trussed girder bridges for railways and highways (IRC & IRS holding). Bearings for bridges.

Module 3

Water Tanks: Pressed steel tanks, tanks with ordinary plates, square, rectangular, circular with hemispherical bottom and conical bottom.

Module 4

Chimneys: Guyed and self supporting steel stacks.

Module 5

Bunkers, Silos & Towers.

Course Outcomes:

CO1. Ability to analyze the forces existing in riveted or bolted plate girder bridges, design them using relevant code of practice and its detailing.

CO2. To design truss girder bridges for railways and highways using standard codes of practice, to visualize the significance of various clauses for design and its detailing.

CO3. To understand the design steps for different shapes of steel water tanks and it's detailing.

CO4. To visualize the design steps for different types of chimneys using relevant codes of practice and the detailing thereof.

CO5. To understand the step by step procedure for the design of bunkers, silos and towers and it's detailing using relevant code of practice.

SUGGESTED TEXT BOOKS AND REFERENCES:

1. Design of Steel Structures – S. Ramamrutham

2. Design of Steel Structures – B.C.Punmia

3. Steel Str. by Ramchandra Vol II
4. Steel Str. by Arya & Ajwani
5. Design of steel structures – L.S. Negi

(PEC)-III, CE03 (B)	Structural Dynamics	3L:0T:0P (Hrs)	3 Credits

Objectives: The objective of this course is to make students to learn principles of Structural Dynamics.To implement these principles through different methods and to apply the same for free and forced vibration of structures. To evaluate the dynamic characteristics of the structures

Module 1 **(10 Hrs)**

Introduction: Introduction to Dynamic problems in Civil Engineering, Concept of degrees of freedom, D'Alembert's principle, principle of virtual displacement and energy principles Dynamics of Single degree-of-freedom systems: Mathematical models of Single-degree-of-freedom systems system, Free vibration response of damped and undamped systems. Methods of evaluation of damping.

Module 2 **(10 Hrs)**

Single-degree-of-freedom systems: Response of Single-degree-of-freedom systems to harmonic loading (rotation unbalance, reciprocating unbalance) including support motion, vibration isolation, transmissibility, Numerical methods applied to Single-degree-of-freedom systems – Duhamel integral, principle of vibration-measuring instruments– seismometer and accelerometer.

Module 3 **(10 Hrs)**

Dynamics of Multi-degree freedom systems: Mathematical models of multi-degree-of-freedom systems, Shear building concept, free vibration of undamped multi-degree-of-freedom systems, Natural frequencies and mode shapes, orthogonality property of modes.

Module 4 **(10 Hrs)**

Response of Shear buildings: Response of Shear buildings for harmonic loading without damping using normal mode approach. Response of Shear buildings for forced vibration for harmonic loading with damping using normal mode approach, condition of damping uncoupling.

Module 5 **(10 Hrs)**

Approximate methods: Rayleigh's method **Dynamics of Continuous systems:** Dunkarley's method, Stodola's method. Dynamics of Continuous systems: Free longitudinal vibration of bars, flexural vibration of beams with different end conditions, Stiffness matrix, mass matrix (lumped and consistent); equations of motion for the discretised beam in matrix form.

Course Outcomes:

Students will be able to

CO1. Achieve Knowledge of design and development of problem solving skills.

CO2. Understand the principles of Structural Dynamics.

CO3. Summarize the Solution techniques for dynamics of Multi-degree freedom systems.

CO4. Understand the concepts of damping in structures.

CO5. Understand various methods involved in dynamics of continuous systems.

Text/Reference Books:

1. Anil K. Chopra, "Dynamics of Structures-Theory and Applications to Earthquake Engineering", Pearson, 3rd Edition, 2011.
2. Gary Hart and Kevin Wong, "Structural Dynamics for Structural Engineers", John Wiley And Sons, 2000.
3. J. W. Smith, "Vibration of Structures. Application in Civil Engineering Design", Chapman and Hall, 1988.
4. Jagmohan L.Humar, "Dynamics of Structures", Prentice Hall, 1990.
5. Mario Paz and William Leigh, "Structural Dynamics - Theory and Computation", Updated With Sap 2000, 5th Edition, Kluwer Academic Publishers.
6. R. W. Clough and J. Penzien, "Dynamics of Structures", Tata Mc Graw Hill, 2nd Edition, 2003.

(PEC)-III, CE03 (C)	Design Of Prestressed Structures	3L:1T: 0P (Hrs)	3 Credits

Objectives: The objective of this course is to make students able to analyse sections using the basic aspects of prestressed concrete, determine losses in prestressed concrete and design of prestressed concrete structural elements.

Module 1 **(12 Hrs)**

Introduction – Theory and Behavior: Basic concepts, Advantages, Applications, Types of prestressing, prestressing systems and methods, materials, losses in prestress, Introduction to IS 1343

Module 2 **(10 Hrs)**

Analysis of Flexural Members: Analysis of sections: Stress concept – Strength concept – Load balancing concept, Basic assumptions for calculating flexural stresses & permissible stresses in steel and concrete as per I.S.1343 Code. Calculation of deflections – Short term and long term deflections, factors influencing deflections

Module 3 **(10 Hrs)**

Design of Statically determinate PSC members: Design for ultimate and serviceability limit states for flexure, analysis and design for shear and torsion, code provisions.

Module 4 **(10 Hrs)**

Design of Statically indeterminate PSC members: Analysis and design of two span continuous beams, choice of cable profile, concordant cable and linear transformation. Methods of achieving continuity in continuous beams & slabs. Analysis for secondary moments, calculation of stresses, principles of design & code provisions.

Module 5 **(10 Hrs)**

End Block design & Miscellaneous Structures: Transmission of prestress in pre-tensioned members, Magnel's method, Guyon's method and IS 1343 code. Determination of anchorage zone stresses for post-tensioned members – design of anchorage zone reinforcement. Design of tension and compression members, tanks, pipes, sleepers and poles.

Course Outcomes:

CO1. Understand the basic concepts of prestressing.

CO2. Analyse sections for obtaining stresses and deflection.

CO3. Design statically determinate PSC members

CO4. Design statically indeterminate PSC members.

CO5. Design end block & miscellaneous structures.

Text/Reference Books:

1. Krishna Raju N., Prestressd Concrete, Tata Mc Graw Hill Book Co.Ltd. New Delhi.
2. Pandit.G.S. and Gupta.S.P., Prestressed Concrete, CBS Publishers and Distributers Pvt. Ltd.
3. Lin T. Y. and Ned H Burns., Design of Prestressed Concrete Structures, Wiley India Pvt. Ltd.
4. Dayaratran P., Prestressed Concrete Structures, Oxford & IBH Co., Delhi.
5. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House.
6. IS: 1343, Indian Standard code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi.
7. IS: 784, Indian Standard Specification for Prestressed Concrete Pipes, Bureau of Indian Standards, New Delhi.
8. IS: 3935 - Code of Practice for Composite Construction, Bureau of Indian Standards, New Delhi.

(PEC)-III, CE03 (D)	**Ground Improvement Techniques**	**3L:0T:0P (5hrs)**	**3 Credits**

Objectives: After this course, the student is expected to identify basic deficiencies of various soil deposits and he/she be in a position to decide various ways and means of improving the soil and implementing techniques of improvement.

Module 1 **(10 Hrs)**

Introduction to Ground improvement techniques: – Purpose - Field compaction and deep compaction methods. Drainage and dewatering: - well point system, shallow & deep well system, vacuum method, electro osmosis method. Comparison between methods

Module 2 **(12 Hrs)**

Methods of stabilizations: – Mechanical – Cement - Lime - Bituminous - Chemical. Grouting:- basic functions- permeation-compaction-hydro fracture, classification of grouts- groutability ratio- properties of grouts - viscosity, stability, fluidity, rigidity, thixotropy, permanence Grouting applications : - seepage control in soil and rock under dams- seepage control in soil for cut off walls – stabilization grouting for underpinning.

Module 3 **(10 Hrs)**

Reinforced earth: - mechanism- types of reinforcing elements- reinforcement-soil interaction – applications- reinforced soil structures with vertical faces Geosynthetics – types of geosynthetics – functions of geosynthetics – properties of geosynthetics.

Module 4 **(12 Hrs)**

Consolidation: - definition- Spring analogy of consolidation -classification- laboratory consolidation teste-log p curve - coefficient of consolidation. Preloading techniques - comparison of compaction and consolidation.

Shear strength:- definition – theoretical considerations: Mohr's stress circle, principal plane, principal stresses – Mohr-coulomb failure theory – the effective stress principle - measurement of shear strength - Direct shear test – advantages and disadvantages. Calculation of parameters from direct shear test data.

Course Outcomes:

Students will be able to

CO1. To Understand the different ground improvement techniques .methods of stabilisation

CO2. To Understand soil stabilization and methods of stabilisation

CO3. To Understand the concept of reinforced soil and the basic concepts of geosynthetics

CO4. To Understand the basic concept of consolidation and the basic concepts of shear strength of the soil.

Text/Reference Books:

1.Moseley M.P., Ground Improvement Blockie Academic and Professional, Chapman and Hall, Glassgow, 1993.

2.Jones J.E.P., Earth Reinforcement and Soil Structure, Butterworths, 1995.

3.Koerner, R.M., "Design with Geosynthetics", (3rd Edition) Prentice Hall, New Jersey, 2002

4.Jewell, R.A., "Soil Reinforcement with Geotextiles", CIRIA special publication, London, 1996

5.Das, B.M., "Principles of Foundation Engineering", Thomson Books / Cole, 2003.

FT-01	Disaster Management, Forecasting and Mitigation	3L:0T:0P (3Hrs)	3 Credits

Objectives: To familiarize the Students with the concepts and developments in the field of Disaster Management and to learn about the nature and characteristics of major natural disasters and how to mitigate the risk involved with such disasters

Module 1 **(08 Hrs)**

Introduction Definition; Types of disasters; History of disasters; Components of disaster; Dimension of disasters; Phases of disaster. The necessity of studying Disaster Management (DM); the scope for a Disaster Manager

Module 2 **(08 Hrs)**

Hazards & Vulnerability: Hazard: Definition; types of hazards; characteristic features, occurrence and impact of Different types of hazards viz. natural hazards (including geo hazards), human Induced hazards, environmental hazards, bio hazards; Hazard map of India. Vulnerability: Definition; Types of vulnerability – physical vulnerability, socioeconomic vulnerability, vulnerability related to gender and age, rural & urban vulnerability; Vulnerability analysis with special reference to India.

Module 3 **(08 Hrs)**

Forecasting: Pre-disaster, during disaster and post-disaster measures in some events in general, early warning: Risk analysis, Monitoring Response capability. Communication and information technology in disaster management. Do's and don'ts in case of disasters and effective implementation of relief aids.

Module 4 **(08 Hrs)**

Disaster Risk: Assessing Disaster Risk: Disaster Risk and Damage potential of disasters; Case studies on some major disasters and Lessons learnt there from (identification of the gaps causing the disasters); Assessment of Disaster Risk. Ways of minimizing disaster risk: Preparedness, Mitigation and Prevention – definition, specific interventions required for each, procedure to be followed and role of various stakeholders in each.

Module 5 **(08 Hrs)**

Disaster Risk Mitigation: Earthquake Risk Mitigation; Earthquake, its Causes and Characteristic features, Magnitude and Intensity of earthquake, Major earthquakes, Seismic zoning, Earthquake vulnerability of India, Earthquake risk mitigation. Flood Risk Mitigation: Causes of Flood, Major floods, Flood vulnerability

of India, Flood preparedness and mitigation. Cyclone Risk Mitigation: Causes of Cyclone, its characteristics, Cyclone vulnerability of India, Cyclone preparedness, Forecast and early warning dissemination. Drought Risk Mitigation: Causes and characteristics of Drought, drought vulnerability of India, Drought preparedness and Mitigation. Landslide Risk Mitigation: Causes and Characteristics of Landslides, Landslide vulnerability of India, Mitigation measures, Prevention measures.

Course Outcomes:

CO1. To understand basic Concept and Phases of Disaster Management

CO2. To know about hazards and vulnerability concepts.

CO3. To understand the different methods of Disaster Forecasting

CO4. To know about the assessing of Disaster Risk

CO5. To understand the mitigation of different Risk of Disaster

Text/Reference Books:

1. Bryant Edwards; "Natural Hazards" Cambridge University Press, U.K. (2005)
2. Carter, W. Nick; "Disaster Management" Asian Development Bank, Manila (1991).
3. Central Water Commission; "Flood Atlas of India" CWC, New Delhi. (1987)
4. Central Water Commission; "Manual of Flood Forecasting" New Delhi. (1989)
5. Government of India; "Vulnerability Atlas of India" New Delhi. (1997)
6. Sahni, Pardeep et.al.; (eds.), "Disaster Mitigation Experiences and Reflections" Prentice Hall of India, New Delhi (2002)

OEC – CE801 (B)	Disaster Mgt, Laws, Policies and Regulations	3L:0T:0P (3Hrs)	3 Credits

Objectives: To familiarize the Students with the concepts and developments in the field of Disaster Management and to learn about Laws, Policies and Regulations of Disaster.

Module 1 **(08 Hrs)**

Introduction: Definition; Types of disasters; History of disasters; Components of disaster; Dimension of disasters; Phases of disaster. The necessity of studying Disaster Management (DM); the scope for a Disaster Manager Hazard & Vulnerability.

Module 2 **(08 Hrs)**

Types of Disaster: Natural Disaster and Manmade disasters: Natural Disasters: nature of natural disaster, drought, cloud burst, Earthquake, Landslides, Cyclone, Storm Surge, climate change, global warming, sea level rise, Manmade Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Study of Disasters related to Construction Industry: Fire, Flood, Airport, Dam, and Bridges.

Module 3 **(08 Hrs)**

Disaster Management Policy Environment and local Action: Disaster Management Act 2005; Disaster Management Authority at National, State and District levels; Roles and responsibilities of Govt. Authorities including Local Self Govt. at various Levels.

Module 4 **(08 Hrs)**

Funding for Disaster Management: State Disaster Mitigation fund, State Disaster response fund (SDRF), National Disaster Response Fund (NDRF), Prime Minister National Relief Fund (PMNRF), Chief Minister Relief Fund and Role.

Module 5 **(08 Hrs)**

Capacity Building: Setting up EOCs at state, district and block levels; Raising National/State Disaster Response Force; Training and Capacity building of all stakeholders – National Institute of Disaster Management (NIDM); Disaster Management Centres (DMC) in every State; Centres of Excellence

Course Outcomes:

CO1. To understand the basic Concept and Phases of Disaster Management

CO2. To know the various types of Disasters.

CO3. To know various government policies in Disaster management.

CO4. To know various government funding in Disaster management

CO5. To know about the Disaster management Institutions

Text/Reference Books:

1. Damon P Capolla; "Introduction to International Disaster Management" Butterworth Heinemann Publ. (2007)
2. Paritosh Srivastava; "Disaster Management: Disaster Management and Mitigation approaches in india" (2014)
3. R B Singh; "Natural Hazards and Disaster Management: Vulnerability and Mitigation" 2006.
4. NDMA; "Disaster Management Guidelines" (2007).
5. Ministry of Home Affairs (NPDM); "National Policy on Disaster Management" (2006).

FT-03	Occupation Health & First aid	3L (5hrs)	3Credits

Objectives: Student**'s** will perform various activities related to Safety management like performing Risk Assessment & developing control strategies- implement Safe Systems of Work- develop work method statements thereby gaining professional hands-on experience in their chosen area.

Module 1

Safety Management Introduction to safety and safety management - Accident causation – Hazard – Trigger – Risk – Heinrich Triangle – Frank Bird Triangle - Domino Theory – General Instructions for safety – Industrial safety practices – classification of accidents – Terms and definitions- General Safety rules

Module 2

Risk Management Risk Analysis & Risk Management – Principles of hazard identification – Hazard analysis & risk control – Quantitative & qualitative assessment - Carrying out a Risk assessment - Preventive and protective measures – Process safety management - Safe Systems of Work – Permit to Work Systems

Module 3

Maintenance of Fire Protection Systems Fire extinguishing appliances. Selection- requirements- installation and maintenance of hand appliances. Mechanically driven fire engines and trailer pumps. Hydrant system- pumps- Fuel System- Fixed monitors- Hose pipes and Nozzles- Maintenance of pumps- Hydrant's hose pipes and nozzles.

Module 4

Structural Hazards Building design – Location of buildings and service functions – designing building to protect against explosions – building and hazard identification – building evaluation – risk reduction measures for building – building design to protect against toxic release – design for emergency egress – checklist for evaluation

Module 5

Introduction – Scaffolding in construction -Terminology – Types of scaffolding – Scaffolding Hazards – Risk Assessment, Parts of Scaffolding – Ground – Sole Board - Base Plate – Screw Jack – Post – Runner – Bearer – Bracing – Guard Rail – couplings – Platform – Castor – Toe Board – Standards and specifications of all the parts - Management & Control of Scaffolding – Lay out & design, Capacity- Load calculation – Access – Fall protection – Falling object protection – Tube & coupler – Frame – System – suspended -

outrigger – Mobile Scaffolds

Course Outcomes:

CO1: To know about the industry related health hazards and diseases and various methods and process implementation to avoid and eliminate health hazards.

CO2: To understand the fundamentals of Safety Management like the scope and nature of occupational health and safety

CO3: To understand broad aspects of Safety Management like the PDCA cycle- HSEMS- OHSAS 18001 Management System- Policy- Organising- Planning & Implementing- Evaluation- Action for Improvement- Audit- Safety Culture & Legal aspects of Safety

CO4: To familiarize the design- installation- working and use of different types of Fire protection systems for low and high residential- commercial and public buildings

CO5: To apply safety and health related theory and technology- analyze workplaces to identify occupational hazards- formulate solutions to control occupational hazards- collaborate with others in their respective organizations to minimize occupational hazards.

Text/Reference Books:

1. Industrial Safety Management – LM Deshmukh
2. Construction Safety Hand Book – K Muraleedharan Pillai
3. To familiarize students with the design- installation- working and use of different types of Fire protection systems for low and high residential- commercial and public buildings
4. OHSAS 18001: Designing and Implementing an Effective Health and Safety Management System (Paperback) - Joe Kausek

OEC – CE801 (D)	Intellectual Property Rights	3L:0T:0P	3 credit

Objective: Acquaint the students with the basic concepts of Intellectual Property Rights; and sensitize the students with the emerging issues in IPR and the rationale for the protection of IPR.

Module 1 **(10 Hrs)**

Introduction to IPR: Introduction and Justifications of IPR, Nature of IP, Major forms of IP- Copyright, Patent, Trade Marks Designs, Geographic indication, layout design of Semi conductors, Plant varieties, Concept & Meaning of Intellectual Property. Major international documents relating to the protection of IP - Berne Convention, Paris Convention, TRIPS. The World Intellectual Property Organization (WIPO).

Module 2 **(10 Hrs)**

Copyright infringement: Copyright Meaning and historical development of copyright , Subject matter , Ownership of copyright, Term of copyright, Rights of owner, Economic Rights, Moral Rights. Assignment and licence of rights, Infringement of copyright, Exceptions of infringement, Remedies, Civil, Criminal, Administrative, Registration Procedure.

Module 3 **(10 Hrs)**

Patents and importance: Patents Meaning and historical development,. Criteria for obtaining patents, Non patentable inventions, Procedure for registration, Term of patent, Rights of patentee, Compulsory license, Revocation, Infringement of patents, Exceptions to infringement, Remedies, Patent office and Appellate Board.

Module 4 **(10 Hrs)**

Trade Marks: Trade Marks, Designs & GI Trade Marks: Functions of marks, Procedure for registration, Rights of holder, Assignment and licensing of marks, Infringement, Trade Marks Registry and Appellate Board. Designs: Meaning and evolution of design protection, Registration, Term of protection, Rights of holder, unregistered designs. Geographical Indication: Meaning and evolution of GI, Difference between GI and Trade Marks, Registration, Rights, Authorised user.

Module 5 **(10 Hrs)**

E-commerce and IPR issues: Contemporary issues & enforcement of IPR , IPR & sustainable development , The impact of interent on IPR. IPR issues in biotechnology, E-commerce and IPR issues, Licensing and enforcing IPR , case studies in IPR.

Course Outcomes:

CO 1. Students will be able to understand Primary forms of IPR

CO 2. Students will be able to asses and critique some basic theoretical justification for major forms of IP Protection

CO3. Students will be able to compare and contrast the different forms of IPR in terms of key differences and similarities.

CO 4. Students will be able understand the registration procedures related to IPR.

CO 5. Students will be exposed to contemporary issues and enforcement policies in IPR.

Text/Reference Books:

1. Neeraj Pandey and Khushdeep Dharni, "Intellectual Property Rights", PHI, 2014
2. N.S Gopalakrishnan and T.G. Agitha, "Principles of Intellectual Property", Eastern Book Co. Lucknow, 2009.
3. Prabuddha Ganguli, " Intellectual Property Rights" Mcgraw Hill Education, 2016.