

SYLLABUS		(SEMESTER-VIII)						
Subject Code	CE08TPE06	CREDITS: 3			Internal Assessment (IA)		ESE	
Subject	Professional Elective - 6	L	T	P	CT-I	CT-II		TOTAL
		3	-	-	15	15	30	70
Professional Elective-6A or Professional Elective-6B or Professional Elective-6C or Professional Elective-6D or Professional Elective-6E		Any one subject to be Selected from the Professional Electives Group-6						
Professional Electives Group -6								
CE08TPE06A	Offshore Engineering							
CE08TPE06B	Surface Hydrology							
CE08TPE06C	Bridge Engineering							
CE08TPE06D	Water and Air Quality Modelling							
CE08TPE06E	Construction Equipment & Automation							

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SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TPE06A									
<i>Subject:</i>	Offshore Engineering	3	0	0	15	15	30	70	100	03

Course Objective:

- To introduce basics of offshore structures and its historical development.
- To characterize static and dynamic loads coming on offshore structure.
- To study about general layout consideration of deck and oil & gas processing system.
- To understand method involving platform installation.
- To learn about material used in design and construction of offshore structure.

Course Content:

UNIT 1 HISTORICAL DEVELOPMENT OF OFFSHORE STRUCTURES: Introduction – Definition of Offshore Structures – Historical Developments – Deep water challenges, Functions of Offshore Structures, selection of Offshore Structure and its Configurations, Bottom Supported Fixed Structures, Complaint Structures, Floating Structures – Novel offshore design – Field development concepts

UNIT 2 LOAD AND RESPONSES: Introduction, Gravity Load, Hydrostatic Loads, Resistance Loads, Current loads on Structures, Current Drag and Lift Force, Steady and Dynamic Wind Loads on Structures, Wave Loads on Structures, Varying Wind Load, Impulse loads and Introduction to design

UNIT 3 TOPSIDE FACILITIES AND LAYOUT: Introduction - General layout Considerations - Areas and Equipment - Deck Impact Loads - Deck Placement and Configuration - Float over Deck Installation - Helipad - Platform Crane - Living quarters - Oil and gas treatment - Oil and gas storage, offloading and export - Utility and process support systems - Drilling facilities

UNIT 4 OFFSHORE INSTALLATION: Introduction – Installation of Fixed Platform Substructures - Floating Structures – Foundations - Subsea Templates – load outs - transportation - Platform Installation Methods and installation criteria – Installation of Pipelines and Risers.

UNIT 5: MATERIALS FOR OFFSHORE APPLICATIONS: Material for Construction-Structural Steel, Topside Materials, Advanced Composite materials, Corrosion Control, Material Reliability and Monitoring and Fracture Control.

Textbooks:

1. Dawson, T.H., "Offshore Structural Engineering", Prentice Hall, 1983
2. B.C Gerwick, Jr. "Construction of Marine and Offshore Structures", CRC Press, Florida, 2000.
3. Subrata K Ckakraarti, "Handbook of Offshore Engineering", Vol 1, Vol 2, Elsevier Publishers, 1st edition, 2005.

Reference Books:

1. API RP 2A., "Planning Designing and Constructing Fixed Offshore Platforms", API
2. McClelland, B & Reifel, M.D., "Planning & Design of fixed Offshore Platforms", VanNostrand, 1986
3. Graff, W.J., "Introduction to Offshore Structures", Gulf Publ. Co. 1981.
4. Reddy, D.V & Arockiasamy, M., "Offshore Structure" Vol.1 & 2,

Course Outcomes:

- To classify types of offshore structure and know its basic fundamental knowledge.

- To analyze various loads and their response on the structure.
- To describe process involving deck layout and oil & gas treatment.
- To outline key feature of platform, foundation and pipelines installation.
- To identify and select appropriate material for construction.

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		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TPE06B							70	100	03
<i>Subject:</i>	Surface Hydrology	3	0	0	15	15	30			

Course Learning Objectives:

- 6) To understand the fundamentals of hydrology and concepts of watershed
- 7) To study the analysis of rainfall and its components.
- 8) To understand the estimation techniques of evapo-transpiration and infiltration
- 9) To learn various types of Hydrographs and its uses.
- 10) To know the Flood estimation and Flood routing methods

Course Content:

UNIT 1: Introduction: Scope and importance of hydrology, Hydrologic cycle, Global and India's Water resources, Applications of hydrology, Formation of precipitation, Climate and Weather seasons in India. Watershed concept and modeling: Catchment-topographic and ground water divide, Description of the catchment, catchment processes, demarking a catchment, stream patterns.

UNIT 2: Location of rain-gauges and optimum number of rain-gauges, Analysis of rainfall data, Rainfall mass curve and hyetograph, Intensity-Duration analysis, Intensity-Frequency-Duration analysis, Depth-Area-Duration analysis, Double mass curve. Abstractions from precipitation: Evaporation-Process, measurement, empirical equations and Estimation by water budget method and Energy budget method.

UNIT 3: Evapo-transpiration-AET & PET, Estimation by Penman's equation, Reference Crop Evapo-transpiration by Blaney Criddle formula, Infiltration-Process, Factor affecting infiltration, Measurement, Horton's equation and Philip's equation. Infiltration indices, Probability and Statistics-Introduction, Probability and Random variables, PDF and CDF, Distribution functions, Selection of distribution function and its parameter estimation.

UNIT 4: Hydrograph and its features, Unit hydrograph and its derivation, Unit hydrographs from complex storms and for various durations, S-curve hydrograph and its uses, Synthetic unit hydrograph.

UNIT 5: Flood: Design flood and its estimation- Rational method, Frequency analysis Gumbel's and Log-Pearson's type III distribution, Selection of design return period. Flood routing- Reservoir routing: Channel routing- Prism and Wedge storage, Muskingum method. Flood control: Structural and Non-structural measures.

Text Books:

8. Engineering Hydrology K.Subramanya, Tata McGraw-Hill Education
9. Hydrology Principles, Analysis and Design H.M.Raghunath, New Age International
10. Hand Book of Applied hydrology V.T.Chow, McGraw-Hill, Inc
11. Viesmann W and Lewis G Lt (2008) "Introduction to Hydrology". Prentice Hall of India
12. Ojha,C.S.P, Bhunya, P, and Berndtsson, R.-

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- 9) To learn various types of Hydrographs and its uses.
- 10) To know the Flood estimation and Flood routing methods

Course Content:

UNIT 1: Introduction: Scope and importance of hydrology, Hydrologic cycle, Global and India's Water resources, Applications of hydrology, Formation of precipitation, Climate and Weather seasons in India. Watershed concept and modeling: Catchment-topographic and ground water divide, Description of the catchment, catchment processes, demarking a catchment, stream patterns.

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- Ojha,C.S.P. Bhunya, P. and Berndtsson, R.-

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Engineering Hydrology, Oxford University Press Canada.

13. K. C. Patra, Hydrology and Water Resources Engg., Narosa Publishing house, New Delhi.

Course Outcomes- Upon completion of this course, students shall be able to:

- 6) Describe the basic concepts of hydrology and watershed to incorporate into physical hydrological processes.
- 7) Relate and analyze the various components involved in rainfall analysis.
- 8) Explain the various process, measurement, and estimation of hydrological components
- 9) Formulate the hydrograph's estimation and apply into engineering practices.
- 10) Examine the various statistical methods for Flood studies and can investigate historical datasets.

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		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TPE06C							70	100	03
<i>Subject:</i>	Bridge Engineering	3	0	0	15	15	30			

Course Learning Objectives:

- To understand the IRC Loadings and Standards for bridge design and to know the important hydrological parameters necessary for bridge design
- To learn the design of slab bridges under various IRC loading cases
- To understand the behaviour of T-beam slab bridge and the design of T-beam bridges
- To evaluate the stresses due to various loads and design of RCC box-culverts
- To study the various forces acting on bridge piers and abutments and the design of abutment and bridge piers

Course Content:

UNIT-1: Brief historical review, Different types of Bridges and span range, Bridge codes, Importance of hydrologic factors in bridge design, Hydraulic geometry, linear water ways, economic span, afflux and scour.

UNIT-2: Design of Reinforced concrete deck slab bridges.

UNIT-3: Design of Reinforced Concrete Tee beam bridges.

UNIT-4: Design of Box culverts.

UNIT-5: Design of Piers and Abutments.

Text Books:

1. Design of Bridge Structures by M A Jayaram
2. Design of RCC Bridges by N. Krishna Raju
3. Essentials Of Bridge Engineering by J. Viktor

Course Outcome: At the end of the course the students will be able:

- To explain and apply various IRC loadings as per the IRC standards in the design of bridges and also explain the importance of hydrological parameters in bridge design
- To design the slab bridges under various IRC loadings
- To analyse and design the T-beam girder bridges
- To explain the behaviour and design the box-culverts

- To describe the various forces to be considered on pier and abutment and design the bridge abutments and piers

SYLLABUS	(SEMESTER-VIII)	Periods/Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TPE06D							70	100	03
<i>Subject:</i>	Water and Air Quality Modelling	3	0	0	15	15	30			

Course Objectives:

- Understand the idea, methodology and basic tools of water and air quality modelling
- Understand the different modelling approaches, their scope and limitations.
- Understand the fate and transport of pollutants in different water bodies and ambient air.
- Become mindful of a wide range of applications of modelling for the water quality and air pollution.
- Understand Water quality indexing parameters and its application.

COURSE CONTENT:

UNIT I MODELING CONCEPTS: Casual and statistical models-Characteristics- Steps in model development - Importance of model building. - conservation of mass and mass balance – calibration and verification of models; Transport phenomena – Advection, diffusion, dispersion, simple transport models; chemical reaction kinetics – Law of mass action, Rate constants, reaction order, types of reactions, equilibrium principles.

UNIT II WATER QUALITY MODELING: Water quality models – Historical development – Mass balance equation – Streeter - Phelps Equation – Modification to Streeter – Phelps Equation – Waste load allocations – Dissolved oxygen in Rivers and estuaries; Lake Water Quality Models; Models for Nitrogen, Bacteria, Phosphate and toxicants - Ground Water Quality Modeling - Contaminant solute transport equation, Numerical methods.

UNIT III AIR POLLUTION MODELING: Chemistry of air Pollutants - Atmospheric reactions, sinks for air pollution –Transport of air Pollutants - Meteorological settling for dispersal of air pollutants – Vertical structure of temperature and stability, atmospheric motions, Wind and shear, self-cleaning of atmosphere; transport and diffusion of stack emissions – atmospheric characteristics significant to transport and diffusion of stack emission – stack plume characteristics.

UNIT IV AIR QUALITY MODELS: Types of modeling technique, modeling for non-reactive pollutants, single source, short term impact, multiple sources and area sources, Fixed box models-diffusion models – Gaussian plume derivation- modifications of Gaussian plume equation- long term average-multiple cell model- receptor oriented and source-oriented air pollution model performance, accuracy and utilization.

UNIT V Water Quality Index: Categories of water quality index. Determination of water quality index (WQI): Industrial and municipal effluent index, ambient water quality index, combined water quality index and Delphi method. Air Quality Index: Categories of air quality index. Determination of air quality index (AQI): National AQI, Extreme value indices, regional indices.

Reference Books:

- Arthur C. Stern, Air Pollution, Air Pollutants, their transformation and Transport, (Ed.), (Third Ed.) Volume I, Academic Press, 2006.
- Chapra, S.C. Surface Water-Quality Modelling, McGraw-Hill, International Edition, 2008
- Deaton and Wine Brake, Dynamic Modeling of Environmental Systems, Wiley & Sons, 2002
- E.V. Thomson, Principles of Surface Water Quality Modeling and Control, Happer and Row Publishers New York, 1987.

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5. Hadlock, C.R., Mathematical Modelling in the Environment. The Mathematical Association of America.
6. J.L. Schnoor, Environmental Modeling Fate and Transport of Pollutants in Water, Air and Soil, John Wiley & Sons Inc., New York, 1996.
7. Lohani B. N. and North A. M. Environmental Quality Management, South Asian Publishers Pvt. Ltd., New Delhi, 1984.
8. Rastogi A.K. (2008) Numerical Groundwater Hydrology, Penram International Publishing Pvt. Ltd., Bombay.
9. Steven C. Chapra, Surface Water Quality Modeling, Tata McGraw-Hill Companies, Inc., New Delhi, 1997.
10. Thomann, R.V. and Mueller, J.A. (1987). Principles of Surface Water Quality Modelling and Control, Harper &
11. Wainwright, J and Mulligan, M., Environmental Modelling Finding simplicity in complexity, John Wiley and Sons Inc., New York, 2013.

Course outcomes:

- CO1: To provide basic knowledge on mathematical and statistical concepts required for mode development.
- CO2: To Develop models based on the mass-balance approach
- CO3: To Perform data exploration and visualization
- CO4: To Predict the impact of the of external waste loading on different water bodies
- CO5: To Design and model of air & water quality and its applicability in the Control of pollution
- CO6: To Determine and evaluate the water quality index

SYLLABUS	(SEMESTER-VIII)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
		L	T	P	CT-1	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TPE06E									
<i>Subject:</i>	Construction Equipment & Automation	3	0	0	15	15	30	70	100	03

Course Learning Objectives:

- To understand the factor for equipment selection and cost of owning and operating.
- To expertise in evaluation and analysis of different equipment life.
- To learn the engineering fundamentals of excavating equipments.
- To learn fundamentals of the pile driving and lifting equipments.
- To understand the concreting equipments and techniques and the advanced instruments like GIS etc. In construction.

Course Content:

UNIT 1: Introduction to course & Planning Process of Equipment Factors affecting equipment selection. Cost of Owning and Operating Construction Equipment Elements of ownership cost, Depreciation accounting methods, Cost Estimation using Average Annual Investment method. Use of compounding factors in Equipment cost estimation based on time value method, Operating cost components, Caterpillar method and Peurifoy method.

UNIT 2: Equipment life and replacement analysis determination of economic life of equipment. Minimum cost method, Maximum profit method, Time value concept

UNIT 3: Engineering Fundamentals of Moving Earth Machine Performance-Required power, Available power, Usable power, Performance chart.

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Earthmoving and Excavating equipment Bull Dozers, Scrapers, Front end loaders, Excavators, Trucks, Productivity estimation and balancing of interdependent machines

UNIT 4 Piles and Pile driving equipment Pile types, pile hammers, principle of pile hammer, factors affecting pile hammer selection, Types of pile hammer: Drop hammer, Single acting and double acting steam hammers, Diesel hammers, Vibratory pile drivers.

Lifting equipment Cranes, Principles of lifting mechanism of crane, types of cranes-lattice boom crawler crane, lattice boom truck mounted cranes, telescopic boom crane, Tower cranes, Factors affecting lifting capacity of crane, Range diagram.

UNIT 5 Concreting equipment Steps in concrete making process, types of concrete mixer machines, Methods of handling and transporting concrete, Consolidation of concrete, Methods of finishing and curing of concrete.

Aerial and Satellite Surveying: GIS and GPS in Construction; use of Drones for spread out sites; Use of robots for repetitive activities.

Reference Books:

1. Construction Planning and Equipment - R.L.Peurifoy - Tata McGraw Hill, New Delhi
2. Construction Equipment & Planning and Application. - Mahesh Verma Artec Publication.
3. GPS satellite surveying- Alfred Leick, Wiley

Course Outcomes- At the end of the course students will be able to:

- To apply the knowledge in equipment selection and able to find cost of owning and operating.
- To find the equipment life, which help in comparisons of different equipments.
- To select the earth excavating equipment on the basis of output and different selection factors.
- To decide the pile driving equipment and lifting equipment based on safe working load determination
- To decide the concreting equipment based on the construction project and relate the knowledge on Surveying to the new frontiers of science like GIS, GPS and Remote Sensing.

SYLLABUS		(SEMESTER-VIII)						
Subject Code:	CE08TPE07X	CREDITS:3			Internal Assessment (IA)		ESE	
Subject:	Professional Elective - 7X	L	T	P	CT-I	CT-II		TOTAL
		3	0	-	15	15	30	70
Professional Elective-7A or Professional Elective-7B or Professional Elective-7C or Professional Elective-7D or Professional Elective-7E		Any one subject to be Selected from the Professional Electives						
Professional Electives Group -7								
CE08TPE07A	Infrastructure Planning and Design							
CE08TPE07B	Traffic Engineering							
CE08TPE07C	Repair and Rehabilitation of Structures							
CE08TPE07D	Finite Element Analysis							
CE08TPE07E	Urban Hydrology and Hydraulics							

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		L	T	P	CT-I	CT-II	TOTAL			
<i>Subject Code:</i>	CE08TPE07A									
<i>Subject:</i>	Infrastructure Planning and Design	3	0	0	15	15	30	70	100	03

Course Learning Objectives:

1. To introduce the various infrastructure sector role in India
2. To explain the effect of Infrastructure Privatization with case studies.
3. To introduce the risks in successful infrastructure planning and implementation.
4. To impart the strategies for successful infrastructure project implementation.
5. To explain Innovative Design and Maintenance of Infrastructure Facilities.

Course Content:

UNIT 1: An overview of Basic Concepts Related to Infrastructure: Introduction to Infrastructure, an overview of the Power Sector in India., an Overview of the Water Supply and Sanitation Sector in India., an overview of the Road, Rail, Air and Port Transportation Sectors in India., an overview of the Telecommunications Sector in India. , an overview of the Urban Infrastructure in India, an overview of the Rural Infrastructure in India, an Introduction to Special Economic Zones, Organizations and Players in the field of Infrastructure, The Stages of an Infrastructure Project Lifecycle., an overview of Infrastructure Project Finance

UNIT 2: Private Involvement in Infrastructure: A Historical Overview of Infrastructure Privatization. The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization, Challenges in Privatization of Water Supply: A Case Study, Challenges in Privatization of Power: Case Study, Privatization of Infrastructure in India: Case Study, Privatization of Road Transportation Infrastructure in India.

UNIT 3: Challenges to Successful Infrastructure Planning and Implementation: Mapping and Facing the Landscape of Risks in Infrastructure Projects, Economic and Demand Risks: The Case study for Political Risks, Socio-Environmental Risks, Cultural Risks in International Infrastructure Projects, Legal and Contractual Issues in Infrastructure, Challenges in Construction and Maintenance of Infrastructure.

UNIT 4: Strategies for Successful Infrastructure Project Implementation: Risk Management Framework for Infrastructure Projects, Shaping the Planning Phase of Infrastructure Projects to mitigate risks, Designing Sustainable Contracts, Introduction to Fair Process and Negotiation, Negotiating with multiple Stakeholders on Infrastructure Projects, Sustainable Development of Infrastructure, Information Technology and Systems for Successful Infrastructure Management.

UNIT 5: Innovative Design and Maintenance of Infrastructure Facilities, Infrastructure Modeling and Life Cycle Analysis Techniques, Capacity Building and Improving the Governments Role in Infrastructure Implementation, An Integrated Framework for Successful Infrastructure Planning and Management - Infrastructure Management Systems and Future Directions.

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