CIVIL ENGINEERING

Civil Engineering			
CEC701	**Advanced Steel Design**	**L**	**T**
		3	**0**

1. Moment resistant connections:- framed connection, eccentric connections brackets. (08 Hrs)
2. Industrial building:- loads, General arrangement and stability considerations design of purlins, roof trusses, gantry girder and bracings. (08 Hrs)
3. Bridge:- Steel footbridge with rankers and Lateral restraining including end bearings. (08)
4. Tanks :- pressed steel water tank, Staging for tanks (06 Hrs)
5. Towers:- Transmission line Towers, microwave Towers, design loads classification, design procedure and specifications. (08 Hrs)
6. Tubular structures:- Introduction to tubular structures. (04 Hrs)

Reference Books:

1. Design of steel structure by S. Duggal
2. Design of steel structure by S. Subrahmaniam
3. Design of steel structure by P. Daya Ratnam
4. Design of steel structure by S. S. Bhavikatti
5. Design of steel structure by L. S. Negi

Civil Engineering			
CEP702	Hydraulic Structures	**L**	**T**
		3	**0**

Pre-requisites: WRE-I, WRE-II

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

CO1	Integrate the hydraulics and water resources background by involving the students in water structures design applications.
CO2	Encourage class discussions for formulating and solving multi-variable hydraulic design problems in an open-ended solution space.
CO3	To develop understanding of the basic principles and concepts of analysis and design of hydraulic structures.

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	Reservoir: Reservoir planning types of reservoirs elements of a Reservoir, mass curve and demand curve, yield of Reservoir, life of Reservoir.	**6**
2.	Types of dams and stability. Gravity dam, forces acting on gravity dam, load combination for stability analysis, elementary profile and practical profile, Foundation treatments, joint and Seal, galleries	**8**
3.	Arch dam: types of Arch dams, constant radium and constant Central angle, using thin and thick cylindrical theories, USSR guidelines for designing arch dam.	**8**
4.	Buttress: Types of buttress dam, design of flat slab buttress Dam, advantages and disadvantages of buttress dam.	**8**
5.	Embankment dams: Earth and rockfill Dam, types of embankment dam, causes of failure, design principles, method of	**8**

	construction, seepage through dams and foundation and remedial measurement.	
6.	Spillway and energy dissipation device: types of spillways, requirement, serviceability, design of straight drop and Ogee spillways, energy dissipation past spillways, types of stilling basin and design of stilling basin.	**8**

Civil Engineering			
CEP703	Composite Materials	**L**	**T**
		3	**0**

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

CO1	Explain the mechanical behavior of layered composites compared to isotropic materials.
CO2	Apply constitutive equations of composite materials and understand mechanical behavior at micro and macro levels.
CO3	Determine stresses and strains relation in composites materials.

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	**Introduction:** Classifications of Engineering Materials, Concept of composite materials, Matrix materials, Functions of a Matrix, Desired Properties of a Matrix, Polymer Matrix (Thermosets and Thermoplastics), Metal matrix, Ceramic matrix, Carbon Matrix, Glass Matrix etc. Types of Reinforcements/Fibers: Role and Selection or reinforcement materials, Types of fibres, Glass fibers, Carbon fibers, Aramid fibers , Metal fibers, Alumina fibers, Boron Fibers, Silicon carbide fibers, Quartz and Silica fibers, Multiphase fibers, Whiskers, Flakes etc., Mechanical properties of fibres.	**14**
2.	**Various types of composites:** Classification based on Matrix Material: Organic Matrix composites, Polymer matrix composites (PMC), Carbon matrix Composites or Carbon-Carbon Composites, Metal matrix composites (MMC), Ceramic matrix composites (CMC); Classification based on reinforcements: Fiber Reinforced Composites, Fiber Reinforced Polymer (FRP) Composites, Laminar Composites, Particulate Composites, Comparison with Metals, Advantages & limitations of Composites.	**10**
3.	**Fabrication methods: Processing of Composite Materials:** Overall considerations, Autoclave curing, Other Manufacturing Processes like filament welding, compression molding, resin-	**8**

	transplant method, pultrusion, pre-peg layer, Fiber-only performs, Combined Fiber-Matrix performs, Manufacturing Techniques: Tooling and Specialty materials, Release agents, Peel plies, release films and fabrics, Bleeder and breather plies, bagging films.	
4.	Mechanical testing of composites, tensile testing, Compressive testing, Intra-laminar shear testing, Inter-laminar shear testing, Fracture testing etc.	**8**

Civil Engineering			
CEP704	**Prestressed Concrete**	**L**	**T**
		3	**0**

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

CO1	Understand the concepts of pre-stressing in concrete structures and identify the materials for pre-stressing.
CO2	Analyse a Pre-stressed Concrete section and Estimate losses of pre-stressing
CO3	Design pre-tensioned and post tensioned girders for flexure and shear

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	Introduction: Fundamentals of prestressing - Classification and types of prestressing Concrete Strength and strain characteristics - Steel mechanical properties – Auxiliary Materials like duct formers.	**8**
2.	Prestressing Systems: Principles of pretensioning and post tensioning - study of common systems of prestressing for wires strands and bars and Losses of Prestress: Losses of prestress in pre tensioned and post tensioned members, I.S. code provisions.	**8**
3.	Analysis of Sections: In flexure, simple sections in flexure, kern distance - cable profile -limiting zones - composite sections cracking moment of rectangular sections.	**8**
4.	Design of Simply Supported Beams: Allowable stress as per I.S. 1343 - elastic design of rectangular and I-sections.	**8**
5.	Shear and Bond: Shear and bond is prestressed concrete beams - conventional design of shear reinforcement - Ultimate shear strength of a section - Prestress transfer in pretensioned beams- Principles of end block design.	**8**

Civil Engineering			
CEP705	**Ground Water Hydrology**	**L**	**T**
		3	**0**

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

CO1	list and describe the properties of aquifers that control the movement and storage of groundwater
CO2	use Darcy's Law to explain the roles of aquifer properties and driving forces in governing the rate of groundwater flow
CO3	interpret the current and historical balance between groundwater recharge and water extraction from well hydrographs

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	INTRODUCTION: Ground water utilization & historical background, ground water in hydrologic cycle, ground water budget, ground water level fluctuations & environmental influence , occurrence and movement of ground water: Origin & age of ground water, rock properties affecting groundwater, groundwater column, zones of aeration & saturation, aquifers and their characteristics/classification, groundwater basins & springs, Darcy's Law, permeability & its determination, Dupuit assumptions, heterogeneity &anisotropy, Ground water flow rates & flow directions, general flow equations through porous media.	**10**
2.	ADVANCED WELL HYDRAULICS: steady/ unsteady, uniform/ radial flow to a well in a confined/ unconfined /leaky aquifer, well flow near aquifer boundaries/ for special conditions, partially penetrating/horizontal wells & multiple well systems, well completion/ development/ protection/ rehabilitation/ testing for yield	**8**
3.	POLLUTION AND QUALITY ANALYSIS OF GROUND	**8**

	WATER: Municipal /industrial /agricultural /miscellaneous sources & causes of pollution, attenuation/ underground distribution / potential evaluation of pollution, physical /chemical /biological analysis of ground water quality, criteria & measures of ground water quality, ground water salinity & samples, graphical representations of ground water quality.	
4.	SURFACE/ SUB-SURFACE INVESTIGATION OF GROUND WATER: Geological /geophysical exploration/ remote sensing / electric resistivity /seismic refraction based methods for surface investigation of ground water, test drilling & ground water level measurement, sub-surface ground water investigation through geophysical / resistivity /spontaneous potential /radiation / temperature / caliper / fluid conductivity / fluid velocity /miscellaneous logging	**8**
5.	MODELING AND MANAGEMENT OF GROUND WATER: Ground water modeling through porous media /analog / electric analog / digital computer models, ground water basin management concept, hydrologic equilibrium equation, ground water basin investigations, data collection & field work, dynamic equilibrium in natural aquifers, management potential & safe yield of aquifers, stream-aquifer interaction.	**8**

Civil Engineering			
CEP706	**Earthquake Engineering**	**L**	**T**
		3	**0**

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

CO1	To explain the concept of earthquakes and knowledge of earthquake engineering practices applied to Civil Engineering problems
CO2	To determine different design parameter under different degree of freedom.
CO3	To identify the remedial measures of earthquake disaster
CO4	Practice of Earthquake code and application

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	Elements of Seismology, Definitions of Magnitude, Intensity, Epicenter, etc. General features of tectonic of seismic regions, Seismographs. Theory of Vibrations.	**8**
2.	Free vibrations of single degree, two degree and multiple degree freedom systems. Computation of dynamic response to time dependent forces. Vibration isolation. Vibration absorbers.	**8**
3.	Principles of Earthquake Resistant Design Response spectrum theory. Brief introduction to accelerographs and S.R.R.'s.	**8**
4.	Nature of dynamic loading resulting from earthquakes. Application of Response spectrum. Theory to a seismic design to structures. Resistance of structural elements and structures for dynamic loads, design criteria-strength and deflection. Ductility and absorption of energy.	**8**
5.	Dynamic Properties of Soils, Remedial measures and management of earthquake disaster, Introduction to Indian Standard Codes IS : 1893 – 1984 and IS: 4326 – 1993.	**8**

Civil Engineering			
CEP707	**Construction Planning and Management**	**L**	**T**
		3	**0**

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

CO1	To describe different planning stages for any project.
CO2	To distinguish between CPM and PERT and its elements.
CO3	To create network diagram using CPM and PERT
CO4	To estimate earth work using Mass Haul diagram

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	Management: Introduction, development of management and its recent trends, principle of management, function of management, administration of management and organization.	**6**
2.	Constructional planning: Need for construction planning, construction resources, stages in construction Job Lay-Out, preparation of construction schedule preparatory work for project, Inspection and quality control. Objective of C. P. M. and PERT, elements of network, network rules, constraints errors in network	**6**
3.	CPM: Critical path analysis, activity times and floats, optimization through CPM Technique, PERT: PERT and three Estimates, critical path and analysis of PERT network. Probability of completion of project, controlling and monitoring	**12**
4.	MASS HAUL DIAGRAM: Characteristics of mass Haul diagram, Earth work calculation by mass haul diagram, objective of motion study, objective/uses of time study, motion/time study procedure.	**6**

5.	SAFETY IN CONSTRUCTION: Hazards in construction projects, causes of accidents, costs of an accident, safety programme for construction, protective equipment, safety measures, construction element of a building.	**6**
6.	PREFABRICATION: Need for prefabrication, classification of prefabrication, scope of prefabrication in India, advantages and disadvantages of prefabrication design principle of prefabricate system.	**4**

Civil Engineering			
CEP708	**Industrial Waste Treatment**	**L**	**T**
		3	**0**

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

CO1	Ability to plan minimization of industrial wastes.
CO2	Ability to design facilities for the processing and reclamation of industrial waste water.

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	INTRODUCTION: Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health Environmental legislations related to prevention and control of industrial effluents and hazardous wastes.	**8**
2.	CLEANER PRODUCTION: Waste management Approach – Waste Audit – Volume and strength reduction – Material and process modifications – Recycle, reuse and byproduct recovery – Applications.	**8**
3.	POLLUTION FROM MAJOR INDUSTRIES: Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants – Wastewater reclamation concepts.	**9**
4.	TREATMENT TECHNOLOGIES: Equalisation – Neutralisation – Removal of suspended and dissolved organic solids – Chemical oxidation – Adsorption – Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management – Dewatering – Disposal.	**11**

Civil Engineering			
CEP709	**Sustainable Construction Methods**	**L**	**T**
		3	**0**

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

CO1	Understand rating systems and compares key features such as cost, ease of use, and building performance
CO2	Know rating systems in detail, including its evolution, objectives, criteria, levels of certification benefits,and shortcomings
CO3	Know a series of case studies representing diverse project types, sizes, certification levels, and climate regions
CO4	Know what are "lessons learned" of sustainable construction through case studies

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	Introduction: Sustainability in the Built Environment, Environmental/Resources Issues & Industrial/Construction Metabolism.	**8**
2.	Environmental Economics and Life Cycle Costing, Life Cycle Assessment, Embodied Energy, Energy, and Materials.	**8**
3.	Building Assessment and Eco-labels, Sustainability Frameworks and Sustainable Communities and Sustainability Indicators.	**8**
4.	Energy Systems, Energy, Entropy, Energy Conservation, and Renewable Energy,Water Resources, Wastewater, and Storm-water and Urban Planning, Land Development, New Urbanism, and Landscaping.	**8**
5.	Design for the Environment, Ecological Principles, Passive Design, and Climatic Design and Construction Operations, Advanced Construction Waste Management and Demolition, Building Health, Building Commissioning and Facility Management, Industrial Ecology and Construction Ecology.	**8**

Civil Engineering			
CEP710	**Elements of Fluivial Hydraulics**	**L**	**T**
		3	**0**

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

CO1	Understand rating systems and compares key features such as cost, ease of use, and building performance
CO2	Know rating systems in detail, including its evolution, objectives, criteria, levels of certification benefits,and shortcomings
CO3	Know a series of case studies representing diverse project types, sizes, certification levels, and climate regions
CO4	Know what are "lessons learned" of sustainable construction through case studies

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	Introduction, Definition, Historical Development of Native Problem. Origin and Properties of sediment Introduction, Origin and Formation of sediment, Fundamental properties.	**8**
2.	Incipient motion Introduction, competent, life concept critical tractive Force, Critical attractive stress of cohesionless, cohesive material.	**8**
3.	Regime of flow :- Introduction, Description ripple dune, Antidune, Importance of regime flow prediction of regime flow.	**8**
4.	Bed load transport : Introduction, Mechanism,suspended saltation & total load transport.semi theoretical approach, Einstein's theory.	**8**
5.	Bed level variation in Alluvial channel Introduction, Mechanism, Aggredation, Degradation, scour, local scour, scour causes& protection.	**8**

Civil Engineering			
CEP711	**Railway Engineering**	**L**	**T**
		3	**0**

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

CO1	Explain Components of Railway Track, different Railway Gauges and design track Gradients as per given requirements.
CO2	Discuss various Types of Track Turnouts and describe purposes and facilities at Railway Stations.
CO3	Explain Interlocking and modern signal system and describe Surface Defects on Railway Track and Their Remedial Measures.

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	**Introduction**: Alignment of Railway Lines Rails, Track Fittings and Track Stresses. Describe history and recent developments in railways. Explain Components of Railway Track, different Railway Gauges. Discuss requirements of an ideal alignment. Comprehend the Standard Rail Sections. Explain Causes and effects of Creep and Measures to Reduce Creep. Explain Fittings and Fastening and their Requirements. Discuss Forces Acting on Track and Coning of Wheels History of Indian Railways, Importance of Railways For Environment. Recent Developments. Role of Civil Engineers In Construction And Maintenance. Components of Railway Track .Definition of Railway Gauges, Types, Uniformity of Gauge. Different Gauges on Indian Railways,. Cross- Section of Permanent Way as Per IRS .Problems Caused By Change of Gauge. Basic Requirements and selection of An Ideal Alignment. Functions and Types Of Rails .Standard Rail Sections. Causes and Effects Of Creep, Measures To Reduce Creep. Fittings and Fastening and their requirements. Forces Acting On Track. Coning Of Wheels.	**8**

2.	**Sleeper & Geometric Design of Track:** Describe Functions & Requirements of sleepers. Explain Method of Fixing Rails with Prestressed Concrete and Wooden Sleepers. Explain the necessity and details of geometric design . Design track Gradients as per given requirements .Functions & Requirements of sleepers 2.2 Types and Spacing of Sleepers, 2.3 Method Of Fixing Rails With Pre-stressed Concrete And Wooden Sleepers, 2.4 Function and Specifications of Track Ballast 2.5 Necessity and Details of geometric design of track 2.6 Design of track Gradients, 2.7 Grade compensation on curves. 2.8 Curves and Super elevation.	**8**
3.	**Resistance to Traction, Points And Crossings**: 3a. Describe resistance to-friction 3b. Explain stress in rails 3c. Explain Necessity of Points & Crossing 3d. Draw Track Layouts And Sketches of Turn Out, 3e. Discuss various Types of Track Turnouts 3.1 Resistance to-friction, wave action, speed, track irregularity, wind, 3.2 Resistance to gradient, curvature, starting and accelerating. 3.3 Stress in rails, sleepers, ballast and formation 3.4 Necessity of Points & Crossing 3.5 Track Layouts And Sketches of Turn Out, 3.6 Types Of Crossing 3.7 Types of Track Turnouts.	**8**
4.	**Railway Stations and Yards**: 4a. Describe purposes and facilities at Railway Stations. 4b.Explain Station Yard 4.1. Purposes 4.2. Facilities Required at Railway Stations. 4.3. Requirements Of Station Yard, 4.4. Classification Of Railway Stations, 4.5. Types Of Yards.	**8**
5.	**Signaling And Interlocking**: 5a. Describe objectives of signaling 5b. Explain Interlocking and modern signal system 5.1 Objectives of signaling 5.2 Classification of signals 5.3 Types and working of Interlocking 5.4 Modern signal system.	**6**
6.	**Maintenance Of Railway Track:** 6a. Explain various types of railway track Maintenance 6b.Describe Surface Defects and Their Remedial Measures 6.1. Introduction of Maintenance Programme. 6.2. Monsoon, Pre-Monsoon & Post- Monsoon Maintenance. 6.3. Causes For Maintenance, 6.4. Routine Maintenance 6.5. Tools For Railway Track Maintenance &Their Functions. 6.6. Surface Defects And Their Remedial Measure.	**6**

Civil Engineering			
CEO712	**Reliability Engineering**	**L**	**T**
		3	**0**

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

CO1	Introduce concepts and methods in the field of reliability engineering and use of TQM (Total Quality Management) tools to measure and evaluate the quality of products.
CO2	Perform reliability analysis of a system and designing the same and apply the acquired knowledge in a practical operational problems or research projects.
CO3	Evaluate the use of reliability engineering for industrial activities.

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	**Introduction:** Definitions and concepts, Reliability, Probability, Impossible and certain events. Failure-data and its Analysis, Hazard rate and Failure density, Reliability in terms of hazard rate, Failure density in other situations.	**10**
2.	**Hazard Models:** Type of distribution and standard deviation and variance, Expectations, Conditional probabilities.	**8**
3.	**System Reliability:** Series, Parallel and mixed configurations. Methods of solving Complex systems.	**8**
4.	**Reliability improvement:** Types of redundancies, Reliability allocation for a series of system, Optimization Reliability- cost trade-off.	**8**

Civil Engineering			
CEO713	**Geographical Information System**	**L**	**T**
		3	**0**

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

CO1	Describe the functional basis of a GIS AND appreciate the potential uses of GIS in ICM.
CO2	Consider the benefits and shortcomings of using GIS for ICM.
CO3	Outline the key data quality issues involved in using GIS AND develop a strategy to implement an effective GIS.

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	Basic concepts of GIS Introduction- Information Systems, spatial and non- spatial information, geographical concepts and terminology, Advantages of GIS. Basic components of GIS. Commercially available GIS hardware and software, organisation of Data in GIS.	**12**
2.	GIS Data: Input data-field data, statiatical data, Maps, Aerial photographs, Satellite data, points, lines and areas features, Vector and Raster data, Advantages and Disadvantages, Data entry through keyboard, digitizers and scanners, digital data. Pre-processing of data- Rectification and Registration. Interpolation techniques.	**12**
3.	Data management: Database Management System (DBMS). Various data models. Run length encoding, Quadtrees, Data Analysis - Data Layers, analysis of spatial and non-spatial data, Data overlay modelling, Data Presentation - Hardcopy devices, softcopy devices.	**8**
4.	Application of GIS.	**8**

Civil Engineering			
CEO714	**Quality Control and Management**	**L**	**T**
		3	**0**

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

CO1	Explain the different meanings of the quality concept and its influence.
CO2	Describe, distinguish and use the several techniques and quality management tools.
CO3	Explain and distinguish the Normalisation, homologation and certification activities.
CO4	Predict the errors in the measuring process, distinguishing its nature and the root causes.

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	Construction projects, Agencies involved in construction projects, mutual relationship, quality control at site, why and whose job is it.	**12**
2.	ISO / IS Requirements: IS 9000 (Parts 1 to 4), (Pt 1: 1994, Pt 2: 1993 Pt 3: 1994 Pt 4: 1993 for total quality management. ISO] 4000 – 988 for environment – impact of large construction projects.	**12**
3.	Quality control on construction projects, Inspection of reinforced concrete, masonry and steel works. testing techniques & quality audit reports.	**8**
4.	Statistical Analysis, Sampling frequencies, statistical & reliability analysis, optimum sample size.	**8**

Civil Engineering			
CEO715	**Repairs & Rehabilitation of Structures**	**L**	**T**
		3	**0**

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

CO1	Perform structural health monitoring AND Perform notable applications of structural health monitoring in civil applications
CO2	Diagnosis the damage of distress structures and Investigate the condition assessment of structures
CO3	Select the proper repair materials and its application and Select the method to Strengthen the distressed structures

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	Maintenance and Repair Strategies Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.	**6**
2.	Strength and Durability Of Concrete- Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete – Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature.	**6**
3.	Special Concretes- Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self-compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.	**8**
4.	Corrosion – Effects of cover thickness; Corrosion monitoring, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic	**8**

	protection; Repair, Rehabilitation and Retrofitting of Structures.	
5.	Evaluation of root causes; Underpinning & shoring; some simple systems of rehabilitation of structures; Guniting, shotcreting; and Techniques for Repair and Protection Methods- Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning.	**6**
6.	Non-Destructive testing systems; Use of external plates, carbon fibre wrapping and carbon composites in repairs. Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – Demolition Techniques – Engineered demolition methods – Case studies.	**6**

*Soft Skills and Interpersonal Communication (syllabus prepared and taught by Humanities Department)

Civil Engineering			
CEO716	**Engineering Economics and Accountancy**	**L**	**T**
		3	**0**

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	Engineering Economics: Introduction to Engineering Economics – Fundamental concepts – Time value of money – Cash flow and Time Diagrams – Choosing between alternative investment proposals.	**9**
2.	Methods of Economic analysis. The effect of borrowing on investment- Various concepts of National Income – Significance of National Income estimation and its limitations.	**9**
3.	Inflation –Definition – Process and Theories of Inflation and measures to control, New Economic Policy 1991 – Impact on industry.	**9**
4	Accountancy: Accounting Principles, Procedure – Double entry system – Journal – Ledger, Trail Balance – Cash Book – Preparation of Trading, Profit and Loss Account – Balance sheet.	**9**
5	Cost Accounting – Introduction – Classification of costs – Methods of costing – Techniques of costing – Cost sheet and preparation of cost sheet- Breakeven Analysis – Meaning and its application, Limitations.	**9**

Reading:

1. Engineering Economic Principles, Henry Malcom Stenar- McGraw Hill Pub.

2. “Modern Economic Theory”, Siltan Chand & Co.

3. Agrawal AN, “Indian Economy”, Dewett K.K., - Wiley Eastern Ltd, New Delhi.

4. “Accounting Part-I’, Jain and Narang - Kalyani Publishers.

5. “Cost Accounting”, Arora, M.N. - Vikas Publications.

Civil Engineering			
CEO717	**Basics of Computational Hydraulics**	**L**	**T**
		3	**0**

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

CO1	Derive the governing equations of transients in pipes and channels
CO2	Apply method of characteristics and finite difference methods to solve unsteady flow problems in pipes and channels
CO3	Analyze transients in pumping and hydropower
CO4	Analyze dam break problem

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	Introduction: Basic equations of fluid motion, heat and mass transfer, need for their numerical solution.	**12**
2.	Solution Techniques: Classification of governing equations- parabolic, elliptic and hyperbolic type, method of characteristics, explicit and implicit finite difference schemes – Crank Nicholson, Penceman-Rachford ADI, Leaffrom, Lax-Wendroff, Successive over-relaxation methods.	**12**
3.	Types of Problems: Analysis of water distribution networks, hydraulic transients in closed conducts, flood routing in stream using Saint-Venant equations, numerical solutions for one – dimensional convection and diffusion equation. Analysis of dam break problems. Positive and negative surge analysis, design and analysis of surge shocks.	**16**

Civil Engineering			
CEO718	**Urban Hydrology and Hydraulics**	**L**	**T**
		3	**0**

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

CO1	Analyze urban storm water systems, urban precipitation and storm water runoff.
CO2	Learn quantification of impacts of climate change on short duration high intensity rainfall in urban areas.
CO3	Case studies of several cities in India are dealt with, in the seminars presented by the students, and thus they get an exposure to a variety of urban flooding problems.

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	Review of basic hydrology; Strom water runoff generation; Return period; Hydrologic risk; Frequency analysis	**10**
2.	IDF relationships; Design storm; Open channel flow in urban watersheds; Interception storage, Infiltration, Depression storage	**10**
3.	Combined loss models; Estimation of runoff rates from urban watersheds; Flow routing; Storm water drainage structures	**10**
4.	Storm water detention; structural and non-structural control measures; Source control techniques; urban storm water models; introduction to urban groundwater systems.	**10**

Civil Engineering			
CEO719	**Intelligent Transportation Systems**	**L**	**T**
		3	**0**

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

CO1	Differentiate different ITS user services
CO2	Select appropriate ITS technology depending upon site specific conditions
CO3	Design and implement ITS components

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	Fundamentals of ITS: Definition of ITS, the historical context of ITS from both public policy and market economic perspectives, Types of ITS; Historical Background, Benefits of ITS.	**6**
2.	Sensor technologies and Data requirements of ITS: Importance of telecommunications in the ITS. Information Management, Traffic Management Centers (TMC).Application of sensors to Traffic management; Traffic flow sensor technologies; Transponders and Communication systems; Data fusion at traffic management centers; Sensor plan and specification requirements; Elements of Vehicle Location and Route Navigation and Guidance concepts; ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), GIS, video data collection.	**8**
3.	ITS User Needs and Services and Functional areas – Introduction, Advanced Traffic Management systems (ATMS), Advanced Traveler Information systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control systems (AVCS), Advanced Public Transportation systems (APTS), Advanced Rural Transportation systems (ARTS).	**8**
4.	ITS Architecture –Regional and Project ITS architecture; Concept of operations; ITS Models and Evaluation Methods;	**8**

	Planning and human factor issues for ITS, Case studies on deployment planning and system design and operation; ITS and safety, ITS and security, ITS as a technology deployment program, research, development and business models, ITS planning.	
5.	ITS applications: Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road-pricing.; Transportation network operations; commercial vehicle operations and intermodal freight; public transportation applications; ITS and regional strategic transportation planning, including regional architectures: ITS and changing transportation institutions Automated Highway Systems- Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.	**10**

Civil Engineering			
CEO720	**Structural geology**	**L**	**T**
		3	**0**

Pre-requisites:

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

CO1	Acquire knowledge on the geometry and type of structures present in earth.
CO2	Understand and describe the features formed in rocks when subjected to stress and impact of structural geology to active tectonic settings
CO3	Interpret graphs and models used in structural geology to understand and demonstratepoly phase deformations.

Course Articulation Matrix:

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DETAILED SYLLABUS

MODULE	CONTENTS	Hrs
1.	Description, classification, and origin of earth structures. Ways in which the continental crust can deform; link scales of structure from the field, outcrops, handspecimen, thin section by integrating analytical techniques with practical examples.	**10**
2.	Theoretical and meso to micro-scale analysis of structures developed through a linked series of lectures and practical; practical 2D strain analysis; 3D strain concepts	**10**
3.	Incremental strain, kinematics and polyphase deformations; fold construction and classes; fault evolution and section balancing; fault rock microstructures;	**10**
4.	Fault and fold mechanics, current concepts in plate tectonics, cross-section construction techniques, structural interpretation of seismic data, structural styles in different tectonic settings (thrust and fold belts, rifts, strike and slip, gravity tectonics, inversion), structural geology of reservoir units.	**10**

Civil Engineering			
CEO721	**Environmental, Health and Safety Management**	**L**	**T**
		3	**0**

MODULE	CONTENTS	Hrs
1.	Occupation, Safety And Management; Occupational Safety, Health and Environmental Safety, Management – Principles & practices, Role of Management in Industrial Safety, Organization Behaviaraion Human factors contributing to accident. Planning for Safety: Planning: Definition, purpose, nature, scope and procedure. Management by objectives and its role in Safety, Health and Management (SHE)	**8**
2.	Monitoring for Safety, Health & Environment: Occupational Safety, Health and Environment Management System, Bureau of Indian Standards on Safety and Health: 14489 – 1998 and 15001 – 2000, ILO and EPA Standards. Principles of Accident Prevention: Definition: Incident, accident, injury, dangerous, occurrences, unsafe acts, unsafe conditions, hazards, error, oversight, mistakes etc.	**8**
3.	Education, Training and Employee Participation in Safety: Element of training cycle, Assessment of needs. Techniques of training, design and development of training programs. Training methods and strategies types of training. Evaluation and review of training programs.	**8**
4	Competence Building Techniques (CBT), Concept for training, safety as an on-line function. Employee Participation: Purpose, areas of participation, methods, Role of trade union in Safety, Health and Environment Protection.	**8**
5	Management Information System: Sources of information on Safety, Health and Environment Protection. Compilation and collation of information, Analysis & use of modern methods of programming, storing and retrieval of MIS for Safety, Health and Environment. QCC HS Computer Software Application and Limitations.	**8**

Semester -VIII

Branch: Civil Engineering

S.N.	Code	Course Title	L	T	P	Credits
1.	CE801D	Project-II			16	08
					Total Credit	08

NOTE- A Student can be allowed to do project outside after the permission of departmental Academic Committee. Those students doing project outside has present their project progress every month. Those students doing project outside can be permitted to present progress every fortnight though video conferencing. Students doing project in house has present their project progress every week.