Seventh Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	DE	CED---	Discipline Specific Elective	-	-	-	3
2	DE	CED---	Discipline Specific Elective	-	-	-	3
3	DE	CEC719	Design of Steel Structure	3	0	0	3
4	CC	CEC720	Design of RC and Steel Structures Lab	0	0	2	1
5	CC	CEC721	Project-I	0	0	6	3
6	GS	GSC707	ESP & SDP - VII	0	1	0	1
			Total				14

Students will undergo project/training/internship in the industry / research organization / reputed Institute during the vacation

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	DE	CED705	Pre-Stressed Concrete	3	0	0	3
2	DE	CED706	Water Resource Engineering	3	0	0	3
3	DE	CED707	Structural Dynamics & Earthquake Engineering	3	0	0	3
4	GE	CED708	Environmental Engineering - II	3	0	0	3

Pre-stressed Concrete

CED705

L-T-P: 3-0-0

Credits: 3

Pre-requisite: Completion of the course Concrete Structures or equivalent. Familiarity with design standards for structural engineering.

Introduction: This subject explores the concept of Pre-Stressed Concrete which broadly covers the following aspects: Introduction to pre stressed concrete, Limit State Design Criteria, Anchorage Zone Stresses in post tensioned members, Composite construction of Pre-Stressed and In Situ Concrete and also pre stressed concrete poles and sleepers.

Course Outcomes (CO): Upon successful completion of this course, students should be able to:

CO1: Evaluate the behavior and design of pre-stressed concrete beams and slabs (including statically indeterminate beams and slabs) and design tendon layout, which satisfy the strength and serviceability limit states as required by design standards;

CO2: Analyze the stresses in anchorage zones and design end anchorages for pre-stressed concrete beams and slabs;

CO3: Evaluate the short-term and long-term losses in pre-stressing and design pre-stressed structures considering these losses;

CO4: Discuss and appraise the recent advances in the pre-stressed concrete technology including the use of advanced materials and application of new technologies.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		3	3	3		3		3				2	2
CO2	3	3		2	3				2				2	
CO3		2		3		1	3	3					2	2
CO4		3	3	3		3			3					2

3 – High; 2 – Medium; 1 – Low

Course Contents:

Module 1: Introduction of Pre-stressed concrete: Materials, pre-stressing system, analysis of pre-stress and bending stress, losses Shear and torsional resistance: design of shear reinforcement, design of reinforcement for torsion shear and bending. Deflections of pre-stressed concrete members: Importance, factors, short term and long-term deflection.

Module 2: Limit state design criteria: Inadequacy of elastic and ultimate load method, criteria for limit states, strength and serviceability. Design of sections for flexure: methods by Lin and Magnel.

Module 3: Anchorage Zone stresses in post tensioned members: Stress distribution in end block, anchorage zone reinforcement.

Module 4: Composite construction of pre-stressed and in-situ concrete: Types, analysis of stresses, Statically Indeterminate structures: advantages of continuous member, effect of pre stressing, methods of achieving continuity and method of analysis of secondary moments.

Module 5: Pre-stressed concrete poles and sleepers: Design of sections for compression and bending.

Text Books:

1. Prestressed Concrete, Fourth Edition, N Krishna Raju McGraw Hill.

2. Design of Prestressed Structures, T.Y.Lin and N.H. Burns, Wiley Eastern Ltd.

3. Fundamentals of Prestressed Concrete, N.C. Sinha and S.K. Roy.

4. Prestressed Concrete, S. Ramamurthan.

Water Resource Engineering

CED706

L-T-P: 3-0-0

Credits: 3

Pre-requisite: Engineering Hydrology

Introduction: The purpose of the course is to get familiar with *water withdrawals and uses, distribution systems, dams and spillways*

Course Outcomes (CO):

Upon successful completion of this course, students should be able to:

CO1: Understand the interaction among various processes in the hydrologic cycle

CO2: *Apply the application of fluid mechanics and use of computers in solving a host of problems in hydraulic engineering*

CO3: *Study types and classes of hydrologic simulation models and design procedures for safe and effective passage of flood flows for design of hydraulic structures*

CO4: *Understand the basic aquifer parameters and estimate groundwater resources for different hydro-geological boundary conditions.*

CO5: *Understand application of systems concept, advanced optimization techniques to cover theocon-technical aspects in the field of water resources.*

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3					3		3				3	
CO2	3	3					3		3				3	
CO3	2	3				3	3		2				3	
CO4	3	2				3	3		3					
CO5	3				3	2	3		3				3	

3 – High; 2 – Medium; 1 – Low

Course Contents:

Module 1: Water withdrawals and uses – water for energy production, water for agriculture, water for hydroelectric generation; flood control. Analysis of surface water supply, Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.

Module 2: Distribution systems -canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals, types of lining. Drainage of irrigated lands: necessity, methods.

Module 3: **Dams and spillways -** embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.

Text/Reference Books

1. K Subramanya, Water Resources Engineering through Objective Questions, Tata Mc-GrawHill
2. G L Asawa, Irrigation Engineering, Wiley Eastern
3. L W Mays, Water Resources Engineering, Wiley

4. J D Zimmerman, Irrigation, John Wiley & SonsC S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology,

Structural Dynamics and Earthquake Engineering

CED707

L-T-P: 3-0-0

Credits: 3

Pre-requisite: Fundamental ideas of Solid mechanics, Basic knowledge of Engineering Mechanics, Structural Analysis.

Introduction: This course introduces the students to the analysis of the dynamic response of structures and structural components to transient loads and foundation excitation; single-degree-of-freedom and multi-degree-of-freedom systems; response spectrum concepts; simple inelastic structural systems; and introduction to systems with distributed mass and flexibility.

Course Outcomes (CO): Upon successful completion of this course, students should be able to:

CO1: Student will develop knowledge in the simulation and mathematical model development.

CO2: Students will be trained to identify, formulate and solve complicated problem.

CO3: Students will be able to understand the role of natural calamity in the damage of structures.

CO4: Students will be able to develop the skill to analyze data and to apply the same in the practical problems.

CO5: Students will be able to apply the developed methodologies for the safe and stable design of structures.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3					3				2	2
CO2	3	3	3	3					3				2	
CO3			3	3		3	2	3	3					2
CO4		2	3	3	3	3			3					2
CO5		3	3	3		3	3		1				2	

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

3 – High; 2 – Medium; 1 – Low

Course Contents:

Module1: Theory of vibrations: Degrees of freedom, Un-damped single degree freedom system, Damped single degree freedom system, Natural frequency, modes of vibration, Introduction to multiple degree freedom system.

Module 2: Response of single degree freedom system due to harmonic loading: Undamped harmonic excitation, Damped Harmonic excitation

Module 3: Response due to Transient loading: Duhamel's Integral, Response due to constant force, rectangular load, Introduction to numerical evaluation of Duhamel's integral of undamped system.

Module4: Elements of seismology: Fundamentals: Elastic rebound theory, Plate tectonics, Definitions of magnitude, Intensity, Epicenter etc., Seismographs, Seismic zoning, Response of Simple Structural Systems.

Unit 5: Principles of earthquake resistant design: Terminology, General principles and Design criteria, Methods of Analysis, Equivalent lateral force method of Analysis for multistoried building as per Indian Standard Code of Practice, Introduction to Response Spectrum Method, Fundamental concepts of Ductile detailing.

Text Books:

1. Mario Paz, Structural Dynamics – Theory and Computations, Fourth Edition, CBS publishers, 1997.
2. Agarwal.P and Shrikhande.M. Earthquake Resistant Design of Structures, Prentice Hall of India Pvt. Ltd. 2007.

References:

1. Clough.R.W, and Penzien. J, Dynamics of Structures, Second Edition, McGraw Hill International Edition, 1995.
2. Jai Krishna, Chandrasekaran. A.R., and Brijesh Chandra, Elements of Earthquake Engineering, South Asia Publishers, 1994.
3. Minoru Wakabayashi, Design of Earthquake Resistant Buildings, Mc Graw – Hill Book Company, 1986
4. Humar.J.L, Dynamics of Structures, Prentice Hall Inc., 1990.

5. Anil K Chopra, Dynamics of structures – Theory and applications to Earthquake Engineering, Prentice Hall Inc., 2007.
6. Moorthy. C.V.R., Earthquake Tips, NICEE, IIT Kanpur,2002.
7. IS13920-1993 Ductile detailing of reinforced concrete structures subjected to seismic forces – Code of practice.
8. IS 1893 part 1 2002 Indian standard criteria for earthquake resistant design of structures.
9. IS 4326-1993 Earthquake Resistant Design and Construction of Buildings–Code of Practice (Second Revision)

Environmental Engineering -II

CED708

L-T-P: 3-0-0

Credits: 3

Pre-requisite: Fundamental ideas of Environmental engineering and Engineering Chemistry.

Introduction: The subject will explore the basic concepts of sewage, sewage treatment, The concept of Air Pollution Meteorology will also be discussed in details.

Course Outcomes (CO):

Upon successful completion of this course, students should be able to:

CO1: To understand quality and quantity perspectives of sewage

CO2: To design sewage treatments units.

CO3: To design Sewers and sewer appurtenances

CO4: To understand different methods of sewage disposal

CO5: To develop a clear concept of the types of pollution like air pollution, their sources and effects.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3			3		3				2	2
CO2	3	3	3	3					3				2	
CO3		2	3	3	3		3	3	1				2	
CO4		3	3	2					3					
CO5		3	3	3			3		3					2

3 – High; 2 – Medium; 1 – Low

Course Contents:

Module 1: **Sewage-**Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water- Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, National River cleaning plans, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes.

Module 2: **Air** - Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution- Occupational hazards, Urban air pollution automobile pollution, Chemistry of combustion, Automobile engines, quality of fuel, operating conditions and interrelationship. Air quality standards, Control measures for Air pollution, construction and limitations

Module 3: **Noise-**Basic concept, measurement and various control methods.

Text Books

1. Environmental Engineering, S.K. Garg, Khanna Publishers.

2. Air Pollution Rao and Rao TMH.

3. Water Supply, Waste Disposal and Environment Pollution Engineering A.K. Chatterjee Khanna Publishers.

Design of Steel Structure

CEC719

L-T-P: 3-0-0

Credits: 3

Pre-requisite: Fundamental ideas of building and construction materials. Basic knowledge of Engineering Mechanics.

Introduction: The subject explores the concept of Rolled steel section, types of structural steel, specifications Structure connections: Riveted, welded and bolted including High strength friction grip bolted joints– types of riveted bolted joints, assumptions, failure of joints, efficiency of joints, design of bolted, riveted & welded joints for axial load, design of tension members, I.S code provisions. design of lacing and batten plates, different types of Column Bases- Slab Base, Gusseted Base, Connection details, permissible stresses in bending, compression and tension. The subject also takes into account the design of webs & flanges, Concepts of curtailment of flanges – Riveted & welded web stiffeners, web flange splices - Riveted, welded& bolted. Gantry Girder: Design gantry girder considering lateral buckling – I.S code provisions.

Course Outcomes (CO):

Upon successful completion of this course, students should be able to:

CO1: Understand concept of Rolled steel section, types of structural steel, connections.
CO2: Know the procedures for design of tension members, I.S code provisions.
CO3: Understand the design of lacing and batten plates, different types of Column Bases- Slab Base, Gusseted Base.
CO4: Know about design of webs & flanges, Concepts of curtailment of flanges – Riveted & welded web stiffeners.
CO5: Understand the design of gantry girder considering lateral buckling – I.S code provisions.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3		3		3				3	2
CO2	3	3	3	3	3		1		3				3	
CO3		1	3	3	3		3		3				3	2
CO4		3	3	3	3		3		2				3	
CO5		3	3	2	3		3		3					

3 – High; 2 – Medium; 1 – Low

Course Contents:
Module1: Materials and Specification: Rolled steel section, types of structural steel, specifications Structure connections: Riveted, welded and bolted including High strength friction grip bolted joints– types of riveted bolted joints, assumptions, failure of joints, efficiency of joints, design of bolted, riveted& welded joints for axial load. ii) Eccentric connection: - Riveted & bolted joints subjected to torsion & shear, tension & shear, design of riveted, bolted & welded connection.
Module2: Tension members: Design of tension members, I.S code provisions. Permissible stresses, Design rules, Examples.
Module3: Compression members: Effective lengths about major & minor principal axes, I.S code provisions. Permissible stresses, Design rules, Design of one component, two components and built-up compression members under axial load. Examples. Built up columns under eccentric loading: Design of lacing and batten plates, Different types of Column Bases- Slab Base , Gusseted Base, Connection details
Module 4: Beams: Permissible stresses in bending, compression and tension. Design of rolled steel sections, plated beams. simple Beam end connections, beam -Column connections. I.S code provisions.
Module5: Plate girders: Design of webs & flanges, Concepts of curtailment of flanges – Riveted & welded web stiffeners, web flange splices - Riveted, welded& bolted. Gantry Girder: Design gantry girder considering lateral buckling – I.S code provisions.

Text Books

1. Limit state design of Steel Structures. S. K. Duggal, McGraw Hills.
2. Steel Structures: Design and practice. N. Subramanian, Oxford University press.

Design of RC and Steel Structures Lab
CEC720
L-T-P: 0-0-2
Credit: 1

RCC structures

1. General considerations: Design principle of R.C.C. sections. Limit state method of design Loads and stresses to be considered in the design as per I.S. code provision.
2. Design & detailing of a i) simply supported R.C.C Beam ii) Continuous T- Beam.
3. Design & Detailing of columns, isolated and combined footing
4. Design & detailing of a i) simply supported one-way slab ii) One-way Continuous slab.
5. Design of different units: Slab, beam column, roofing and staircase from floor plan of a multi-storied frame building, typical detailing of a two-way floor slab.

Steel structures

Problems on general consideration and basic concepts.
Discussion on different loads (i.e. wind load, Dead load, live load and others) as per IS875.
Design & drawing of the following components of a roof truss:

1. Members of the roof truss.
2. Joints of the roof truss members
3. Purlins
4. Gable bracings
5. Column with bracings
6. Column base plate
7. Column foundation

ESP & SDP –VII
GSC707
L-T-P: 0-2-0
Credits: 2

Pre-requisite: Basic concepts in mathematics and English Language.
Introduction: The course is on GATE exam preparation, revision and advanced problems in quantitative aptitude, reasoning, Verbal English etc.
Course Outcomes (CO): In this course we will study the basic components of math and English language. Students are expected to be capable of understanding the better communication, their advantages and drawbacks. To reach this goal, the following objectives need to be met:
CO1: Students would be able to know GATE exam preparation.

CO2: Students would be able to implement verbal and non-verbal communication.
CO3: By analyzing the logic of any arithmetic structure able to solve problem.
CO4: To become an efficient math and English language.

Mapping of Course Outcomes (CO) and Program Outcomes (PO):

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3		3							3		
CO2	3			2								3		
CO3	2	3	3									1		
CO4	3	3	3		3							3		

3 – High; 2 – Medium; 1 – Low

Course Contents:

Section A: Employment Enhancement Skills-VII

Module-1 Stream wise GATE & IES syllabus.

Section B: Skill Development for Professional-VII

Module-1 Miscellaneous Problems on Verbal English [CAT level-4].

Module-2 Miscellaneous Problems on quantitative aptitude [CAT level-4].

Module-3 Miscellaneous Problems on Logical Reasoning [CAT level 4]. Newspaper reading: The Hindu & Economic Times.

Textbook

1. Fastrack objective Arithmetic: Arihant
2. Quantitative aptitude for Competitive exam (4th Edition): TATA Mc Graw Hill
3. Quantitative aptitude for Competitive exam (3rd Edition): PEARSON
4. Engineering mathematics-Pearson
5. GATE Mathematics- Willey/McGrawhill