Scheme of Instruction, Examination and Syllabi

Of

Choice Based Credit System (CBCS) of

BE / B.TECH VII and VIII Semesters

OF

FOUR YEAR DEGREE COURSE

IN

CIVIL ENGINEERING

(With effect from the academic year 2019-20)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A),

HYD-75

SCHEME OF INSTRUCTION & EXAMINATION

CIVIL ENGINEERING

SEMESTER VII

S. No.	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per Week		Duration in Hrs	Maximum Marks		
			L/T	D/P		Continuous Internal Evaluation (CIE)	Semester End Exam (SEE)	
THEORY								
1	16CE C34	Water Resources Engineering-II	3	-	3	30	70	3
2	16CE C35	Design of Steel Structures - I	3/1	-	3	30	70	4
3	16CE C36	Estimation and Specifications	3/1	-	3	30	70	4
Elective - III								
4	16CE E07	Advanced Reinforced Concrete Design	3	-	3	30	70	3
5	16CE E08	Advanced Environmental Engineering						
6	16CE E09	Ground Improvement Techniques						
Elective - IV								
7	16CE E10	Elements of Earthquake Engineering	3	-	3	30	70	3
8	16CE E11	Advanced Transportation Engineering						
9	16CE E12	Design and Detailing of Irrigation Structure						
Elective - V (open Elective)								
10	16CS O06	Fundamentals of DBMS	3	-	3	30	70	3
11	16ME O01	Entrepreneurship						
12	16EG O01	Technical Writing Skills						
13	16EE O02	Energy Management Systems						
PRACTICAL								
14	16CE C37	Computer Applications Lab	-	3	3	25	50	2
15	16CE C38	Project seminar	–	3	–	50	–	2
		Total	**20**	**6**		**255**	**470**	**24**

L=Lecture, T=Tutorial, D/P= Drawing/ Practical's
CIE - Continuous Internal Evaluation SEE - Semester End Examination

16CE C34

WATER RESOURCES ENGINEERING - II

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives: To enable the students to understand

1. Storage head works, selection, and stability analysis. Finalize profile of a gravity dam.
2. Types of dams, seepage analysis, design criteria of an earth dam.
3. Types of spillways, selection, energy dissipaters and spillway gates.
4. Understand water power engineering, hydel plant layout and components.
5. Comprehend minor irrigation, river engineering, and water resources management.

Course outcomes: At the End of the course, the student will be able to

1. Analyze and design a non-overflow gravity dam
2. Design a typical earth dam as per criteria.
3. Formulate a spillway proposal with appurtenant energy dissipaters.
4. Prepare a preliminary proposal of hydel plant for a given site.
5. Know about minor irrigation and formulate it. Plan for the river training work, water resources management.

UNIT – I:

Storage Head Works : Types of dams, advantages and disadvantages, selection criteria, Economical height of the dam, Gravity dams, Forces acting on dam, stability analysis, Principal stresses, Elementary Profile and Practical Profile, Low and High Gravity dams, joints, galleries, foundation grouting.

UNIT – II:

Earth Dams: Types, methods of construction, Seepage analysis for homogeneous and zoned embankment dams, Drainage in embankment dams, failure of Earth dams & Design Criteria.

Various types of filters, filter criteria and design. Stability of slopes during steady seepage, sudden drawdown condition, failure due to pore pressure during construction of dam.

UNIT – III:

Spill Ways and Energy Dissipation: Types of Spill Ways, Ogee Spill ways, Design of Ogee Profile, Fixation of levels, Syphon Spill Way & Chute Spill Way.

Energy Dissipaters, Hydraulic Jump & Bucket type dissipaters, Tail water rating curve & Jump Height Curve, Spillway gates.

UNIT-IV:

Water Power Engineering: History, demand and generation, comparison hydel and thermal power, types of Hydel Plants, Water Conveyance, Penstocks and Surge tanks, powerhouse layout and components – their functions, flow and power duration curves. Load factor, utilization factor, capacity factor.

Power House: Substructure and super structure of a power house, merits and demerits of an underground power house, fixation of dimensions of a power house.

UNIT-V:

Minor Irrigation: Role and importance of minor Irrigation, delineation of catchment area, free and intercepted catchment, components of minor Irrigation

River engineering: Classification of rivers, meandering process, river training, types of training works.

Water resources management: Integrated river basin planning and management, warabandi, farmer's participation in water management, strategies and problems in water resources management, Interlinking of rivers.

Text Books:

1. P. N. Modi, "*Irrigation Water Resources and Water Power Engineering*", Standard Publishers, New Delhi, 2014.
2. S. K. Garg, "*Irrigation Engineering & Hydraulic Structures*", Khanna Publishers, New Delhi, 2017.

Suggested Reading:

1. Ralph A.Wurbs and Wesley.P.James, "*Water Resources Engineering*", Pearson, New Delhi, 2015
2. M. M. Dandekar&K. N. Sharma, "*Water Power Engineering*", Vikas Publishers, New Delhi, 2016.
3. Challa, Satya N Murthy., "*Water Resources Engineering*", New Age International, New Delhi ,2002.

16CE C35

DESIGN OF STEEL STRUCTURES -I

Instruction	4(3L+1T) Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives: To enable the students

1. Learn and apply the design philosophies(working stress method and limit state method) for various steel structural components and their connections, as per the relevant standards
2. To understand the behaviour of compression members and design column bases
3. To understand the modes of failure of tension members.
4. To understand the behaviour of flexural members in the industry.
5. Learn the Behaviour of trusses and design of purlins.

Course Outcomes: At the end of the course, the student

1. Attains fundamental knowledge of the design of various Steel Structures, connections and is able to interpret the specifications of relevant codes.
2. Able to design compression members & column bases.
3. Able to understand the behaviour of tension members and its design.
4. Able to understand the classification of beam section, local failure of section and design of flexural members.
5. Able to estimate the loading roof trusses and design of purlins.

UNIT – I:

Materials and Specifications: Chemical composition of steel, types of Structural Steel - classification of Rolled Steel Sections.

Design Philosophies: Working Stress Method, Limit State Method,

Loads and Load Combinations: Design Loads & load Combinations; Characteristic Loads, Partial safety factors for materials and loads.

Bolted Connections (Limit State Method): Lap & Butt joints and the behaviour of Bolted Joints -Modes of failure - Design of Bolted joints using ordinary Black Bolts - Concentric Connections and Eccentric Connections –Connections using High Strength Friction Grip Bolts.

Welded Connections (Limit State Method): Lap and Butt Joints- strength of welded joints -design of welded joints - Concentric Connections and Eccentric Connections.

UNIT – II:

Design of Compression Members (Limit State Method): Introduction, Buckling &yielding phenomena, Sections used for compression Members. Effective Length of Compression Members, Design of Compression Members with single section and Built-up Sections (Symmetric in both directions), Lacing and Battening, Column Splices.

Design of Column Bases: Design of Slab and Gusset Bases.

UNIT – III:

Design of tension members (Limit State Method): Introduction to tension members - Applications of tension members, Modes of Failure, Design of Tension Members – Design of Lug Angles - Staggered bolting.

Working Stress Method (as per IS 800-2007): Permissible Stresses, Slenderness Ratio, Design of tension members, Design of Simple Compression Members.

UNIT – IV:

Design of Beams (Limit State Method) : Introduction to Plastic Analysis – Plastic Hinge, Plastic moment, Shape factor; Classification of Cross Sections, Phenomenon of Lateral Torsional Buckling; Design of Laterally Supported beams and laterally Unsupported Beams, Secondary considerations - Check for Web crippling, web buckling and deflection .

UNIT – V:

Design of Roof trusses (Limit State Method): Types of trusses, Estimation of loads- dead load, live load and wind load, Design of purlins, Analysis and design of roof trusses with angle sections.

Text Books:

1. N. Subramanian, "*Design of Steel Structures",* Oxford University Press, 2008.
2. S. K. Duggal, "*Design of Steel Structures*", 2nd Edition, Tata McGraw Hill Publishing, 2014.

Suggested Reading:

1. S. S. Bhavikatti, "*Design of steel Structures*", 3rd Edition, I.K. International Publishing House Pvt. Ltd. 2012.
2. IS 800:2007,"*Indian Standard General Construction in Steel- Code of Practice*". (Third revision).

16CE C36

ESTIMATION AND SPECIFICATIONS

Instruction	4(3L+1T) Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course objectives: To enable the students understand

1. The working of detailed estimates for different structures.
2. The working of steel quantities of R.C.C Framed works and preparation of BBS
3. The rate Analysis for different items of works.
4. About TSDSS and Departmental procedures.
5. About Specifications and standard procedure for construction works.

Course outcomes: At the End of the course the students should be able to

1. Prepare detailed estimates for different structures.
2. Prepare the detailed estimate steel qualities of RCC framed works and to prepare BBS.
3. Do the rate analysis for different items of works of buildings, concrete and bituminous road works.
4. Apply TSDSS and departmental procedures.
5. Work out standard procedure and specifications of construction works.

UNIT – I:

Introduction of estimation, object of estimation, factors influencing estimation, types of estimates, Detailed estimated for Flat roof building (load bearing and RCC framed) - long and short wall method - centre line method.

UNIT – II:

Estimation of steel quantities and preparation of bar bending schedule (BBS) - RCC framed works - Slabs (one way and two way), Beams and columns, footings, stair case Retaining wall.

UNIT – III:

Detailed estimate of road works for Bituminous, WBM roads and CC road (including earth work), single cell rectangular box culvert, Septic tank and earth work of irrigation canals.

UNIT – IV:
Preparation of analysis of rates and theoretical requirements of materials as per the Telangana State Standard Data and Schedule of Rates, for major items of works of a building, all items of work of Bituminous and concrete road works.

UNIT – V:
General and detailed specifications of works as per Telangana State Standard Data and Schedule of Rates, Departmental procedure for construction work, Measurement Book and Muster Roll.

Text Books:

1. B. N. Dutta, "*Estimating and Costing in Civil Engineering – Theory and Practice*", UBS, publishers' distributors (p) ltd.-New Delhi 2012.
2. M. Chakraborti, "*Estimating, Costing, Specifications and Valuation in Civil Engineering"*, Chakraborti 2006.

Suggested Reading:

1. Jagjit Singh, "*Estimating and Costing in Civil Engineering*", Galgotia Publications, New Delhi, 1996.
2. B. S. Patil," *Civil Engineering Contracts and Estimation*", Orient Black swan Private Ltd; Fourth edition 2015.
3. Standard Scheduled Rates and Relevant BIS Codes

16CE E07

ADVANCED REINFORCED CONCRETE DESIGN (ELECTIVE – III)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student
1. To understand the concepts of beams curved in plan along with analysis and design.
2. To understand the Analysis and Design and Detailing of Deep Beams.
3. To understand the behaviour of portal frames, Bunkers, silos and their design.
4. To understand the design principles of Flat Slabs and grid slabs.
5. To understand the structural behaviour and design principles of Raft and Pile.

Course Outcomes: Upon the completion of this course, the student should be able to
1. Analyse and Design beams curved in plan as per the field requirements.
2. Design simply supported and continuous deep beams.
3. Analyse, design and detail the Bunkers, silos and portal frames.
4. Analyse and design flat slabs and grid slabs using the codal provisions.
5. Predict structural behaviour of Raft, and Pile foundations and design them.

UNIT – I:
Beams curved in plan: Introduction–Design Principles–Structural Design of rectangular beams circular in plan and rectangular in cross-section, continuously supported on 'n' number of symmetrically spaced columns.

UNIT – II:
Deep Beams: Introduction–flexural and shear stresses in deep beams.–I.S. Code provisions – Design of simply supported and continuous Deep beams.
Building Frames: Analysis of Multistorey building frames subjected to gravity loads using Substitute frame method and Design.

UNIT – III:
Bunkers and Silos: Introduction, design principles and theories, IS code provisions, design of Rectangular bunkers and cylindrical silos.

UNIT – IV:

Flat slabs: Introduction, Components- I.S. Codal Provisions–Design principles and methods – Direct design method, Equivalent frame method and Design for flexure and shear.

UNIT – V:

Raft Foundations: Definitions, types**,** design of Raft foundation -flat plate type and beam slab type for buildings with column grids up to three by three.

Pile Foundations: Structural design of Pile and Pile caps.

Text Books:

1. N. Krishna Raju, "*Advanced Reinforced Concrete Design*", CBS Publishers, 2016.
2. H.J. Shah," *Reinforced Concrete Vol-I and Vol-II"*, Charotar Publishers, 2016 and 2014.

Suggested Reading:

1. P. C. Varghese, "*Advanced Reinforced Concrete Design*", PHI, 2005.
2. B. C. Punmia and Ashok Kumar Jain, "*Comprehensive R.C.C. Designs*", Laxmi Publishers 2005.

16CE E08

ADVANCED ENVIRONMENTAL ENGINEERING
(ELECTIVE - III)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student

1. Understand the characteristics and effects of industrial effluents & legislation regarding effluent disposal
2. Understand manufacturing process and effluent treatment of various industries
3. Comprehend and monitor ambient air quality in order to assess the pollutants.
4. Understand the methods of air pollution control and selection of equipment for the control.
5. Understand the need and objectives of Environmental Impact Assessment (EIA), impacts of road projects, industries and dams.

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

1. Characterize the effluents, analyze the effects of industrial effluents on the human health & thoroughly practice environmental legislation
2. Apply the methods of Industrial waste water management and treatment.
3. Evaluate, monitor and analyze ambient air quality.
4. Apply the methods of air pollution control to field situations.
5. Evaluate the impact of road project, industry and a dam on the surrounding environment.

UNIT – I:

Industrial waste Management: Types of industries, characteristics of Industrial wastes, effects of industrial effluents on streams, land and human health. Environmental legislation related to Industrial effluents and hazardous wastes. Self-purification of water bodies, Streeter Phelps Equation.

UNIT – II:

Industrial Waste Water treatment: Manufacturing process, waste water characteristics and effluent treatment of the following industries- leather tanning, dairy, pulp and paper, pharmaceutical, textiles, steel plants, thermal power plants, fertilizer, cement, sugar and distilleries.

UNIT – III:

Air pollution: Sources, classification and effects of air pollutants, Meteorology of air pollution, wind rose diagrams, lapse rates, atmospheric stability an dispersion of air pollutants, stack height calculation, ambient air quality monitoring, stack sampling, analysis of air pollutants.

UNIT- IV:

Air Pollution Control: Air quality standards, methods of air pollution control – zoning, source correction, control of suspended particulate meter by equipment (gravitation, centrifugation, flirtation, scrubbing, electrostatic precipitation), selection of proper equipment, gaseous pollutant control by adsorption, condensation, combustion.

Noise Pollution: Sources, measurement and various control methods.

UNIT – V:

Environmental Impact Assessment: Need for environmental impact assessment (EIA), objectives of EIA, EIA capabilities and limitations. Legal provisions of EIA, Base line at a collection required for EIA, Evaluation of impacts, Prediction of impacts, Preparation of Environmental Management Plan, Preparation of EIAs of road project, Industry, and dam. Issues related to rehabilitation of affected people, Preparation of Environment, Impact statement and Environment Management Plan.

Text Books:

1. M. N. Rao and Dutta, "*Waste Water Treatment"*, Oxford and IBM Publications Ltd., 2017.
2. W. W. Eckenfelder, "*Industrial Water Pollution C*ontrol", Mc Graw Hill India, 2005.
3. M.N. Rao, H.V.N. Rao, "*Air Pollution Control*", Tata Mc Graw Hill, 2017

Suggested Reading:

1. C. S. Rao, "*Environmental Pollution Control Engg"*, New Age International Publishers, 2018.
2. Peavy and Rowe, "*Environmental Engg"*, McGraw Hill Publications, 2017.
3. Keiley, "*Environmental Engg*", Mc Graw Hill Publishers, 2003.

16CE E09

GROUND IMPROVEMENT TECHNIQUES
(ELECTIVE - III)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To make the students understand

1. The importance of ground improvement and learn about various types of ground improvement techniques available to date, and selecting and designing suitable ground improvement technique for given soil conditions.
2. The concepts behind a range of ground improvement and soil remediation techniques.
3. The different concepts of dewatering procedures, soil stabilization, grouting in soils, consolidation and shear strength of the soil.
4. The Types, functions and applications of Geo-textiles, geo-grid, tests on geo-textiles and Reinforced earth.
5. The advantages, disadvantages, and limitations for each ground improvement techniques.

Course Outcomes: At the end of the course, the student would

1. Know the importance of ground improvement techniques and types of techniques for different soils.
2. Apply the various ground improvement techniques to address the field problems.
3. Understand the degree to which soil properties may be improved; and the benefits involved
4. Identify suitable ground improvement technique for specific project and its implications.
5. Design ground improvement techniques as well as be able to advice regarding value engineering to save cost and obtain maximum benefits for the specific project

UNIT- I:

Introduction: Need for ground improvement, applications, and factors affecting– different mechanical, chemical, static and dynamic techniques – mechanical stabilization – blending of aggregate – RothfutchTesting. Concept of Soil confinement, Gabion Walls, Crib Walls and Sand Bags.

UNIT – II:

Chemical stabilization: Lime, Cement, Bitumen, Emulsions, Chemicals, factors influencing–Design approach, construction procedure, laboratory testing, additives. Suspension and solution grouts, Principles, method, equipment, applications, compaction grouting, jet grouting, field compaction control.

UNIT – III:

Stabilization of Cohesion less soils: In Situ densification, Vibro techniques– Mechanisms. Factors affecting, suitability number, compacting piles. Vibro replacement process, Vibro flotation process, Terra Probe Method, Dynamic Compaction.

UNIT- IV:

Stabilization of Cohesive soils: In Situ densification, Pre-loading–Dewatering–sand drains. Sand wicks, geo-drains, rope-drains, band-drains, stone columns, and lime piles, thermal and vacuum methods.

Treatment of Expansive Soils: Expansive Soils- parameters of expansive soils and their classification- moisture changes in expansive soils - Design of foundations in expansive soils - CNS technique.

UNIT – V:

Ground treatment for Slopes: Different types of in-situ soil stabilization like soil nailing, anchoring, pre-stressed anchoring - design methods and construction techniques.

Geo-textiles: Woven and non-woven fabrics. Types, functions and applications– Geo-textiles, geo-grids test on geo-textiles, Reinforced earth – Principles and factors governing design.

Text Books:

1. P.Purushothama Raju, "*Ground Improvement Techniques*", Laxmi publications 2016.
2. K.R Arora, *"Soil Mechanics and Foundation Engineering"*, 5th Edition, Standard Publishers, 2005.

Suggested Reading:

1. Nihar Ranjan Patra, "*Ground Improvement Techniques*", Vikas publishing house Pvt. Ltd, 2012.
2. R. Hausmann., *"Engineering Principles of Ground Modification"*, McGraw Hill Publishing Co.,2013.
3. H. Fang,*" Foundation Engineering Hand Book*", 2nd Edition, CBS Publication, New Delhi, 2004.
4. G. V. Rao and G. V. S. S. Raju, *"Engineering with Geosynthetics"*, McGraw Hill Education, 1998
5. IRC-SP 58 (2001): "*Guidelines for use of fly ash in road embankments*".

16CE E10

ELEMENTS OF EARTH QUAKE ENGINEERING
(ELECTIVE-IV)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives: To enable the student

1. Understand the causes of earthquakes , their Magnitude & effects and various types of earthquake waves
2. Understand the concepts of damped and un damped vibrations and the response of single , two and multi-degree systems to these vibrations , and concepts of Response spectrum
3. Review various case studies of past earthquakes , and performance of buildings during those earthquakes, understand the concepts of Seismic Design Philosophy and Earthquake Resistant Design of Masonry , RC and Steel structure
4. Gain knowledge of Seismic Performance of Engineered and Non-Engineered Urban and Rural buildings
5. Understand the basic concepts of Seismic resistant construction , Base isolation techniques and other energy dissipation devices and Concepts of Seismic retrofitting

Course outcomes: At the end of the course, the student is able to

1. Assess the cause of an earthquake , it's magnitude and its effects on structures
2. Apply the concepts of Damped and Un-damped Vibrations to single , two and multi-degree systems and deduce a response spectrum
3. Apply the concepts of Seismic Design Philosophy and Earthquake Resistant Design to Masonry , RC and Steel structures
4. Evaluate the Seismic Performance of Engineered and Non-Engineered Urban and Rural buildings
5. Apply the concepts of Seismic Resistant Construction , Base isolation techniques and other energy dissipating devices and also the concepts of Seismic Retro fitting, use and interpret the knowledge gained from the case studies of performance of buildings during past earthquakes

UNIT – I:

Engineering Seismology: Causes of earthquakes–Seismic waves-Magnitude, Intensity and Energy release – characteristics of strong earthquake ground motions – Soil effects and Liquefaction. Seismic Zonation of India, Seismic Instruments.

UNIT – II:

Theory of Vibrations: Introduction to theory of vibrations, Equations of motion – single degree of freedom (SDOF) systems, free and forced vibrations. Concepts of damped and undamped vibrations.

UNIT – III:

Multi degree of freedom (MDOF) system: Equation of Motion, Modal analysis - generation of modal frequencies and mode shapes, construction of response spectrum.

UNIT – IV:

Seismic Design Philosophy: Concept of Seismic resistant design, reduction factors– Over strength, Ductility and Redundancy –Determination of earthquake forces on buildings – Equivalent static method and Response spectrum method.

UNIT – V:

Seismic Performance of Buildings: Case Studies* of a few severe earthquakes in the country - Damages to buildings – Damage Patterns – Performance of Non-Engineered Buildings, Rural houses during the Earthquakes.
Concepts of earthquake resistant constructions in rural area. Base isolation and energy dissipation devices. Principles of Seismic Repair, rehabilitation and retrofitting.

* Students are made to discuss case studies in groups.

Text Books:

1. Pankaj Agarwal and Manish Shrikhande, "*Earthquake Resistant Design of Structures*", Prentice Hall of India Pvt. Ltd, 2006
2. S. K. Duggal, "Earthquake *Resistant Design of Structures*", Oxford publishers, 2013.

Suggested Reading:

1. A.K. Chopra, "*Dynamics of Structures*", Pearson Education, 2012.
2. A.R Chandrasekaran, J. Krishna, B. Chandra, "*Elements of Earthquake Engineering*", South Asian Publishers Pvt. Ltd, 2000.
3. Steven L Kramer, "Geo-*Technical Earthquake Engineering"*, Pearson Education Ltd, 2013.
4. NPTEL notes.

16CE E11

ADVANCED TRANSPORTATION ENGINEERING (ELECTIVE – IV)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives: To enable the student

1. Understand the various materials and methods used for soil stabilization for roads.
2. Learn and apply the basic design principles for rigid and flexible pavements.
3. Evaluate the distress in highways, capacity of highways, transport cost and economy of a Highway..
4. Know the travel demand and management concepts and use computer applications for traffic and transport planning.

Course Outcomes: At the end of the course, the student should be

1. Able to apply various materials and methods for soil stabilization of roads.
2. Able to design a Rigid and flexible pavement.
3. Able to evaluate a highway for its distress, skid resistance, structural strength and drainage.
4. Able to assess the capacity and economic viability of a highway and also conduct transport cost-benefit analysis.
5. Able to apply the travel demand management concepts and use computer applications for traffic and transport planning.

UNIT-I:

Soil – Stabilized Road: Preliminary investigation, materials, Techniques of stabilizations, Methods of stabilization, Mechanical, Soil Cement, Soil Bitumen, Soil-fly ash -Lime Stabilization.

UNIT-II:

Pavement design: Factors affecting pavement design, Concepts of ESWL, flexible pavements-GI method-CBR method-IRC 37 2018, Rigid pavement design-IRC 58 2015.

UNIT-III:

Pavement Evaluation: Pavement distress**,** Skid resistance, structural evaluation, Benkelman beam method, Overlays, Highway drainage – importance, requirements surface drainage system, sub-surface drainage system.

UNIT-IV:

Highway capacity and Economic evaluation: Passenger car units (IRC), Level of service–concept, factors, multilane capacities for rural, urban, and express ways.

Concept of – Transport cost & benefits: Benefit cost ratio, net present value, rate of return, and their relative comparison for evaluation. Accidents – causes, methodologies for accident costing precautions to minimize the accidents.

UNIT-V:

Travel demand management: Traffic Management Systems (TMS)–Restrictions on turning movements, One way streets, tidal flow – Operations, Exclusive bus lanes. Traffic Relief at junctions, at plane, parking studies, parking inventories, types of parking service, parking analysis, bottle necks.

Nature of traffic problems in cities Effect on environment due to traffic noise and air pollution. Introduction of Computer applications in traffic and transport planning.

Text Books:

1. L. R. Kadiyali, "*Traffic Engineering and Transportation Planning*", Khanna Publications, 2011.
2. S. K. Sharma, "*Principles, Practice and Design of Highway Engineering*", S. Chand & Company, 2014.

Suggested Reading:

1. G. V. Rao," *Principles of transportation and Highway Engineering*", McGraw Hill Education India Pvt. Ltd, 2000.
2. S.K. Khanna and C.E. Justo, "*Highway Engineering*", Nem Chand & Sons, 2017.
3. S.C. Saxena,"*Text book Highway and Traffic Engineering*", CBS 2005.

16CE E12

DESIGN AND DETAILING OF IRRIGATION STRUCTURES (ELECTIVE - IV)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The student should be able to understand the

1. Principles of a surplus weir
2. Design of direct sluice
3. Basic principles of glacis type canal drop
4. Basic principles of Design of Cross regulator
5. Design of super passage.

Course Outcomes: The Student will be able to design procedures and detail a

1. Surplus weir
2. Direct sluice
3. Glacis type canal drop
4. Cross regulator
5. Super passage.

UNIT – I:

Surplus Weir: - Components of surplus weir - computation of flood discharge - Design of surplus weir & detailing

UNIT-II:

Direct Sluice:-Hydraulic particulars - General arrangements of various components - Design of vent way, Sluice barrel, Head walls, Wing Walls and return walls - Detailing

UNIT-III:

Glacis type Canal Drop:- Components, General arrangements, Fluming ratio, fixing the crest level, length of weir, U/S and D/S glacis, Transitions - Protection works - Curtain wall, Energy dissipation arrangements - Design & Detailing

UNIT-IV:

Cross Regulator: General design principles - General arrangements of various components - design of vent way by drowning ratio - arrangements of energy dissipation - U/S & D/S protection works - Design & Detailing.

UNIT-V:

Super Passage:- Hydraulic particulars of drain & Canal - U/S & D/S transitions - TEL's - fixing vent way - design of trough - Afflux in the canal - Proposal sketch of the super passage including transitions. Concepts of Syphon design.

Text Books:

1. B.C. Punmia, "*Irrigation & Water Power Engineering*", Lakshmi Publications, Delhi, 2016.
2. Ch. S. N. Murthy, "*Water Resources Engineering*: Principles and Practice", New Age International Publishers, Delhi, 2002.

Suggested Reading:

1. R.S. Varshney, S.C. Gupta, R.L. Gupta, "*Theory & Design Of Irrigation Structures Vol. 1*", Nem Chand & Brothers, 1992
2. S. K. Garg, "*Irrigation Engineering and Hydraulic Structures*", Khanna Publishers, New Delhi, 2017.

16CS O06

FUNDAMENTALS OF DBMS
(ELECTIVE – V) (OPEN ELECTIVE)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: File Structures.

Course Objectives: The main objectives of this course are:

1. To learn data models, conceptualize and depict a database system using E-R diagram.
2. To understand the internal storage structures in a physical DB design.
3. To know the fundamental concepts of transaction processing techniques.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Understand the find fundamental components of the DBMS.
2. Design the database schema and develop E-R model.
3. Devise queries using relational algebra and SQL.
4. Apply normalization techniques and solve problems using various Indexing techniques.
5. Understand transaction processing, Concurrency control and recovery techniques.

UNIT – I:

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Users and Administrators Database System Architecture, Application Architectures. **Database Design and E-R Model:** Basic concepts, Constraints, E-R Diagrams, E-R Design Issues, Extended E-R Features, Specialization and Generalization.

UNIT – II:

Relational Model: Structure of Relational Databases, Database Schema, Keys, Relational Algebra, Fundamental Operations.

Structured Query Language: Overviews, SQL Data Types, SQL Queries, Data Manipulation Language Set Operations, Aggregate Functions, Data Definition Language, Integrity Constraints, Null Values, Views, Join Expression. Index Definition in SQL.

UNIT – III:

Relational Database Design: Undesirable Properties in Relational Database Design, Functional Dependencies, Trivial and Nontrivial Dependencies, Closure of Set of Functional Dependencies, Closure of Set of Attributes, Irreducible Set of Functional Dependencies, Normalization – 1NF, 2NF, and 3NF, Dependency Preservation, BCNF, Comparison of BCNF and 3NF.

UNIT – IV:

Indexing: Basic concepts, Dense and Sparse Indices, Secondary Indices, Tree-Structured Indexing, Indexed Sequential Access Method (ISAM), B+ Tree Index Files.

Transaction Management: Transaction Concept – ACID Properties, States of Transaction, Implementation of Atomicity and Durability, Serializability, Recoverability.

UNIT – V:

Concurrency Control: Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Deadlocks Handling: Deadlock Prevention, Deadlock Detection and Recovery.

Recovery System: Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions.

Text Books:

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, "*Database System Concepts*", Sixth Edition, McGraw-Hill International Edition, 2011.
2. Date CJ, Kannan A, Swamynathan S, "*An Introduction to Database Systems*", Eight Edition, Pearson Education, 2006.

Suggested Reading:

1. Raghu Ramakrishnan, Johnnes Gehrke, "*Database Management Systems*", Third Edition, McGraw Hill, 2003.
2. Ramez Elmasri, Durvasul VLN Somayazulu, Shamkant B Navathe, Shyam K Gupta, "*Fundamentals of Database Systems*", Fourth Edition, Pearson Education,2006.

16ME O01

ENTREPRENEURSHIP
(ELECTIVE – V) (OPEN ELECTIVE)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: Student will understand

1. The environment of industry and related opportunities and challenges
2. Concept and procedure of idea generation
3. Elements of business plan and its procedure
4. Project management and its techniques
5. Behavioral issues and Time management

Course Outcomes: After completing this course, students will be able to:

1. Identify opportunities and deciding nature of industry
2. Brainstorm ideas for new and innovative products or services
3. Analyze the feasibility of a new business plan and preparation of Business plan
4. Use project management techniques like PERT and CPM
5. Analyze behavioural aspects and use time management matrix

UNIT-I:

Indian Industrial Environment: Competence, Opportunities and Challenges, Entrepreneurship and Economic growth, Small Scale Industry in India, Objectives, Linkage among small, medium and heavy industries, Types of enterprises, Corporate Social Responsibility.

UNIT-II:

Identification and Characteristics of Entrepreneurs: First generation entrepreneurs, environmental influence and women entrepreneurs, Conception and evaluation of ideas and their sources, Selection of Technology, Collaborative interaction for Technology development.

UNIT-III:

Business Plan: Introduction, Elements of Business Plan and its salient features, Technical Analysis, Profitability and Financial Analysis, Marketing Analysis, Feasibility studies, Executive Summary.

UNIT-IV:

Project Management: During construction phase, project organization, project planning and control using CPM, PERT techniques, Human aspects of project management, Assessment of tax burden

UNIT-V:

Behavioral Aspects of Entrepreneurs: Personality, determinants, attributes and models, Leadership concepts and models, Values and attitudes, Motivation aspects, Change behavior

Time Management: Approaches of time management, their strengths and weaknesses. Time management matrix and the urgency addiction

Text Books:

1. Vasant Desai, "*Dynamics of Entrepreneurial Development and Management*", Himalaya Publishing House, 1997.
2. Prasanna Chandra, "*Project-Planning, Analysis, Selection, Implementation and Review*", Tata Mcgraw-Hill Publishing Company Ltd. 1995.
3. S.S. Khanka, "*Entrepreneurial Development*", S. Chand & Co. Pvt. Ltd., New Delhi

Suggested Reading:

1. Robert D. Hisrich, Michael P. Peters, "*Entrepreneurship"*, 5/e, Tata Me Graw Hill Publishing Company Ltd., 2005.
2. Stephen R. Covey and A. Roger Merrill, "*First Things First*", Simon and Schuster Publication, 1994.
3. Sudha G.S., "*Organizational Behavior"*, National Publishing House, 1996.

16EG O01

TECHNICAL WRITINGS SKILLS
(ELECTIVE – V) (OPEN ELECTIVE)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The course will introduce the students to

1. Process of communication and channels of communication in general writing and technical writing in particular.
2. Learn Technical Writing including sentence structure and be able to understand and use technology specific words.
3. Write business letters and technical articles.
4. Write technical reports and technical proposals.
5. Learn to write agenda, record minutes of a meeting, draft memos. Understand how to make technical presentations.

Course Outcomes: After successful completion of the course students will be able to

1. Communicate effectively, without barriers and understand aspects of technical communication.
2. Differentiate between general writing and technical writing and write error free sentences using technology specific words
3. Apply techniques of writing in business correspondence and in writing articles.
4. Draft technical reports and technical proposals.
5. Prepare agenda and minutes of a meeting and demonstrate effective technical presentation skills.

UNIT-I:

Communication – Nature and process.

Channels of Communicational: Downward, upward and horizontal communication. Barriers to communication.

Technical Communication: Definition, oral and written communication. Importance and need for Technical communication. Nature of Technical Communication. Aspects and forms of Technical communication.

Technical communication Skills – Listening, Speaking, Reading & Writing.

UNIT –II:

Technical Writing: Techniques of writing. Selection of words and phrases in technical writing. Differences between technical writing and general writing abstract and specific words. Sentence structure and requisites of sentence construction. Paragraph length and structure.

UNIT- III:

Business correspondence: Sales letters, letters of Quotation, Claim and Adjustment letters.

Technical Articles : Nature and significance, types. Journal articles and Conference papers, elements of technical articles.

UNIT- IV:

Technical Reports: Types, significance, structure, style and writing of reports. Routine reports, Project reports.

Technical Proposals:: Definition, types, characteristics, structure and significance.

UNIT- V:

Mechanics of Meetings: Preparation of agenda, participation, chairing and writing minutes of a meeting. Memorandum. Seminars, workshops and conferences.

Technical Presentations: Defining purpose, audience and locale, organizing content, preparing an outline, use of Audio Visual Aids, nuances of delivery, importance of body language and voice dynamics.

Text Books :

1. Meenakshi Raman andSangeeta Sharma, **"***Technical Communications-Principles and Practice***",** Oxford University Press, Second Edition, 2012.
2. I..M Ashraf Rizvi, **"***Effective Technical Communication***",** Tata McGraw Hill Education Pvt. Ltd, 2012.

16EE O02

ENERGY MANAGEMENT SYSTEMS (ELECTIVE – V) (OPEN ELECTIVE)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives: The course will introduce the students to

1. To know the concept of Energy management
2. To understand the formulation of efficiency for various engineering systems
3. To explore the different ways to design various technologies for efficient engineering systems.

Course Outcomes: After completion of this course, students will able to:

1. Know the current energy scenario and importance of energy conservation.
2. Understand the concepts of energy management.
3. Evaluate the performance of existing engineering systems
4. Explore the methods of improving energy efficiency in different engineering systems
5. Design different energy efficient devices.

UNIT-I:

BASICS OF ENERGY AND ITS VARIOUS FORMS: Overview of engineering, elements Solar energy, electricity generation methods using solar energy, PV cell, elements of wind energy, electricity generation using wind energy, elements of bio energy, bio mass energy conservation, elements of geothermal energy, sources of geothermal energy, sources of chemical energy, fuel cells, Energy Scenario in India

UNIT-II:

Energy Management - I: Defining Energy management, need for energy management, energy management techniques, importance of energy management, managing the energy consumption, energy crisis, environmental aspects

UNIT-III:

Energy Management-II: Energy management approach, understanding energy costs, bench marking, energy performance, matching energy use to requirement,

optimizing the input, energy requirements, energy audit instruments, material and energy balance diagrams, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, restructuring of the energy supply sector, energy strategy for the future

UNIT-IV:

Energy Efficient Technologies-I: Importance of energy efficiency for engineers, Energy efficient technology in mechanical engineering: Heating, ventilation and air-conditioning, boiler and steam distribution systems

Energy efficient technology in civil engineering: future of roads, harnessing road and transport infrastructure;

UNIT-V:

Energy Efficient Technologies-II: Energy efficient technology in electrical engineering: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors; Energy efficient technology in chemical engineering: green chemistry, low carbon cements, recycling paper

Text Books:

1. UmeshRathore, *'Energy Management'*, Kataria publications, 2nd edition, 2014.
2. "*Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects*".
3. Hargroves, K., Gockowiak, K., Wilson, K., Lawry, N., and Desha, C. (2014), *"An Overview of Energy Efficiency Opportunities in Mechanical/civil/electrical/chemical Engineering*", The University of Adelaide and Queensland University of Technology.

Suggested Reading:

1. "*Success stories of Energy Conservation"*, BEE, New Delhi (www.bee-india.org)
2. K V Shama, P Venkataseshaiah, "*Energy Management and Conservation*", I. K. International Publishing agency pvt. ltd., 2011, ISBN: 978-93-81141-29-8

16 CE C37

COMPUTER APPLICATIONS LAB

Instruction	3 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives: To enable the students:

1. Gain exposure to a few software packages used in various areas of Civil Engineering (Structural Analysis & Design, Surveying, Water Supply & Sanitary Engineering, Water resources Engineering and Soil Mechanics) and the applications of these software packages.
2. Attain the fundamental knowledge of navigation of these software packages.
3. Acquire adequate conceptual knowledge and skills to use these software packages in the field in order to provide solutions to civil engineering problems
4. Provide accelerated/time bound solutions with help of these software packages without effecting the accuracy of computations
5. Understand the aspects of debugging, if errors occur while using these software packages

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

1. Model and analyse a framed structure and design all its components including isolated footings, using software.
2. Analyse pipe networks and sewer networks using software.
3. Estimate ground water flow head and velocity and also the pollutant concentration in ground water flow, using software.
4. Digitize topo sheets using GIS and also prepare Map overlays using GIS.
5. Analyse a natural slope using slope stability methods and design a cantilever retaining wall using software.

List of Exercises:

1. Modelling & analysis of framed structure.
2. Design of framed structure.
3. Design of isolated footing
4. Steady state analysis of pipe networks (open/looped) using EPANET.
5. Analysis of sewer networks.
6. Estimation of ground water flow head and velocity.
7. Estimation of pollutant concentration in groundwater flow - flow through porous media by using visual.
8. Digitization of topo sheets using GIS.
9. Map overlay using GIS.
10. Analysis of natural slope using Slope stability.
11. Design of cantilever retaining wall.

16CE C38

PROJECT SEMINAR

Instruction	3 Hours per week
CIE	50 Marks
Credits	2

The objective of 'Project Seminar' is to enable the student take up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/Modelling/Simulation/Experiment/ Design/Feasibility;
4. Preparing a Written Report on the Study conducted for Presentation to the Department;
5. Final Seminar, as oral Presentation before a departmental Committee.

Guidelines for the award of Marks:

Max. Marks: 50

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Department Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

CIVIL ENGINEERING

SEMESTER VIII

S. No.	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per Week		Duration in Hrs	Maximum Marks		
			L/T	D/P		Continuous Internal Evaluation (CIE)	Semester End Exam (SEE)	
THEORY								
Elective - VI								
1	16CE E13	Design of Steel Structures - II	3	-	3	30	70	3
2	16CE E14	Advanced Steel Design						
3	16CE E15	Industrial Structures						
Elective - VII (Open Elective)								
4	16ME O04	Intellectual Property Rights	3	-	3	30	70	3
5	16EG O02	Gender Sensitization						
6	16CS O09	Basics of Artificial Intelligence						
7	16EE O05	Waste Management						
Elective - VIII								
8	16CE E16	Health Monitoring and Retrofitting of Structures	3	-	3	30	70	3
9	16CE E17	Ground Water Hydrology						
10	16CE E18	Pre-Stressed Concrete						
11	16CE C39	Seminar	–	–	3	50	–	2
12	16CE C40	Project	–	–	6	50	100	6
		Total	**09**	**--**		**190**	**310**	**17**

L=Lecture, T=Tutorial, D/P= Drawing/ Practical's
CIE - Continuous Internal Evaluation SEE - Semester End Examination

16CE E13

DESIGN OF STEEL STRUCTURES -II
(ELECTIVE – VI)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Codes required: IS 800 – 2007, steel tables, Bridge rules, Bridge Code (Railways)

Course Objectives: To enable the students to

1. Gain exposure to a few basic types of steel structures (Plate Girders, Gantry girders, Trussed girders etc.) and their components, used in Highway bridges , Industrial workshops and Railway bridges .
2. Attain fundamental knowledge of design of plate girder, gantry girder, steel railway bridges (plate girder & truss girder type), rocker & roller bearings and is able to interpret the specifications of relevant codes.
3. Acquire adequate conceptual knowledge and skills to extend the same to investigate into critical issues , compare various options & choose best solution for the problems in the areas of highway , industrial and railway steel structures
4. Consider economy in the design of these structures without suffering the safety, in a given situation.
5. Understand the intricacies of detailing aspects of these structures and their connections

Course Outcomes: At the end of the course the students are able to

1. Design a welded plate girder for industrial and infrastructural purpose, as per the specifications of relevant codes
2. Design a gantry girder for industrial workshops as per the specifications of relevant codes
3. Design Roller & Rocker bearings for railway bridges
4. Design and detail a deck type riveted plate girder bridge using railway code and bridge rules
5. Design and detail a through type riveted truss girder bridge using railway code and bridge rules

UNIT-I:

Design of Plate girders: Design of welded plate girder for static loads– Economical Depth, Design of Cross Section, Flange curtailment, intermediate and bearing stiffeners, connections- As per IS 800-2007

UNIT-II:

Design of Gantry girders: Basic principles, Loads, Codal provisions, Detailed Design- Cross section and connections, Drawing- general layout and cross section;

UNIT-III:

Introduction to Railway Bridges and Design of bearings: Bridges: Deck and through type bridges – Economical span – Indian standard railway broad gauge train loadings – permissible stresses. Bearings: Types and general description of various bearings, detailed Design of Rocker and roller bearings for railway bridges.

UNIT-IV:

Design of Deck type riveted plate girder railway bridges: Economical depth, detailed design of Cross section, connections, intermediate and bearing stiffeners, Wind effects-Design of Cross frames Drawing-General layout, generation of longitudinal and cross sections

UNIT-V:

Design of Through type riveted truss girder railway bridges: Truss configurations, Detailed design of stringer beams, Cross girders and Truss girders; Wind effects- Design of top lateral and bottom Lateral bracing, Portal and sway bracings; Drawing-General layout , generation of longitudinal and cross sections.

Text Books:

1. S .K. Duggal, "*Design of Steel Structures, Limit State Method*", 2nd Edition, Tata McGraw Hill Publishing, 2014.
2. A.S Arya and J.L Ajmani, "*Design of Steel Structures*", Nem Chand & Bros, 2011.

Suggested Reading:

1. N. Subramanian, "*Design of Steel Structures, Limit State Method*", Oxford University Press, 2008.
2. Ramachandra and Virendra Gehlot, "*Design of Steel Structures*", Volume – 2, Scientific Publishers, 2008.
3. B.C. Punmia and Dr. Ashok Kumar Jain, "*Comprehensive Design of Steel Structures*", Laxmi Publications, 2015.

16CE E14

ADVANCED STEEL DESIGN
(ELECTIVE – VI)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Note: 1. IS Codes required: IS 800, Is 802, IS 805, IS 806, IS 1161.
2. For all units design philosophy is working stress method

Course Objectives: To enable the students to

1. Gain exposure to the concepts of a beam-column and grillage foundation with their applications
2. Attain fundamental knowledge on steel water tanks, understanding the codal provisions
3. Understand the significance and advantages of using tubular structures along with respective codal provisions
4. Acquire adequate conceptual knowledge on bunkers and silos and design them
5. Gain knowledge on transmission line towers, understand terminology and analyse them.

Course out comes: At the end of the course the students are able to

1. Analyse and design a beam-column and grillage foundation with detailing
2. Learn and apply the design concepts for the design of water tanks
3. To understand the nature of tubular section and their design.
4. To understand the behavior of Bunker's and Silo's and their design.
5. Learn apply basic principles of analysis of transmission towers, arrangement of member and design.

UNIT– I:

Beam Columns: Introduction, Design for Uni-axial and Bi-axial bending.

Grillage Foundations: Introduction, necessity of grillage foundations, various types, Design of Grillage foundations for axial loads under single and double columns.

UNIT-II:

Steel Tanks: Introduction, Types, loads, permissible stresses - detailed design of elevated rectangular mild steel and pressed steel tanks including staging.

UNIT-III:

Tubular Structures: Introduction – Advantages - Permissible Stresses - Design of tubular trusses - Design of tension members, compression members and flexural members including welded joints.

UNIT-IV:

Bunkers and Silos: introduction - general design principles- design theories - Janssen's Theory and Airy's Theory - Detailed design of rectangular bunkers and cylindrical silos.

UNIT-V:

Transmission Line Towers: Classification, economical spacing and design loads - IS code provisions - Calculation of wind loads and permissible stresses - Overall arrangement and design procedure - Detailed design including foundations

Text Books:

1. B.C. Punmia and Dr. Ashok Kumar Jain, "*Comprehensive Design of Steel Structures*", Laxmi Publications,2015.
2. S. Ramachandra and Virendra Gehlot, "*Design of Steel Structures Volume – 2"*, Scientific Publishers, 2008.

Suggested Reading:

1. A.S Arya and J.L Ajmani, "*Design of Steel Structures*", Nem Chand & Bros.2011.
2. S. K. Duggal, "*Design of Steel Structures*", 3rd Edition, Tata McGraw Hill Publishing, 2017.
3. P. Dayaratnam by "*Design of Steel Structures*" Orient Longman, Pub.-2012.
4. I.C. Sayal and S. Singh, by "*Design of Steel Structures"*, Standard Pub. -2009.

16CE E15

INDUSTRIAL STRUCTURES
(ELECTIVE – VI)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To impart knowledge about the fundamentals of load calculation, mechanical behavior, design and detailing aspects of

1. Steel Gantry Girders.
2. Steel Portal and Gable Frames.
3. Bunker and silo.
4. Steel Chimney.
5. Pre-engineered buildings

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

1. Develop an understanding in basic concepts in the Design of Steel Gantry Girders. Design in accordance with Relevant Indian Standard provisions to ensure safety and serviceability
2. Analyze and design with detailing for Steel Portal and Gable Frames according to specific codal criteria.
3. Differentiate between Bunker and silo, and design the Steel Bunkers and Silos on engineering concepts which are applied in field of Structural Engineering.
4. Understand the theoretical and practical aspects of Design of Steel Chimney along with the design aspects.
5. Analyse and design a pre-engineered industrial building.

UNIT-I:

Steel Gantry Girders: Introduction, Basic principles, loads acting on gantry girder, Codal provisions, , permissible stress, types of gantry girders and crane rails, crane data, maximum moments and shears, Detailed Design of gantry girder - Cross section and connections, Drawing- general layout and cross section;

UNIT-II:

Portal Frames: Design of portal frame with hinge base, design of portal frame with fixed base - Gable Structures – Lightweight Structures

UNIT-III:

Steel Bunkers and Silos: Design of square bunker – Jansen's and Airy's theories – IS Code provisions – Design of side plates – Stiffeners – Hopper Bottom – Longitudinal beams. Design of cylindrical silo – Side plates – Ring girder – stiffeners.

UNIT-IV:

Steel Chimneys: Introduction, dimensions of steel stacks, chimney lining, breech openings and access ladder, loading and load combinations, design considerations, stability consideration, design of base plate, design of foundation bolts, design of foundation.

UNIT-V:

Pre-engineered buildings: Concepts of Pre-engineering and Pre-engineered buildings – Analysis and design of an industrial building using pre-engineered elements.

Text Books:

1. B.C. Punmia, K. K. Jain, and A. K. Jain, "*Design of Steel Structures*",., 2nd Ed., Laxmi Publishers,2015.
2. Ram Chandra, "*Design of Steel Structures*", Standard Publishers,2016.
3. Vivek K. S., Vyshnavi P, "Pre-Engineered Steel Building", Lap Lambert publishing, 2017.

Suggested Reading:

1. Subramanian, "*Design of Steel Structures*", Oxford University Press, 2106.
2. Alexander Newman, "Metal Building systems", McGraw Hill Education, 2014.

16ME O04

INTELLCTUAL PROPERTY RIGHTS
(ELECTIVE – VII) (OPEN ELECTIVE)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: Student will learn

1. Fundamental aspects of IP
2. Aspects of IPR acts.
3. Awareness of multi disciplinary audience
4. Awareness for innovation and its importance
5. The changes in IPR culture and techno-business aspects of IPR

Course Outcomes: At the end of the course, a student

1. Will respect intellectual property of others
2. Learn the art of understanding IPR
3. Develop the capability of searching the stage of innovations.
4. Will be capable of filing a patent document independently.
5. Completely understand the techno-legal business angle of IPR and converting creativity into IPR and effectively protect it.

UNIT-I:

Overview of Intellectual Property: Introduction and the need for intellectual property right (IPR), IPR in India – Genesis and Development, IPR abroad, Some important examples of IPR. Importance of WTO, TRIPS agreement, International Conventions and PCT

Patents: Macro economic impact of the patent system, Patent and kind of inventions protected by a patent, Patent document, How to protect your inventions. Granting of patent, Rights of a patent, how extensive is patent protection. Why protect inventions by patents. Searching a patent, Drafting of a patent, Filing of a patent, the different layers of the international patent system, (national, regional and international options), compulsory licensing and licensers of right & revocation, Utility models, Differences between a utility model and a patent. Trade secrets and know-how agreements

UNIT-II:

Industrial Designs: What is an industrial design. How can industrial designs be protected? What kind of protection is provided by industrial designs? How long does the protection last? Why protect industrial designs?

UNIT-III:

Trademarks: What is a trademark, Rights of trademark? What kind of signs can be used as trademarks. Types of trademark, function does a trademark perform, How is a trademark protected? How is a trademark registered. How long is a registered trademark protected for? How extensive is trademark protection. What are well-known marks and how are they protected? Domain name and how does it relate to trademarks? Trademark infringement and passing off.

UNIT-IV:

Copyright: What is copyright. What is covered by copyright. How long does copyright last? Why protect copyright? Related Rights: what are related rights? Distinction between related rights and copyright. Rights covered by copyright? Copy rights in computer programming.

UNIT-V:

Enforcement of Intellectual Property Rights: Infringement of intellectual property rights Enforcement Measures Emerging issues in Intellectual property protection. Case studies of patents and IP Protection.

Unfair Competition: What is unfair competition? Relationship between unfair competition and intellectual property laws.

Text Books:

1. Ajit Parulekar and Sarita D' Souza, "*Indian Patents Law – Legal & Business Implications*", Macmillan India ltd , 2006
2. B. L.Wadehra; "*Law Relating to Patents, Trade Marks, Copyright, Designs & Geographical Indications*", Universal law Publishing Pvt. Ltd., India 2000
3. P. Narayanan, "*Law of Copyright and Industrial Designs*", Eastern law House, Delhi 2010

Suggested Reading:

1. W.R1 Cronish, "*Intellectual Property; Patents, copyright, Trad and Allied rights*", Sweet & Maxwell, 1993.
2. P. Narayanan, "*Intellectual Property Law*", Eastern Law Edn., 1997.
3. Robin Jacob and Daniel Alexander, "*A Guide Book to Intellectual Property Patents, Trademarks*, Copy rights and designs", 4/e, Sweet, Maxwell,.

16EG O02

GENDER SENSITIZATION
(ELECTIVE – VII) (OPEN ELECTIVE)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: This course will introduce the students to

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To expose the students to debates on the politics and economics of work. To help students reflect critically on gender violence.

Course Outcomes: After successful completion of the course the students will be able to

1. Develop a better understanding of important issues related to what gender is in contemporary India.
2. Be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature, and film.
3. Attain a finer grasp of how gender discrimination works in our society and how to counter it. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
4. Understand what constitutes sexual harassment and domestic violence and be made aware of New forums of Justice.
5. Draw solutions as to how men and women, students and professionals can be better equipped to work and live together as equals.

UNIT – I:

Understanding Gender:

Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)

Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)

Introduction.Preparing for Womanhood.Growing up Male. First lessons in Caste. Different Masculinities.

UNIT – II:

Gender And Biology:

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)

Declining Sex Ratio.Demographic Consequences.

Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)

Two or Many?Struggles with Discrimination.

UNIT – III:

Gender andLabour:

Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3)

"My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)

Fact and Fiction.Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT-IV:

Issues Of Violence

Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading:"*Chupulu*".

Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading:

New Forums for Justice.

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)

Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of

Violence.

UNIT – V:

Gender: Co - Existence

Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers.

Additional Reading: Rosa Parks-The Brave Heart.

Textbook:

1. A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote,VasudhaNagaraj, AsmaRasheed, Gogu Shyamala,

DeepaSreenivas and Susie Tharu **"***Towards a World of Equals: A Bilingual Textbook on Gende***r"** published by Telugu Akademi, Hyderabad, Telangana State, **2015**.

Suggested Reading:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. AbdulaliSohaila. **"***I Fought For My Life…and Won***."** Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

Web Resources:

1. https://aifs.gov.au/publications/gender-equality-and-violence-against-women/introduction
2. https://theconversation.com/achieving-gender-equality-in-india.

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

16CS O09

BASICS OF ARTIFICIAL INTELLIGENCE
(ELECTIVE – VII) (OPEN ELECTIVE)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Basic Mathematics.

Course Objectives: The main objectives of this course are:

1. Provide a strong foundation of fundamental concepts in Artificial Intelligence.
2. Discuss the various paradigms involved in solving an AI problems which involve perception, reasoning and learning
3. Apply the AI concepts to build an expert system to solve the real-world problems.

Course Outcomes: On Successful completion of this course, student will be able to

1. Differentiate between a rudimentary Problem and an AI problem, it's Characteristics and problem-solving Techniques.
2. Compare and contrast the various knowledge representation schemes of AI.
3. Understand and analyze the various reasoning and planning techniques involved in solving AI problems.
4. Understand the different learning techniques.
5. Apply the AI techniques to solve the real-world problems.

UNIT – I:

Introduction: Definition, history, applications. **Problem Solving:** AI problems, AI Technique, Defining problem as a State-Space Search, Problem Characteristics. Heuristic Search Techniques: Generate–and–test, Hill Climbing, Constraint Satisfaction.

UNIT – II:

Knowledge Representation (Logic): Representing facts in logic, proposition logic, predicate logic, resolution and unification. **Knowledge Representation (Structured):** Declarative representation, Semantic nets, procedural representation, frames.

UNIT – III:

Reasoning: Probability and Bayes theorem, Certainty factors and Rule based systems, Bayesian Networks, Dempster-Shafer Theory. **Planning:**Components, goal stack planning, nonlinear planning, hierarchical planning.

UNIT – IV:

Learning: Introduction, Rote learning, learning by taking advice, learning in problem solving and learning from examples: Decision tree. **Intelligent Agents:** Classification, Working of an agent, single agent and multi agent systems, multi agent application.

UNIT - V

Expert System: Representing and Using Domain Knowledge, Expert systems shells, Explanation, Knowledge Acquisition. **Perception and Action:** Real Time Search, Vision, Speech Recognition, ACTION: Navigation, Manipulation, Robot architectures.

Text Books:

1. Elaine Rich, Kevin Night, Shivashankar B Nair, "*Artificial Intelligence*", 3rd Edition, 2008
2. Russell Norvig, "*Artificial Intelligence-Modern Approach*", 3rd edition, 2010.

Suggested Reading:

1. Saroj Kaushik, "*Artificial Intelligence*", Cengage Learning India, 2012.
2. Nelson M. Mattos, " *An Approach to Knowledge Base Management*", Springer Berlin Heidelberg, 1991.

Online Resources:

1. http://nptel.ac.in/courses/106106126/
2. http://nptel.ac.in/courses/106105077/

16EE O05

WASTE MANAGEMENT
(ELECTIVE – VII) (OPEN ELECTIVE)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To Imbibe the concept of effective utilization of any scrap
2. To Become familiar with the processes of all disciplines of engineering.
3. To Learn the technique of connectivity from waste to utility.

Course outcomes: After completion of this course, students will be able to:

1. Understand the various processes involved in allied disciplines of engineering
2. Infer the regulations of governance in managing the waste
3. Distinguish the nature of waste materials concerned to the particular branch of engineering
4. Explore the ways and means of disposal of waste material
5. Identify the remedies for the disposal of a selected hazardous waste material

UNIT-I:

Introduction to waste management: Relevant Regulations Municipal solid waste (management and handling) rules; hazardous waste (management and handling) rules; biomedical waste handling rules; fly ash rules; recycled plastics usage rules; batteries (management and handling) rules. Municipal Solid Waste Management – Fundamentals Sources; composition; generation rates; collection of waste; separation, transfer and transport of waste; treatment and disposal options.

UNIT-II:

Hazardous Waste Management : Fundamentals Characterization of waste; compatibility and flammability of chemicals; fate and transport of chemicals; health effects, Radioactive Waste Management – Fundamentals Sources, measures and health effects; nuclear power plants and fuel production; waste generation from nuclear power plants; disposal options.

UNIT-III:

Environmental Risk Assessment: Defining risk and environmental risk; methods of risk assessment; case studies, Physicochemical Treatment of Solid and

Hazardous Waste Chemical treatment processes for MSW (combustion, stabilization and solidification of hazardous wastes); physicochemical processes for hazardous wastes (soil vapor extraction, air stripping, chemical oxidation); ground water contamination and remediation

UNIT-IV:

Biological Treatment: Solid and Hazardous Waste Composting; bioreactors; anaerobic decomposition of solid waste; principles of biodegradation of toxic waste; inhibition; co-metabolism; oxidative and reductive processes; slurry phase bioreactor; in-situ remediation.

UNIT-V:

Landfill design aspects: Landfill design for solid and hazardous wastes; leachate collection and removal; landfill covers; incineration

Text Books:

1. John Pichtel," *Waste Management Practices*", CRC Press, Taylor and Francis Group 2005.
2. LaGrega, M.D.Buckingham,P.L. and Evans, J.C. "*Hazardous Waste Management*", McGraw Hill International Editions, New York, 1994
3. Richard J. Watts, "*Hazardous Wastes - Sources, Pathways*", Receptors John Wiley and Sons, New York, 1997.

Suggested Reading:

1. "*Basics of Solid and Hazardous Waste Mgmt* Tech", KantiL.Shah 1999, Prentice Hall.
2. "*Solid and Hazardous Waste Management* ", 2007 by S.C.Bhatia Atlantic Publishers & Dist.

16CE E16

HEALTH MONITORING AND RETROFITTING OF STRUCTURES (ELECTIVE – VIII)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives: To enable the students to

1. Understand SHM as a way of monitoring health of a structure using smart materials
2. Learn and apply the various vibration based techniques for monitoring the health of the structure
3. Learn and apply the various capacitive sensing techniques for structures
4. Comprehend the methods of condition assessment of damages in buildings and to learn the different non- destructive evaluation and testing methods
5. Learn about implementation of health monitoring in different types of structures

Course Outcomes: At the end of the course the graduate should be able to

1. Interpret SHM as a way of monitoring the health of a structure using smart materials
2. Select and implement an appropriate vibration based technique for health monitoring of a structure
3. Select and implement an appropriate capacitive sensing technique
4. Perform condition assessment survey of damaged/ existing buildings and to identify possible defects in a concrete structure and suggest necessary repairs
5. Implement various health monitoring techniques for different types of structures for different situations

UNIT – I:

Introduction of Structural Health Monitoring (SHM) : Introduction, definition of structural health monitoring (SHM), basic components of SHM, Passive and Active SHM, Relationship between SHM – NDE(Non- Destructive Evaluation) and NDECS (Non- Destructive Evaluation of Co-operative Structures), materials for sensor design.

UNIT – II:

Vibration based techniques used for structural health monitoring: SHM using vibration based technique – Introduction – Local and global methods – Applications, SHM using fiber optic sensors – Applications, SHM using Low Frequency Electromagnetic Techniques – Introduction – Applications to the NDE /NDT domain & SHM domain.

UNIT – III:

Capacitive Method: Introduction of capacitive methods, the principle, types of capacitive sensing, capacitive probe for cover concrete – Capacitive sensing in bridges (case studies), Applications for external post – tensioned cables.

UNIT – IV:

Conditions Survey, NDE and NDT of Concrete Structures: Definition and objective of condition survey, stages of conditions survey – planning, inspections and testing stages, possible defects in concrete structures, quality control of concrete structures, NDT techniques- rebound hammer, infra-red thermography, ground penetration technique, ultra-sonic pulse velocity test and Windsor probe test, calibration of NDT equipment and safety audit, semi destructive testing – core cutting.

UNIT – V:

Case studies on structures: Historical buildings, Special structures – bridges, dams, tunnels, high rise buildings.

Text Books:

1. Daniel Balageas and Claus–Peter Fritzen, "*Structural Health Monitoring*", published by ISTE Ltd., U.K .2006.
2. V.M. Malhotra, *"In Situ/Non-destructive Testing of Concrete (Publication, Sp-82)"*, published by Amer Concrete Inst 1984.

Suggested Reading:

1. Hua- Peng Chen, "*Structural Health monitoring of large engineering structures*", published by Wiley-Blackwell, 2018.
2. "*Guide book on Non-destructive testing of concrete structures*", training course, series no.17, International Atomic Agency, Vienna 2002.
3. Jean-Paul Balayssac and Vincent Garnier, "*Non Destructive evaluation and evaluation of civil engineering structures"*, published by ISTE Press – Elsevier, 2017.

16CE E17

GROUND WATER HYDROLOGY
(ELECTIVE - VIII)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives: The student should able to understand

1. Basics of groundwater hydrology, familiar with aquifer parameters.
2. Unsteady flow and its flow computation.
3. Exploring groundwater through surface and subsurface methods.
4. Artificial recharge and causes, methods of recharge.
5. Various models in groundwater, quality of groundwater, pollutant transport.

Course outcomes: The student should able to

1. Assess groundwater potential and head.
2. Estimate hydraulic conductivity and storage coefficient for time variant flow.
3. Investigate groundwater availability for a given area.
4. Plan and design artificial recharge.
5. Construct model and analyze groundwater flow.

UNIT- I:

Introduction : Occurrence of groundwater, rock properties effecting groundwater, groundwater basin, ground water in hydraulic cycle, vertical distribution of ground water, Hydrologic balance equation, types of aquifers, unconfined, confined and leaky aquifers. Darcy's law and limitations, compressibility of aquifer, aquifer parameters, specific yield, safe yield, general equation of ground water flow, steady unidirectional flow. Steady radial flow to a well in unconfined and confined aquifers. Steady flow with uniform recharge.

UNIT- II:

Unsteady radial flow to a well: Non equilibrium equation for pumping tests. This method of solution, Cooper Jacob method, Chow's methods of solution.Law of times, well flow near aquifer boundaries, Image well theory, multiple well systems, well losses, pumping and recuperation tests.

UNIT- III:

Geophysical Exploration: Surface investigations, of ground water – electrical resistivity method, seismic refraction method, gravity and magnetic methods,

geologic methods, dowsing. Subsurface Investigations – test drilling, resistivity logging, potential logging, Temperature logging, caliper logging, Interpretation of logs and selection of site as a well.

UNIT-IV:

Artificial Recharge of groundwater: Methods of recharge, water spreading, sewage discharge, recharge through pits and shafts, recharge through well, induced recharge.

Sea water intrusion in coastal aquifers, occurrence, Ghyben – Herzberg relation, shape of fresh – salt water interface, Length of the intruded sea water wedge. Prevention and control of sea water intrusion.

UNIT –V:

Modelling techniques: Introduction, porous media, analog, viscous, membrane, thermal, blotting paper models. Numerical modelling and solutions. Finite difference method.

Quality of groundwater: Sources and Pollution of groundwater, groundwater quality criteria, distribution and evaluation of groundwater pollution, pollutant transport and modelling of pollutant transport.

Text Books:

1. D.K. Todd, "*Ground Water Hydrology"*, John Wiley & Sons, Inc., USA, 2015
2. H.M. Raghunath, "*Ground Water*", Wiley Eastern Limited, New Delhi, 2007.

Suggested Reading:

1. Bouwer, "*Ground Water Hydrology*", Mc. Graw Hill, Newyork, 2013
2. A. K. Rastogi, "*Numerical Groundwater Hydrology*", Penram International Publishing, Mumbai, 2007.
3. Bear J, "*Hydraulics of Ground Water*", Mc-Graw Hill, Newyork, 2013.

16CE E18

PRE-STRESSED CONCRETE
(ELECTIVE - VIII)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: To enable the student to

1. The aim of this course is to introduce students to the basic principles about structural behaviour, of pre stressed concrete structures, with reference to IS 1343 code
2. The objective is to equip the students with a thorough understanding of the behaviour and analysis, design of prestressed concrete beam, slab and column.
3. Various time dependent factors, such as cracking, creep and shrinkage of concrete, and prestress losses, are discussed thoroughly.
4. Background to design equations and relevant modern research will also be discussed to provide the students with solid understanding of the topics covered.
5. To provide students with an opportunity to enhance their skills in pre stressed concrete design and applications. The specific implication, to the serviceability and ultimate limit states are covered.

Course outcomes: On successful completion of this course

1. Students will understand the general mechanism of pre stressed concrete members, types of pre stressing, losses in pre stressing, short and long term deflections in P.S.C members.
2. Students will be able to evaluate the behaviour of pre stressed concrete structures,
3. Students will be able to analyze and design of pre stressed concrete structures using serviceability limit states.
4. Student will be able to analyze and design for shear in P.S.C members.
5. Student will be able to analyze the stresses in anchorage zones and design the end anchorages

UNIT-I:

General Principles of Pre Stressed Concrete:

Introduction: Basic concepts – Materials - permissible stresses – Advantages – pre-tensing and post tensing – Pre Stressing by straight Concentric, Eccentric bent and Parabolic Tendons – Different methods of Pre stressing – Hoyer System

– Freyssinet system – Magnel – Blaton system – Lee Mecal system – Use of IS 1343 code, concepts of precast and post tensioned elements.

Losses of Pre stress: Losses in P.S.C. members due to elastic shortening – Shrinkage – Creep in Concrete – Relaxation of Steel – Slip in anchorage – Frictional Loss – Computation of losses.

UNIT – II:

Analysis: Analysis of sections for pre stress and flexure. Deflections of P.S.C members: Importance of deflections - factors influencing deflections, short term and long term deflections – IS code requirements for Maximum deflections – Computation of deflection due to pre stressing force – Dead and live loads – Different cases of loading.

UNIT – III:

Design of Section for Flexure: Allowable stresses – Elastic Design and Limit state method of Design of Rectangular – I Section beams for Flexure – Kern of section – Pressure Line – Cable Profile – IS 1343 Codal Provisions – Check for ultimate flexural strength.

Design of Section for Shear and Torsion: Shear and principal stresses – Cracked and uncracked sections – Codal provisions – Ultimate shear resistance – Design of shear reinforcement in beams – Design of torsional reinforcement in beams.

UNIT – IV:

Anchorage Zone stress in post tensioned members: Stress distribution in End block – A analysis by Magnel and Guyon's methods – IS 1343 code provisions – Bursting Tensile force – Design of anchorage zone reinforcement.

UNIT – V:

Continuous beams: Advantage and Disadvantages – Primary and Secondary moment – P and C lines– Liner transformation concordant and Non concordant cable profile - Analysis and Design of Continuous beams.

Floor slabs: Analysis and design of one way slab and two way slab.

Text Books:

1. N. Krishna Raju ,**"***Prestressed Concrete***"** , Tata Mc Graw Hill,2018
2. G.S. Pandit and S.P. Gupta, **"***Prestressed Concrete***",** CBS Pub., 2009.

Suggested Reading:

1. Arthur H. Nilson, **"***Design of Prestressed Concrete*", John Wiley 1987.
2. T.Y Lin and Burn," *Design of prestressed Concrete*",Wiley India Private Limited, 2010.

16CE C39

SEMINAR

Instruction	3Hours per week
CIE	50 Marks
Credits	2

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state of the art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:

1. Submit a one page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

Seminars are to be scheduled from 3rd week to the last week of the semester and any change in schedule shall be discouraged.

For the award of Sessional marks students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall preferably be from any peer reviewed recent journal publications.

Guidelines for awarding marks		
Sl No.	Description	Max Marks
1.	Contents and relevance	10
2.	Presentation skills	10
3.	Preparation of PPT slides	05
4.	Questions and answers	05
5.	Report in a prescribed format	20

16CE C40

PROJECT

Instruction	6 Hours per week
CIE	50 Marks
Semester End Examination	100 Marks
Credits	6

The object of Project is to enable the student extend further the investigative study, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/ Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/ Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar presentation before Departmental Committee.

Guidelines for the award of marks in CIE: (Max. Marks: 50)

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
Department Review Committee	05	Review 1
	08	Review 2
	12	Submission
Supervisor	05	Regularity and Punctuality
	05	Work Progress
	05	Quality of the work which may lead to publications
	05	Report Preparation
	05	Analytical / Programming / Experimental Skills

Guidelines for awarding marks in SEE: (Max. Marks: 100)

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
External and Internal Examiners together	20	Power Point Presentation
	40	Thesis Evaluation
	20	Quality of the project ● Innovations ● Applications ● Live Research Projects ● Scope for future study ● Application to society
	20	Viva-Voce