ENGINEERING ECONOMICS

Course Code: 19HS6ICEEM **Credits: 03**
L: P: T: S: 3: 0: 0: 0 **CIE Marks: 50**
Exam Hours: 03 **SEE Marks: 50**
Total Hours: 40

COURSE OBJECTIVES:

1. Expose the students to role and importance of engineering economics in decision making.
2. Equip the students with methods of evaluating investment decisions.
3. Establish decision making capabilities in investments alternatives.

Course Outcomes: After completion of the course, the graduates will be able to

ENGINEERING ECONOMICS	
CO1	Identify the importance and role of engineering economy in investment decisions.
CO2	Understand the techniques of cash flows and interest calculations
CO3	Use present, annual & future worth comparisons for evaluation of investment decisions
CO4	Analyze and determine the various rates of reruns for different investments.
CO5	Plan a depreciation schedule for an asset and make break even decisions
CO6	Recommend decisions on replacement of equipment and assess the cost of product by considering the various elements of cost.

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	2	-	1	-	1	3	2
CO2	2	3	2	2	2	2	-	1	-	1	3	3
CO3	2	3	3	2	2	2	-	1	-	1	3	2
CO4	3	3	3	2	2	2	-	1	-	1	3	2
CO5	3	3	3	2	2	2	2	1	-	1	3	2
CO6	3	3	2	2	2	3	3	1	-	1	3	2

Module	Course Content	Hours	COs
1	**Introduction to Engineering economics** - Engineering Decision makers, Problem solving, Decision making, **Interest and Interest Factors** - Interest rate, simple interest & Compound interest factors, Cash- flow diagrams, Numerical Exercises.	8	CO1 CO2
2	**Present Worth Comparison** - Conditions for present worth comparisons, Basic Present worth comparisons, Present worth equivalence, Net Present worth, Assets with equal and unequal lives, Future worth comparison, Numerical Exercises.	8	CO3
3	**Equivalent Annual Worth Comparisons** - Equivalent Annual Worth Comparison methods, Situations for Equivalent Annual Worth Comparison, Consideration of asset life, Use of sinking fund method, Numerical Exercises. **Rate of Return Calculations:** Rate of return, Minimum acceptable rate of return, IRR, Numerical Exercises on Rate of return calculations.	8	CO4
4	**Depreciation:** Causes of Depreciation, Basic methods of computing Depreciation charges: Straight line method of depreciation, Declining balance method, Sum of year's digits method and Sinking fund method. **Breakeven analysis**: Introduction to breakeven analysis, calculation of BEQ, BEP, Numerical Exercises.	8	CO5
5	**Replacement Analysis**: Deterioration, obsolescence, inadequacy, Economic life for cycle replacements, individual replacement, Numerical Exercises. **Costing**: Elements of cost, Components of cost, preparation of cost sheet, Numerical Exercises..	8	CO6

SELF-STUDY COMPONENT/ASSIGNMENT:

Unit-1: Law of demand and supply, Law of returns.
Unit-2: Comparison of assets with infinite lives.
Unit-3: Rate of return calculations by using ERR method.
Unit-4: Depreciation computations by using double declining balance method
Unit-5: Group replacement analysis.

TEXT BOOKS:

1. RIGGS J.L., Engineering economy, McGraw Hill, 2002
2. R PANEERSELVAM, Engineering Economics, PHI, Eastern Economy Edition, 2013.
3. NAIDU, BABU & RAJENDRA, Engineering Economy, New Age international Publishers, 2006
4. M N Arora, Priyanka Katyal, Cost Accounting, Vikas Publishing house, 2nd Revised Edition, 2016

REFERENCE BOOKS:

1. TARACHAND, Engineering Economy, 2000
2. TUESEN.G. Engineering Economy, PHI, 9th edition, 2009.

DESIGN & DRAWING OF STEEL STRUCTURES

Course Code : 19CV6GCDDS
L:P:T:S : 4:0:0:0
Exam Hours : 03
Hours/Week : 04

Credits : 4
CIE Marks : 50
SEE Marks : 50
Total hours : 50

Course Objectives:

1. Provide basic knowledge in the areas of limit state method and concept of Steel structures
2. Identify, formulate and solve engineering problems
3. Give procedural knowledge to design a system, component or process as per needs and specifications
4. Imbibe the culture of professional and ethical responsibilities by following IS Codes

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

	Course Outcome
CO 1	Analyse basics of different design techniques used in steel structural design .
CO 2	Analyse and design Bolted joints Under axial load and moments.
CO 3	Analyse and design of welded joints Under axial load and moments
CO 4	Understand Plastic behaviour of steel structures
CO 5	Design tension and compression members
CO 6	Design flexural members

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	3								
CO2	3	3	3	3								
CO3	3	3	3	3								
CO4	3	3	3	3								
CO5	3	3	3	3								
CO6	3	3	3	3								

Module	Content	Hours	Co's
1	INTRODUCTION: Advantages and Disadvantages of Steel structures, Loads and Load combinations, Design considerations, Limit State Method (LSM) of design, Codes, Specifications and section classification. Plastic Behaviour of Structural Steel: Introduction, Plastic theory, Plastic hinge concept, Plastic collapse load, conditions of plastic analysis, Theorem of Plastic collapse, Methods of Plastic analysis, Plastic analysis of continuous beams.	10	CO1, CO4
2	BOLTED CONNECTIONS: Introduction, Behaviour of Bolted joints, Design strength of ordinary Black Bolts, Design strength of High Strength Friction Grip bolts (HSFG), Simple Connections, Moment resistant connections, Beam to Beam connections, Beam and Column splices, Beam –beam bolted drawing Beam – column bolted drawing	9	CO2
3	WELDED CONNECTIONS: Introduction, Welding process, Welding electrodes, Advantages of Welding, Types and Properties of Welds, Types of joints, Weld symbols, Weld specifications, Effective areas of welds, Design of welds, Simple joints, Moment resistant connections, Continuous Beam to Column connections, Continuous Beam to Beam connections, Beam Column splices, Beam –beam welded drawing Beam – column welded drawing	9	CO3
4	Design of Tension Members: Introduction, Types of tension members, Behaviour of tension members, Modes of failure, Factors affecting the strength of tension members, Angles under tension, Other sections, Design of tension member Design of Beams: Introduction, Beam types, Lateral stability of beams, factors affecting lateral stability, Design strength of laterally supported beams in Bending, Plastic behaviour Design of Compression Members: Introduction, Failure modes, Behaviour of compression members, Elastic buckling of slender compression members, Sections used for compression members, Effective length of compression members, Design of compression members, Built up compression members.	12	CO5, CO6
5	Design of Column Bases:, Design of simple slab base and gusseted base Truss drawing(joints), slab and gusset base drawings	12	CO5

Note: ALL THE DRAWINGS WILL BE CARRIED OUT IN GRAPH SHEETS ONLY

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Self-Study Component		
Module	**Contents of the unit**	**CO's**
1	Failure criteria for steel	CO1
2	Pin Connections, Tubular connections	CO2
3	Tubular connections	CO3
4	Lug angles, Splices, Gussets.	CO4
5	Design of laterally unsupported beams, purlins, plate girder and gantry girder	CO4

TEXT BOOKS:

1. Subramanian N, "Design of Steel Structures", Oxford university Press, New Delhi
2. K S Duggal, "Design of Steel Structures", Tata McGraw Hill, New Delhi
3. Structural Design & Drawing Reinforced Concrete, Krishnaraju, University Press
4. Structural Desing and Drawing, Krishnamurthy, CBS Publisher.

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REFERENCES BOOKS:

1. Charles E Salman, Johnson & Mathas, "Steel Structure Design and Behaviour", Pearson Publications
2. Nether Cot, et.al, "Behaviour and Design of Steel Structures to EC -III", CRC Press

QUANTITY SURVEYING AND COSTING

Course Code : 19CV6GCQSC
L:P:T:S : 3:0:0:0
Exam Hours : 03
Hours/Week : 03

Credits : 3
CIE Marks : 50
SEE Marks : 50
Total hours : 40

Course Objectives:

1.Plan and estimate building by specifications and rate analysis
2. Understanding the tendering and contracts procedures

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

	Course Outcome
CO 1	Study various drawings with estimates
CO 2	Estimate different types of building materials
CO 3	Specifications of common items of works in buildings
CO 4	Analyse quantities and rates for the following standard items of works
CO 5	Calculate the concepts and procedure of contracts
CO 6	Identify the concepts and procedure of tenders

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1									
CO2	3	2	1									
CO3	3	3	3									
CO4	3	2	1									
CO5	3	3	1									
CO6	3	2	1									

Module	Content	Hours	Co's
1	ESTIMATION: Study of various drawings with estimates, important terms, units of measurement, abstract methods of taking out quantities and cost – center line method, long and short wall method or crossing method. Preparation of detailed and abstract estimates for the following Civil Engineering works – Buildings – RCC framed structures with flat, sloped RCC roofs with all Building components	8	CO3 CO1 CO2
2	ESTIMATE: Different type of estimates, approximate methods of Estimating buildings, cost of materials. Estimation of wooden joineries such as doors, windows & ventilators. ESTIMATES: Steel truss (Fink and Howe truss), manhole and septic tanks, RCC Culverts. SPECIFICATIONS: Definition of specifications, objective of writing Specifications, essentials in specifications, general and detail specifications of common items of works in buildings.	8	CO3
3	RATE ANALYSIS: Definition and purpose. Working out quantities and rates for the following standard items of works – earth work in different types of soils, cement concrete of different mixes, bricks and stone masonry, flooring, plastering, RCC works, centering and form work for different RCC items, wood and steel works for doors, windows and ventilators	8	CO3
4	MEASUREMENT OF EARTHWORK FOR ROADS: Methods for computation of earthwork – cross sections – mid section formula or average end area or mean sectional area, trapezoidal & prismoidal formula with and without cross slopes.. Lateral supported beams in Bending and shear.	8	CO4
5	CONTRACTS: Types of contract – essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – Tender, earnest money deposit, security deposit, tender forms, documents and types. Acceptance of contract documents. Termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval – Technical sanction. Nominal muster roll, measurement books – procedure for recording and checking measurements – preparation of bills. Application of Excel in preparation of BOQ as per SR	8	CO6

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents**	**CO's**
1	Study of various drawings with estimates	CO1
2	estimation of wooden joineries such as doors	CO2
3	wood and steel works for doors	CO3
4	Methods for computation of earthwork	CO4
5	depreciation and method of estimating depreciation	CO5

Textbook:

1. Estimating & Costing, B. N. Dutta, Chand Publisher
2. Quantity Surveying- P.L. Basin S. Chand : New Delhi.
3. Estimating & Specification - S.C. Rangwala :: Charotar publishing house, Anand.

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Reference Books:

1. Text book of Estimating & Costing- G.S. Birde, Dhanpath Rai and sons : New Delhi.
2. A text book on Estimating, Costing and Accounts- D.D. Kohli and R.C. Kohli S. Chand : New Delhi.
3. Contracts and Estimates, B. S. Patil, University Press, 2006.

RAILWAYS, AIRPORTS AND TUNNELS

Course Code : 19CV6GCRAT | **Credits : 3**
L:P:T:S : 3:0:0 | **CIE Marks : 50**
Exam Hours : 03 | **SEE Marks : 50**
Hours/Week : 03 | **Total hours : 40**

Course Objectives

1. To expose the students about the fundamentals of transportation engineering like railways, airport, tunnel engineering with applications in the field
2. Students learn about concept of railway track, airport and tunnel engineering with fundamental design principles, detailing aspects, analysis and design of high speed tracks
3. Principles of site selection of site for harbours, tunnels and airports

	Course Outcome
CO1	Identify the different components of Railway tracks, Airports and Tunnels
CO2	Design the important geometric elements like railway track, runway, taxiway and other elements of airport and different tunnelling
CO3	Interpret the proper runway orientation through Wind Rose diagram
CO4	Identify the alignment requirements of tunnels, site selection and survey
CO5	Maintenance of track, understand the practical problems of tunnel and airport design
CO6	Understand the Location of various harbour and airport components

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2											
CO2	1		3									
CO3			2	3								
CO4		2										
CO5			2	3								
CO6	1											

Module	Content	Hours	Co's
1	RAILWAY ENGINEERING: Role of railways in transportation, Selection of Routes, Permanent way and its requirements, Gauges and types, Typical cross sections-single and double line B G track in cutting, embankment and electrified tracks, Coning of wheels and tilting of rails, Rails-Functions-requirements—types and sections length-defects-wear-creep-welding-joints, creep of rails	8	**CO1 CO2 CO3**
2	SLEEPERS AND BALLAST: Functions, requirements, Track fitting and fasteners-Dog spike, screw spike and Pandrol clip-Fish plates-bearing plates, Calculation of quantity of materials required for laying a track-Examples, POINTS AND CROSSING: Components of a turnout, Details of Points and Crossing, Design of turnouts with examples (No derivations) types of switches, crossings, track junctions Stations and Types, Types of yards, Signaling-Objects & yard	8	**CO2** **CO3**
3	GEOMETRIC DESIGN: Necessity, Safe speed on curves, Cant: cant deficiency-negative cant-safe speed based on various criteria,(both for normal and high speed tracks) Transition curve, Gradient and types, grade compensation, Examples on above.	8	**CO2 CO3 CO4**
4	Introduction, layout of an airport with component parts and functions, Site selection for airport, Aircraft characteristics affecting the design and planning of airport, Airport classification, Runway orientation using wind rose with examples, type – P diagrams RUNWAY- Basic runway length-Corrections and examples, Runway geometrics, **Taxiway**-Factors affecting the layout - geometrics of taxiway-Design of exit taxiway with examples,	8	**CO5**
5	TUNNEL ENGINEERING: Advantages and disadvantages, Size and shape of tunnels, Surveying-Transferring centre line, and gradient from surface to inside the tunnel working face, Weisbach triangle-Examples, Tunnelling in rocks- different methods, Tunnelling methods in soils-, Tunnel lining, Tunnel ventilation, vertical shafts, Pilot tunnelling, mucking and methods.	8	**CO6**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents of the unit**	**CO's**
1		**CO1, CO2,CO3**

	RAILWAY ENGINEERING: modern high speed track across different countries	
2	**SLEEPERS AND BALLAST:** Equipment-Turn table, Fouling mark, buffer stop, level crossing, track defects, and maintenance.	**CO2, CO3**
3	**GEOMETRIC DESIGN :**Design of high speed track with examples	**CO2, CO3, CO4**
4	**RUNWAY-:** study the planning and design of Bengaluru International airport	**CO5**
5	**TUNNEL ENGINEERING:** Bengaluru metro tunnel construction	**CO6**

Text Books:

1. Railway Engineering, Saxena and Arora, DhanpatRai& Sons, New Delhi.
2. Airport Planning and Design, KhannaArora and Jain, Nem Chand Bro, Roorkee

References:

1. Railway Engineering, Mundrey, McGraw Hill Publications.
2. Indian Railway Track, M MAgarwal, Jaico Publications, Bombay
3. Dock and Harbour Engineering, H P Oza& G H Oza, Charaotar Publishing House

EXTENSIVE SURVEY PROJECT

Course Code : 19CV6GLESP
L:P:T:S : 0:1:2:0
Exam Hours : 03
Hours/Week : 03

Credits : 2
CIE Marks : 50
SEE Marks : 50
Total hours : 30

Course Objectives:

1. Perform water supply and sanitation projects
2. Perform old tank project.

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

	Course Outcome
CO 1	Analyse the concepts of Site selection, Alignment of centre line of the proposed bund, Longitudinal and cross sections of the centre line.
CO 2	Design the Tracing of Capacity contours.
CO 3	Design of Waste weir and sluice points and Canal alignment.
CO 4	Design of water supply and sanitary project for a village/town/city.
CO 5	Investigation for restoration of old tank projects.
CO 6	Choose the alternate routes for alignments and final alignment in highway projects.

Mapping of Course outcomes to Program outcomes:

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

CO6	3	2										

Module	Content	Hours	CO's
1	Collection of toposheet from Geological Survey of India, Digital elevation model, GIS, GPS & RS, Reconnaissance of the sites and fly leveling to establish bench marks.	6	CO3
2	NEW TANK PROJECTS: The work shall consist of i) Alignment of centerline of the proposed bund, Longitudinal and cross-sections of the centerline. ii) Capacity contours survey. iii) Details at Waste weir and sluice points. iv) Canal alignment.	6	CO5
3	WATER SUPPLY AND WASTEWATER MANAGEMENT: Examination of sources of water supply, Calculation of quantity of water required based on existing and projected population. Preparation of village map by any suitable method of surveying, location of sites for ground level and overhead tanks underground drainage system surveys for laying the sewers.	6	CO6
4	HIGHWAY PROJECT: Preliminary and detailed investigations to align a new road (min. 1 to 1.5 km stretch) between two obligatory points. The investigations shall consist of topographic surveying of strip of land for considering alternate routes and for final alignment. Report should justify the selected alignment with details of all geometric designs for traffic and design speed assumed. Drawing shall include key plan initial alignment, final alignment, longitudinal section along final alignment, typical cross sections of road, pavement design, components of highway	6	CO4
5	RESTORATION OF MINOR TANK PROJECTS: The work shall consist of i) Alignment of center line of the existing bund, Longitudinal and cross sections of the centre line. ii) Capacity contour surveys to explore the quantity. iii) Details at existing Waste weir and sluice points.	6	CO5

NOTE: 1. Survey work should be carried out using TOTAL STATION

2. Extensive survey is carried out for 6 to 10 days to expose to practical applications

3. Questions for CIE and SEE not to be set from self-study component.

4. Assignment Questions should be from self-study component only.

Self Study Component		
	Contents of the unit	**CO's**
1	Drone survey – Application, EDM	

TEXT BOOKS:

1. Highway engineering by Justo and Khanna
2. Surveying –II by B.C.Punimia
3. Irrigation Drawing by Murthy
4. Irrigation Engineering by B.C.Punimia

Assessment Pattern: Internal assessment is assessed based on the performance in fieldwork during survey camp for 50 marks and External assessment is assessed based on final project report and viva voice

GEOTECHNICAL ENGINEERING LABORATORY

Course Code : 19CV6GLGTE **Credits : 2**
L:P:T:S : 0:1:2:0 **CIE Marks : 50**
Exam Hours : 03 **SEE Marks : 50**
Hours/Week : 03 **Total hours : 40**

Course Objectives:

1. To have an understanding of detailing of structures and to generate the bar-bending schedule
2. To have a basic idea of quantity estimation of steel in different structural elements
3. To give an exposure to understand the design procedure and interpret the same in the Drawing

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

	Course Outcome
CO 1	Identification of gravel type, sand type, silt type and clay types
CO 2	Determine the grain size analysis of soil sample
CO 3	Perform In situ density by core cutter and sand replacement methods
CO 4	Conduct strength tests on different types of soil.
CO 5	Determine the Coefficient of permeability by constant head and variable head methods.
CO 6	Determination of compression index and coefficient of consolidation

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2									
CO2	2	1	2									
CO3	1	2	1									
CO4	2	1	1									
CO5	1	2	3									
CO6	2	1	1									

Module	Content	Hours	Cos

1	Identification of gravel type, sand type, silt type and clay types soils, Tests for determination of Specific gravity (for coarse and fine grained soils) and Water content (Oven drying method).	**3**	**CO1**
2	Grain size analysis of soil sample	**3**	**CO1,CO2**
3	In situ density by core cutter, sand replacement methods, hydrometer test	**3**	**CO3**
4	Consistency Limits – Liquid Limit (Casagrande and Cone Penetration Methods), plastic limit and shrinkage limit.	**6**	**CO1**
5	Standard Proctor Compaction Test and Modified Proctor Compaction Test, Deep compaction test	**3**	**CO2**
6	Coefficient of permeability by constant head and variable head methods.	**3**	**CO5**
7	Strength Tests and calculation of determining SBC using a. Unconfined Compression Test b. Direct Shear Test c. Triaxial Compression Test	**9**	**CO4**
8	Consolidation Test- Determination of compression index and coefficient of consolidation.	**4**	**CO6**
9	Determination of CBR value	**3**	**CO3**

REFERENCE BOOKS:

1. Soil Mechanics and Foundation Engg.- Punmia B.C. (2005), 16th Edition Laxmi Publications Co. , New Delhi.
2. BIS Codes of Practice: IS 2720(Part-3/Sec. 1) – 1987;
3. IS 2720 (Part – 2) - 1973; IS 2720 (Part – 4) – 1985; IS 2720 (Part – 5) – 1985; IS 2720 (Part – 6) – 1972; IS 2720 (Part – 7) – 1980; IS 2720 (Part – 8) – 1983; IS 2720 (Part– 17) – 1986;
4. Soil Testing for Engineers- Lambe T.W., Wiley Eastern Ltd., New Delhi.
5. Manual of Soil Laboratory Testing-Head K.H., (1986)- Vol. I, II, III, Princeton Press, London.
6. Engineering Properties of Soil and Their Measurements- Bowles J.E. (1988), - McGraw Hill Book Co. New York

GROUND IMPROVEMENT TECHNIQUES

Course Code :19CV6DEGIT **Credits : 3**
L:P:T:S : 3:0:0:0 **CIE Marks : 50**
Exam Hours : 03 **SEE Marks : 50**
Hours/Week : 03 **Total hours : 40**

Course Objectives

1. To consider the suitable soil improvement programme and types of Mechanical modification
2. To study the effect of compaction on soil and Hydraulic modification on soil.

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

	Course Outcome
CO 1	Evaluate different types of grouting techniques and suitable methods for different conditions
CO 2	Analyse the effect of compaction on soil sample.
CO 3	Analyse the different method of compaction on soil and suitable methods for different soil sample
CO 4	Assessment of ground condition for preloading, Electro kinetic dewatering.
CO 5	Explain the criteria for cement stabilization, Lime stabilization and their suitability, process and special effects.
CO 6	Explain hydraulic modification.

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2									
CO2	1	1	2									
CO3	1	2	3									
CO4	2	3	1									
CO5	3	2	1									
CO6	1	2	3									

Module	Content	Hours	Co's
1	Different types of grouting techniques and suitable methods for different conditions,. effect of compaction on soil sample different method of compaction on soil and suitable methods for different soil sample Ground Improvement: Definition, Objectives of soil improvement, Classification of ground improvement techniques, Factors to be considered in the selection of the best soil improvement technique. Mechanical Modification:, Aim of modification, compaction, Principle of modification for various types of soils.	8	**CO1** **CO2** **CO3**
2	Compaction: Effect of grain size distribution on compaction for various soil types like BC soil, lateritic soil, coarse-grained soil, micaceous soil. Effect of compaction on engineering behaviour like compressibility, swelling and shrinkage, relative density, liquefaction potential. Field compaction – static, dynamic, impact and vibratory type. Specification of compaction. Tolerance of compaction. Shallow and deep compaction.	8	**CO2** **CO3**
3	Hydraulic Modification: Definition, aim, principle, techniques. Gravity drain, lowering of water table, multistage well point, spacing of well points, Drainage & Preloading: Drainage of slopes. Preloading, vertical drains, sand drains. Assessment of ground condition for preloading, Electro kinetic dewatering.	8	**CO2** **CO3** **CO6**
4	Chemical Modification: Definition, aim, special effects, and methods. Admixtures, cement stabilization. Hydration – effect of cement stabilization on permeability, Swelling and shrinkage. Criteria for cement stabilization. Lime stabilization – suitability, process, special effects, criteria for lime stabilization other chemicals, chlorides, hydroxides, lignin, hydrofluoric acid. Properties of chemical components, reactions and effects. Bitumen, tar or asphalt in stabilization.	8	**CO5**
5	Grouting: Introduction, Effect of grouting. . Chemicals and materials used. Types of grouting. Grouting procedure. Miscellaneous methods: Only concepts of thermal methods, crib walls, gabions, Mattresses.	8	**CO1**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents of the unit**	**CO's**
1	**Introduction:** Type of mechanical modification.	**CO1,CO2 CO3**
2	**Compaction:** Effect of compaction on permeability of soil.	**CO2 CO3**
3	**Hydraulic Modification:** Vacuum dewatering	**CO2,CO3 CO6**
4	**Chemical Modification**: Stabilization using Fly ash	**CO5**
5	**Grouting:** Applications of grouting.	**CO1**

Text Books:

1. Ground Improvement Techniques- Purushothama Raj P. (1999) Laxmi Publications, New Delhi.
2. Construction and Geotechnical Method in Foundation Engineering- Koerner R.M. (1985) - McGraw Hill Pub. Co., New York.

Reference Books:

1. Engineering principles of ground modification- Manfred Haussmann (1990) - McGraw Hill Pub. Co., New York.
2. Methods of treatment of unstable ground- Bell, F.G. (1975) Butterworths, London.
3. Expansive soils- Nelson J.D. and Miller D.J. (1992) -, John Wiley and Sons.
4. Soil Stabilization; Principles and Practice- Ingles. C.G. and Metcalf J.B. (1972) – Butterworths, London.

DESIGN OF PRESTRESSED CONCRETE

Course Code : 19CV6DEPSC | **Credits : 3**
L:P:T:S : 3:0:0:0 | **CIE Marks : 50**
Exam Hours : 03 | **SEE Marks : 50**
Hours/Week : 03 | **Total hours : 40**

Course Objectives:

1. To understand the basics of PSC.
2. Design of PSC beams and end blocks.

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

	Course Outcome
CO 1	To choose and understand the importance of Prestressed Concrete structures.
CO 2	Identify the losses and cable profiles required for PSC structures.
CO 3	Examine the PSC structures for limit state of serviceability such as deflections and losses.
CO 4	Estimate the losses occurred during pre-tensioning of PSC beam
CO 5	Design the end blocks of Pre Stressed concrete structures
CO 6	Design of PSC beams according to code for limit state of collapse.

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1									
CO2	3	3	1									
CO3	3	2	2									
CO4	3	3	1									
CO5	3	1	1									
CO6	3	1	1									

Module	Content	Hours	Co's
1	**MATERIALS:** High strength concrete and steel, Stress-Strain characteristics and properties. **BASIC PRINCIPLES OF PRESTRESSING:** Fundamentals, Load balancing concept, Stress concept, Centre of Thrust. Pre-tensioning and posttensioning systems, tensioning methods and end anchorages.	**8**	**CO3**
2	**ANALYSIS OF SECTIONS FOR FLEXURE:** Stresses in concrete due to pre-stress and loads, stresses in steel due to loads, Cable profiles. **LOSSES OF PRE-STRESS:** Various losses encountered in pre-tensioning and post tensioning methods, determination of jacking force.	**8**	**CO2**
3	**DEFLECTIONS:** Deflection of a pre-stressed member – Short term and long term deflections, Elastic deflections under transfer loads and due to different cable profiles. Deflection limits as per IS 1343. Effect of creep on deflection, load verses deflection curve, methods of reducing deflection	8	**CO1**
4	**LIMIT STATE OF COLLAPSE:** Flexure -IS Code recommendations – Ultimate flexural strength of sections. **LIMIT STATE OF COLLAPSE (cont…):** Shear - IS Code recommendations, shear resistance of sections, shear reinforcement. Limit state of serviceability – control of deflections and cracking.	8	**CO4**
5	**DESIGN OF END BLOCKS:** Transmission of prestress in pretensioned members, transmission length, Anchorage stress in post-tensioned members. Bearing stress and bursting tensile force-stresses in end blocks-Methods, I.S. Code, provision for the design of end block reinforcement. **DESIGN OF BEAMS:** Design of pre-tensioned and post-tensioned symmetrical and asymmetrical sections. Permissible stress, design of prestressing force and eccentricity, limiting zone of pre-stressing force cable profile. Introduction to Post Tension slab	8	**CO5**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

REFERENCE BOOKS:

1. Pre-stressed Concrete- N. Krishna Raju - Tata Mc. Graw Publishers.
2. Pre-stressed Concrete- P. Dayarathnam : Oxford and IBH Publishing Co.
3. Design of pre-stressed concrete structures- T.Y. Lin and Ned H. Burns - John Wiley & Sons, New York.
4. IS : 1343 : 1980
5. Pre-stressed Concrete- N. Rajgopalan

Self Study Component		
Module	**Contents**	**CO's**
1	Centre of Thrust, end anchorages	CO1
2	Determination of jacking force, Cable profiles	CO3
3	Methods of reducing deflection,	CO5

4	Limit state of serviceability – control of deflections and cracking.	CO6

ENVIRONMENTAL IMPACT ASSESSMENT

Course Code : 19CV6IEEIA
L: P: T: S : 3:0:0:0
Exam Hours : 03
Hours/Week : 03

Credits : 3
CIE Marks : 40
SEE Marks : 50
Total hours : 40

Course Objectives:

1. Develop Step-by-step procedures for conducting EIA.
2. Overview of the concepts, methods, issues and various forms and stages of the EIA Process

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

	Course Outcome
CO 1	Develop Step-by-step procedures for conducting EIA.
CO 2	Assess and Predict Impacts on different Attributes.
CO 3	Develop frame work of Impact Assessment.
CO 4	Discuss the different steps within environmental impact assessment
CO 5	Analyse how to liaise with and the importance of stakeholders in the EIA process
CO 6	Identify the major principles of environmental impact assessment in India

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1									
CO2	3	3	1									
CO3	3	3	1									
CO4	3	3	1									
CO5	3	1	1									
CO6	3	1	1									

Module	Content	Hours	Co's
1	Development Activity and Ecological Factors EIA, Rapid and Comprehensive EIA, EIS, FONSI. Baseline Information, Step-by-step procedures for conducting EIA, Limitations of EIA.	8	**CO1 CO2 CO3**
2	Frame work of Impact Assessment. Development Projects-Environmental Setting, Objectives and Scope, Contents of EIA, Methodologies, Techniques of EIA. Assessment and Prediction of Impacts on Attributes Air, Water, Noise, Land Ecology, Soil, EIA guidelines for Development Projects, Rapid and Comprehensive EIA.	8	**CO2 CO3**
3	Public Participation in Environmental Decision making. Practical Considerations in preparing Environmental Impact Assessment and Statements.	8	**CO2 CO3 CO4**
4	Salient Features of the Project Activity-Environmental Parameter Activity Relationships- Matrices.	8	**CO5**
5	EIA for Water resource developmental projects, Highway projects: Nuclear- Power plant projects, Mining project (Coal, Iron ore), Infrastructure Construction Activities.	8	**CO6**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.
2. Assignment Questions should be from self-study component only.

Self-Study Component		
Unit	**Contents of the unit**	**CO's**
1	Need for EIA Studies	
2	Cultural and Socio-economic Environment.	
3	NIL	
4	NIL	
5	EIA for Thermal Power Plant	

TEXT BOOKS:

1. Environment Impact Assessment. - Anjaneyalu. Y.

REFERENCES BOOKS:

1. Environmental Impact Analysis-Jain R.K.-Van Nostrand Reinhold Co.
2. Guidelines for EIA of developmental Projects Ministry of Environment and Forests, GOI.
3. Environment Impact Assessment - Larry W. Canter – McGraw Hill Publication.