



III – Semester

Sl. No.	Course Code	Course Title	Teaching Department	Hrs. / Week			Credits	Examination Marks		
				L	T	P		CIE	SEE	Total
1	P18MA31	+ / ++ Engineering Mathematics – III	MA	4	-	-	4	50	50	100
2	P18CV32	Building Materials and Construction	Civil	3	-	-	3	50	50	100
3	P18CV33	Concrete Technology	Civil	3	-	-	3	50	50	100
4	P18CV34	Basic Surveying	Civil	3	-	-	3	50	50	100
5	P18CV35	Fluid Mechanics	Civil	3	-	-	3	50	50	100
6	P18CV36	Strength of Materials [Foundation course -1]	Civil	2	2	-	3	50	50	100
6	P18CVL37	Construction Materials Testing Laboratory	Civil	-	-	3	1.5	50	50	100
7	P18CVL38	Computer Aided Building Planning and Drawing	Civil	-	-	3	1.5	50	50	100
8	P18HU39	#Aptitude and Reasoning Development - Basics (ARDB)	HM	2	-	-	-	50	-	-
9	P18HUDIP310	*Comprehensive Communication Development (CCD)	HM	2	-	-	[2]	[50]	[50]	[100]
10	P18HUDIP311	*Indian Constitution, Human Rights & Professional Ethics (ICHRPF)	HM	2	-	-	-	(50)	-	-
11	P18MADIP31	*Additional Mathematics - I	MA	4	-	-	-	(50)	-	-
Total							22	400	400	800
Total							[24]	[450]	[450]	[900]

* CCD / ICHRPF / Additional Mathematics-I: Lateral entry (i.e. Diploma) students shall have to pass these mandatory learning courses before completion of VI- Semester. CIE only for 50 marks.
 #ARDB: All students shall have to pass this mandatory learning courses before completion of VI- Semester
 + Common to BE (AU, CV, ME and I&PE)
 ++ Common to BE (CS, EC, E&E and IS&E)

IV – Semester

Sl. No.	Course Code	Course Title	Teaching Department	Hrs. / Week			Credits	Examination Marks		
				L	T	P		CIE	SEE	Total
1	P18MA41	+ / ++ Engineering Mathematics - IV	MA	4	-	-	4	50	50	100
2	P18CV42	Hydrology and Irrigation Engineering	Civil	3	-	-	3	50	50	100
3	P18CV43	Transportation Engineering	Civil	3	-	-	3	50	50	100
4	P18CV44	Advanced Surveying	Civil	3	-	-	3	50	50	100
5	P18CV45	Hydraulics & Hydraulic Machines	Civil	3	-	-	3	50	50	100
6	P18CV46	Basic Structural Analysis [Foundation course –II]	Civil	2	2	-	3	50	50	100
7	P18CVL47	Surveying Practice	Civil	-	-	3	1.5	50	50	100
8	P18CVL48	Hydraulics and Hydraulic Machines Laboratory	Civil	-	-	3	1.5	50	50	100
9	P18HU49	Aptitude and Reasoning Development - Intermediate (ARDI)	HM	2	-	-	1	50	50	100
10	P18EVDIP50	*Environmental Studies	HM	2	-	-	-	(50)	-	-
11	P17MADIP41	*Additional Mathematics - II	MA	4	-	-	-	(50)	-	-
Total							23	450	450	900

* Additional Mathematics-II & Environmental Studies: Lateral entry (i.e. Diploma) students shall have to pass these mandatory learning courses before completion of VI- Semester. CIE only for 50 marks.
 + Common to BE (AU, CV, ME and I&PE)
 ++ Common to BE (CS, EC, E&E and IS&E)



Department of Civil Engineering
P.E.S College of Engineering, Mandya, (An Autonomous Institution under VTU)

V Semester

Sl.no	Course code	Course Title	Teaching Department	Hrs/Week			Credits	Examination Marks		
				L	T	P		CI E	SE E	Total
1	P18CV51	Construction Management & Entrepreneurship	Civil	4	-	-	4	50	50	100
2	P18CV52	Water Supply and Treatment	Civil	4	-	-	4	50	50	100
3	P18CV53	Analysis of Indeterminate Structures	Civil	4	-	-	4	50	50	100
4	P18CV54	Design of RC Structural Elements	Civil	4	-	-	4	50	50	100
5	P18CV55X	Professional Elective –I	Civil	2	2	-	3	50	50	100
6	P18CVL56	Concrete Laboratory	Civil	-	-	3	1.5	50	50	100
7	P18CVL57	Highway Laboratory	Civil	-	-	3	1.5	50	50	100
8	P18CVL58	Skill Oriented Laboratory – I	Civil	-	-	2	1	50	50	100
9	P18CV591	Technical Skills - I (Proficiency in Civil Engineering)	Civil	-	2	-	1	50	50	100
10	P18HU510	Aptitude and Reasoning Development - Advance(ARDD)	HM	-	2	-	1	50	50	100
Total							25	500	500	1000
P18CV55X : Professional Elective -I			Technical Skills -I							
Sl.no	Course Code	Course Title	Sl.no	Course Code	Course Title					
1	P18CV551	Applied Geology	1	P18CV591	Proficiency in Civil Engineering					
2	P18CV552	Matrix Method of Structural Analysis								
3	P18CV553	Construction Quality and Safety Management.								
4	P18CV554	Pavement Evaluation & Management								

VI –Semester

Sl. No.	Course Code	Course Title	Teaching Department	Hrs / Week			Credits	Examination Marks		
				L	T	P		CIE	SEE	Total
1	P18CV61	Waste Water Collection and Treatment	Civil	4	-	-	4	50	50	100
2	P18CV62	Geotechnical Engineering.-I	Civil	4	-	-	4	50	50	100
3	P18CV63	Advanced Design of RC Structures	Civil	4	-	-	4	50	50	100
4	P18 CV 64X	Professional Elective –II	Civil	2	2	-	3	50	50	100
5	P18 CVO65X	Open Elective -I	Civil	3	-	-	3	50	50	100
6	P18CVL66	Geotechnical Engineering Laboratory	Civil	-	-	3	1.5	50	50	100
7	P18CVL67	Extensive Surveying	Civil	-	-	3	1.5	50	50	100
8	P18CVL68	Skill Oriented Laboratory	Civil	-	-	2	1	50	50	100
9	P18HU693	Technical Skills– II (Internals of C Programming)	HM		2	-	1	50	50	100
Total							23	450	450	900
List of Electives										
P18CV64X : Professional Elective -II			P18CVO65X : Open Elective -I							
Sl. No	Course Code	Course Title	Sl.No	Course Code	Course Title					
1	P18CV641	Alternative Building Materials and Masonry Structures	1	P18CVO651	Building Science and Engineering.					
2	P18CV642	Reinforced Earth Structures	2	P18CVO652	Basic Transportation Engineering					
3	P18CV643	Solid Waste Management	3	P18CVO653	Occupational Health and Safety					
4	P18CV644	Traffic Engineering								



VII – Semester

Sl. no	Course Code	Course Title	Teaching Department	Hrs/Week			Credits	Examination Marks		
				L	T	P				
1	P18CV71	Quantity surveying and Contract Management	Civil	4	-	-	04	50	50	100
2	P18CV72	Design of Steel Structures	Civil	4	-	-	04	50	50	100
3	P18CV73	Applied Geotechnical Engineering	Civil	4	-	-	04	50	50	100
4	P18CV74X	Professional elective	Civil	2	1	-	03	50	50	100
5	P18CV75X	Open Elective –II	Civil	3	-	-	03	50	50	100
6	P18CVL76	Environmental Engineering laboratory	Civil	-	-	3	1.5	50	50	100
7	P18CVL77	CAD Laboratory - II	Civil	-	-	3	1.5	50	50	100
8	P18CV78	Project Work Phase – I and Project seminar	Civil	-	-	4	2	100	-	100
Total							23	450	350	800
List of Electives										
Professional Elective - III					Open Elective – II					
Sl.no	Course Code	Course Title	Sl.no	Course Code	Course Title					
1	P18CV741	Design of Bridges	1	P18CVO751	Environmental Impact Assessment					
2	P18CV742	Prefabricated structures	2	P18CVO752	Atmospheric Environmental Pollution and Control					
3	P18CV743	Open Channel Hydraulics	3	P18CVO753	Building services					
4	P18CV744	Advanced Foundation Design	4	P18CVO754	Remote Sensing and introduction to Geoinformatics					

VIII – Semester

Sl. no	Course Code	Course Title	Teaching Department	Hrs/Week			Credits	Examination Marks		
				L	T	P				
1	P18CV81	Pre stressed concrete structures	Civil	4	-	-	04	50	50	100
2	P18CV82X	Professional Elective - IV	Civil	2	1	-	03	50	50	100
3	P18CV83	Internship	Civil	-	-	-	02	50	-	50
4	P18CV84	Project Work Phase – II	Civil	-	-	-	06	100	100	200
5	P18CV85	Self study course & Seminar	Civil	-	-	04	02	50	-	50
Total							17	300	200	500
Professional Elective - IV										
Sl.no	Course Code	Course Title								
1	P18CV821	Earthquake resistant design of structures								
2	P18CV822	Ground Improvement Technique								
3	P18CV823	Environmental Impact Assessment								
4	P18CV824	Pavement Analysis and Design								



Course Title: QUANTITY SURVEYING AND CONTRACT MANAGEMENT			
Course Code: P18CV71	Semester: VII	L - T - P : H : 4-0-0: 04	Credits :04
Contact Period: Lecture: 52 Hr	Exam Hours :03 Hr	Weightage: CIE:50; SEE:50	
Prerequisites : Building planning and drawing, Design and drawing of RCC structures , Basic surveying.			

Course Learning Objectives (CLOs)

The main objective of this course is to,

1. Understand the various drawings and to learn the calculation of quantities of materials
2. Learn the definition and objective of specifications
3. Learn the rate analysis
4. Compute the earthwork for roads
5. Learn various concepts of contracts

Course Content

UNIT - I

ESTIMATION: Study of various drawings with estimates, important terms, units of measurement, abstract of estimates. 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 with flat roof.

18 Hr

Self Study Component: Sloped RCC roofs with all Building components, Use of spread-sheets for preparation of estimates.

UNIT-II

ESTIMATES: Steel truss (Fink and Howe truss), manhole and septic tanks,

MEASUREMENT OF EARTHWORK FOR ROADS: Methods for computation of earthwork – cross sections – mid section formula or average end area or mean sectional area, trapezoidal & prismatic formula.

12 Hr

Self Study Component: Estimate of RCC slab and pipe culverts. Estimate of metalled road and premix carpeting.

UNIT-III

SPECIFICATIONS: Definition of specifications, objective of writing specifications, essentials in specifications, general and detail specifications of common item of works in buildings.

(Earth work in foundation, Cement concrete in foundation RCC works Class I and II brick works, Reinforced brickworks, plastering , pointing, C.C. flooring, color washing painting on ironwork, wood work painting, stone masonry G.I. Sheet roofing, Mangalore tile roofing).

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.

12 Hr

Self Study Component: Wood and steel works for doors, windows and ventilators.



UNIT-IV

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. Comparative statements, acceptance of contract documents and issue of work orders. Duties and liabilities, 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

Valuation: Gross income, net income, outgoings, scrap & salvage values, depreciation and method of valuation.

10 Hr

Self Study Component: – Preparation of bills.

TEXT BOOKS:

1. **Estimating and costing** – B. N. Dutta, UBS publishers Distributors Ltd, India.
2. **Quantity Surveying-** P.L. Basin S. Chand and company, New Delhi.
3. **Estimating & Specification** - S.C. Rangwala, Charotar publishing house, Anand.

REFERENCE BOOKS:

1. **Text book of Estimating & Costing-** G.S. Birde, DhanpathRai 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. **Estimation and costing** – H S Vishwanath, Sapna publications.
4. **P.W.D Schedule of Rates and N.B.C**

Note: Self study for 5 marks only in CIE and not in SEE

Course Outcomes (CO's)

After learning all the units of the course, the student is able to,

1. Apply the knowledge of engineering fundamentals for quantifying and cost estimate of buildings, roads, steel truss, man holes and septic tanks.
2. Evaluate the rate analysis for different items of buildings as per applicable specifications.
3. Demonstrate the calculation of Earth quantity for roads and canals.
4. Understand how to prepare a notice inviting tender document for bidding.



C. Evaluation Scheme

- UNIT-I is compulsory for 40 marks
- Student should answer One question each from UNIT-II, UNIT-III and UNIT-IV of 20 marks.

<u>Course Articulation Matrix</u>																
Sl. no	Course Outcomes (CO)	Program Outcomes											Program Specific Outcomes			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
1	Apply the knowledge of engineering fundamentals for quantifying and cost estimate of buildings, roads, steel truss, man holes and septic tanks	2												3		
2	Carry out rate analysis for different items of buildings as per applicable specifications		3		2				3						3	
3	Demonstrate the calculation of Earth quantity for roads and canals.			3											2	
4	Understand how to prepare a notice inviting tender document for bidding								2							3



Course Title: DESIGN OF STEEL STRUCTURES			
Course Code: P18CV72	Semester: VII	L - T - P : H : 4-0-0:4	Credits : 04
Contact Period: Lecture: 52 Hr	Exam Hours :03 Hr	Weight age: CIE:50; SEE:50	
Prerequisites : Strength of Materials, Structural analysis.			

Course Learning Objectives (CLOs)

The main objective of this course is to,

1. Learn the analysis and design of steel structures.
2. Understand the Codal provisions.
3. Learn different types of connections.
4. Learn the analysis and design of various components of steel structures.
5. Understand the plastic behaviour of steel structures.

Course Content **UNIT – I**

STEEL STRUCTURES AND CODAL SPECIFICATION: Advantages and Disadvantages of steel structures, Principles of Limit state method (LSM) of design, failure criteria for steel, codes, specifications and section classification.

ANALYSIS AND DESIGN OF BOLTED CONNECTION

Introduction to bolted connections, Behavior of Bolted joints, Design strength of ordinary Black Bolts, Design strength of High strength friction Grip bolts (HSFG), pin connections, simple Bolted connections of tension members. Efficiency of joints. Beam to Beam connections and Beam to Column framed connections.

10 Hr

Self Study Component: Loads and Load combinations, Design considerations.

UNIT – II

ANALYSIS AND DESIGN OF BOLTED CONNECTION: Moment resistant bracket connections, moment acting in the plane of joint, moment acting in the plane perpendicular to the joint.

WELDED CONNECTIONS:

Introduction, Advantages and disadvantages of welded connections, types of welds, strength of welds, Design of welded connections for tension members and bracket connections.

10 Hr

Self Study Component: Defects in weld



UNIT – III

DESIGN OF TENSION MEMBERS:

Introduction, types of tension members, Slenderness ratio, Behaviour of tension members, Modes of failure, Design strength of tension members, Design of splices, Design of tension members, Lug angles.

DESIGN OF COMPRESSION MEMBERS: Introduction, Failure modes, Strength of compression members, Sections used for compression members, Slenderness ratio, Effective length of compression members, Design of single section compression members.

10 Hr

Self Study Component: Prying forces

UNIT – IV

DESIGN OF COMPRESSION MEMBERS: Design of compression members- built up compression members. Design of lacing and battening system.

DESIGN OF COLUMN SPLICE AND BASES:

Design of column splices (for columns of same and different sections). Design of simple slab base and gusseted base.

12 Hr

Self Study Component: Grillage foundation

UNIT – V

INTRODUCTION TO PLASTIC BEHAVIOUR OF STRUCTURAL STEEL:

Introduction, Plastic theory, Plastic hinge concept and shape factors, Plastic collapse load, conditions of Plastic analysis, Theorem of Plastic analysis, Plastic analysis of continuous beams.

DESIGN OF BEAMS: Introduction, Beam types, lateral stability of beams, factors affecting lateral stability. Analysis and design of laterally supported and laterally unsupported beams, Check for deflection.

10 Hr

Self Study Component: Plastic Analysis of portal frames

TEXT BOOK:

1. **Design of Steel Structures** - N. Subramanian, Oxford.
2. **Design of steel structure** – Prof. V.L.Shah and Prof. Veena Gore, structure publication, standard publishers and distributors.

REFERENCE BOOKS:

1. **Design of steel Structures-** Ramachandra, vol I, standard book House.
2. **Comprehensive Design of steel Structures**, Dr. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications.
3. **Design of Steel Structures**, Duggal.
4. **Bureau of Indian standards** IS 800-2007, IS 875-1987.
5. Steel Tables.

Note: Self study for 5 marks only in CIE and not in SEE



Course Title: APPLIED GEOTECHNICAL ENGINEERING			
Course Code: P18CV73	Semester: VII	L - T - P : H : 4-0-0: 4	Credits :04
Contact Period: Lecture: 52 Hr	Exam Hours :03 Hr	Weight age: CIE:50; SEE:50	
Prerequisites : Geo-Technical Engineering -I			

Course Learning Objectives (CLOs)

The main objective of this course is to,

1. Gain the knowledge of Science and Geology to compute engineering properties of soil.
2. Sketch the flow nets for soil structures as per Laplace Equation.
3. Learn and analyze earth pressure and stability of slopes for design of earth retaining structures.
4. Evaluate and interpret bearing capacity and settlement data for design of footings.

Course Content

UNIT – I

SUB-SURFACE EXPLORATION: Importance of exploration program, Methods of exploration: Boring, sounding tests, geophysical methods- Electrical resistivity and Seismic refraction methods. Types of samples, undisturbed, disturbed and representative samples Samplers, sample disturbance, area ratio, Recovery ratio, clearance ratios, Stabilization of boreholes - Typical bore log. Number and depth of borings for various civil engineering structures.

DRAINAGE AND DEWATERING: Location of ground water table in fine and coarse grained soils. Determination of ground water level by Hvorselev's method. Dewatering- Ditches and sumps, well point system, Shallow well system, Deep well system, Vacuum Method, Electro- Osmosis method.

12 Hr

Self Study Component: Soil exploration report. Control of ground water during excavation.

UNIT – II

STRESSES IN SOILS: Boussinesq's and Westergaard's theories for concentrated, circular, rectangular, line and strip loads. Comparison of Boussinesq's and Westergaard's analysis. Nemark's chart.

FLOWNETS: Laplace equation (no derivation) assumptions and limitations only, characteristics and uses of flow nets, Methods of drawing flow nets for Dams and sheet piles. Estimating quantity of seepage and exit gradient. Determination of phreatic line in earth dams with and without filter. Piping and protective filter graded filter.

10 Hr

Self Study Component: contact pressure.

UNIT – III

LATERAL EARTH PRESSURE: Active and passive earth pressures, Earth pressure at rest, Earth pressure coefficient. Earth pressure theories- Rankine's and Coulomb's –assumptions and limitations, Graphical solutions for active earth pressure (cohesion less soil only) –Culmann's and Rebhann's methods, lateral earth pressure in cohesive and cohesion less soils.



Self Study Component: Earth pressure distribution.

UNIT – IV

STABILITY OF EARTH SLOPES: Types of slopes, causes and type of failure of slopes. Definition of factor of safety, Stability of finite and infinite slopes- Method of slices, Friction Circle method, Felineous method, Taylor's stability number.

10 Hr

Self Study Component: Infinite slopes

UNIT – V

BEARING CAPACITY: Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's and Brinch Hansen's bearing capacity equations-assumptions and limitations Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity. Plate load test, Standard penetration test, cone penetration test.

FOUNDATION SETTLEMENT: Settlement Analysis, Data for settlement analysis, computation of settlement, Concept, immediate, consolidation and secondary settlements (no derivations), Tolerance.

10 Hr

Self Study Component : BIS specifications for total and differential settlements of footings and rafts.

TEXT BOOKS:

1. Soil Mechanics and Foundation Engg.- Punmia B.C. (2005), 16th Edition Laxmi Publications Co., NewDelhi.
2. Soil Mechanics and Foundation Engineering- Murthy V.N.S.(1996), 4th Edition, UBS Publishers and Distributors, NewDelhi.
3. Soil Engineering in Theory and Practice- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.

REFERENCES:

- 1 Foundation Analysis and Design- Bowles J.E. (1996), 5th edition, McGraw Hill Pub. Co. New York.
- 2 Basic and Applied Soil Mechanics- Gopal Ranjan and Rao A.S.R.(2000), New Age International (P) Ltd., New Delhi.
- 3 Geotechnical Engineering- Venkatrahmaiah C. (2006), 3rd Edition New Age International (P) Ltd., New Delhi

Note: Self study for 5 marks only in CIE and not in SEE



Course Title: Design of Bridges			
Course Code: P18CV741	Semester: VII	L - T - P : H : 2-1-0: 3	Credits :03
Contact Period: Lecture: 52 Hr	Exam Hours :03 Hr	Weightage: CIE:50; SEE:50	
Prerequisites : Design of RCC Structures, Analysis of Indeterminate Structures.			

Course Learning Objectives (CLOs)

The main objective of this course is to,

1. Provide basic knowledge of mathematics, science and engineering in the design of bridges, using limit state design
2. Enable Student to identify, formulate and solve Engineering Problems on design of bridges.
3. Give procedural knowledge of Definition, components of bridge, Historical Developments, Site Selection for Bridges, Classification of Bridges, Survey and data collection for a bridge site selection, Hydraulic design, Design Discharge, linear water way, economical span, types of bridges, hydraulic design
4. Give procedural knowledge to design a system, component or process as per needs and specifications of different variety of bridges like slab culvert & T beam bridges subjected to various load combinations with different boundary conditions.
5. Provide factual knowledge on analysis and design of various types of bridges, R.C.C slab Culvert, Box Culvert, T beam Bridge

Course Content

UNIT – I

INTRODUCTION: Definition, components of bridge, Historical Developments, Site Selection for Bridges, Classification of Bridges, Survey and data collection for a bridge site selection, Hydraulic design, Design Discharge, linear waterway, economical span.

12 Hr

Self study component: The Student shall visit the nearby bridge site and understand the component parts of bridges

UNIT-II

SPECIFICATIONS OF ROAD BRIDGES: Indian road Congress Bridge code, carriageway, clearance, Forces on bridge, Review of IRC loadings, applications of loads on bridge such as dead load, live load, impact effect etc.

10 Hr

Self study component: Highway bridge loading standards of different countries.

UNIT – III

RCC SLAB CULVERT: Introduction, IRC loadings – Class AA, Class 70R, Class A and Class B, Bending Moment due to dead load and Live load. Structural Design and detailing of Slab Culvert.

10 Hr

Self study Component: Design of skew slab culvert.

UNIT - IV

BOX CULVERT: Loading Cases, IRC Class AA Tracked Vehicle, IRC Class AA Wheeled Vehicle, IRC Class A Loading, Moment Distribution, Structural Design and detailing of Box Culvert.

10 Hr

Self study component: Structural design of pipe culvert.



UNIT – V

T BEAM BRIDGE: Proportioning of Components, Analysis of Slab Using IRC Class AA Tracked Vehicle, Structural Design of Slab, Analysis of Cross Girder for Dead Load & IRC Class AA Tracked Vehicle, Structural Design of Cross Girder, Analysis of Main Girder Using COURBON’S Method, Calculation of Dead load BM and SF, Calculation of Live load B M & S F using IRC Class AA Tracked vehicle. Structural design and detailing of main Girder.

10 Hr

Self study component: Distribution of live load on longitudinal Girders by Guyonmassonet method and Hendry jaegar method.

TEXT BOOK:

1. **Johnson D Victor**, Essentials of Bridge Engineering Oxford & IBH Publishing Co New Delhi
2. **Krishna Raju N**, Design of Bridges Oxford & IBH Publishing Co New Delhi

REFERENCE BOOK:

1. **Principles and Practice of Bridge Engineering** by S P Bindra, DhanpatRai & Sons New Delhi.
2. **Relevant IRC & IS codes.**

Note: Self study for 5 marks only in CIE and not in SEECourse.

Course Outcome

After learning all the units of the course, the student is able to,

1. Identify site locations for the bridges.
2. Understand the IRC loadings.
3. Analyse and design of slab culvert.
4. Analyse and design of box culvert and T Beam Bridge.

Course Articulation Matrix																	
Sl. No	Course Outcomes	Program Outcomes												Program Specific Outcomes			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	Identify site locations for the bridges	1													2		
2	Understand the IRC loadings.	1						2							1	1	
3	Analyse and design slab culvert.		2													2	
4	Analyse and design box culvert and T beam bridge.	2	2			2									1	2	



Course Title : PREFABRICATED STRUCTURES			
Course Code: P18CV742	Semester : VII	L-T-P : H : 2- 1 - 0 : 3	Credits :03
Contact Period : 52 Hr	Exam Hours :3 Hr	Weight age : CIE : 50% , SEE : 50%	
Prerequisites: Strength of materials, Structural analysis			

Course Learning Objectives (CLO's)

The main objective of this course is to,

1. Understand basic principles of modular construction and industrialized construction
2. Understand the behavior of Structural components.
3. Design prefabricated elements for Joint flexibility.
4. Understand the structural connection and Design of expansion joints.
5. Understand the effects Earthquakes, Cyclones, and importance of avoidance of progressive collapse

Course Content

Unit – I

INTRODUCTION: Need for prefabrication–Principles–Materials–Modular coordination–Standardization–Systems–Production–Transportation–Erection.

12 Hr

Self Study Components: Erection using different methods.

Unit – II

PREFABRICATED COMPONENTS: Behavior of structural components–Large panel constructions–Construction of roof and floor slabs–Wall panels–Columns–Shear walls.

10 Hr

Self Study Components: Construction of Shear walls by recent technology

Unit-III

DESIGN PROBLEMS: Joint flexibility–Allowance for joint deformation.

10 Hr

Self Study Components: Methods of Evaluation of Joint Flexibility

Unit-IV

JOINT IN STRUCTURAL MEMBERS: Joints for different structural connections–Dimensions and detailing–Design of expansion joints.

10 Hr

Self Study Components: Methods of determination of expansion joints.

UNIT-V

EFFECTS: Earthquakes, Cyclones, etc., Importance of avoidance of progressive collapse.

10 Hr

Self Study Components: Recent earthquakes and cyclones in India

Course Outcomes:

After studying this course, students will be able to:

1. Use modular construction, industrialized construction.
2. Analyze the behavior of prefabricated elements.
3. Design of elements for joint deformation and joint Flexibility.
4. Choose and suggest type of joint connections and detailing, understand importance of avoidance of progressive collapse.



Course Title : OPEN CHANNEL HYDRAULICS			
Course Code: P18CV743	Semester : VII	L-T-P : H : 2– 1 – 0 : 3	Credits :03
Contact Period : 52 Hr	Exam Hours :3 Hr	Weight age : CIE : 50% , SEE : 50%	
Prerequisites: Fluid Mechanics , Hydraulics			

Course Learning Objectives (CLO's)

The main objective of this course is to,

- 1 Understand the channel classifications, conservation equations for mass, momentum and kinetic energy in open channel flow, design of channels for uniform flow and standard channel sections.
- 2 Understand the concepts of critical depth in various channel sections, different methods to analyze the problems in gradually varied flow and rapidly varied flow.
- 3 Understand dynamic equation for wide rectangular channels, classification of channel bottom slopes, water surface profiles in different sloped channels,
- 4 Understand the characteristics of hydraulic jumps in rapidly varied flow and exponential channels, tail water curve and jump water curve.
- 5 Understand the application of hydraulic jump as energy dissipater and in various stilling basins, design of crest profile of spillway

Course content

UNIT -I

INTRODUCTION: Open channels, types, channels of first kind and channels of second kind, classification of flow, pressure and velocity distribution in open channel flow, energy equation, momentum equation, kinetic energy and momentum factors, Numericals.

UNIFORM FLOW: Concepts, uniform flow equations, conveyance of channel section, section factor for uniform flow, Normal slope and critical slope, hydraulic exponent for uniform flow, design of channels for uniform flow, standard channel sections, Numericals.

10 Hr

Self Study Component : Surges in open channels

UNIT -II

CRITICAL FLOW: Concept of specific Energy – Control sections. Calculation of critical depth for rectangular, triangular, circular and trapezoidal sections, Design of channel, Section Factor for critical flow, Hydraulic exponent for critical flow, critical depth as a flow measurement, problems.

GRADUALLY VARIED FLOW: Concepts, GVF equation, its different forms, Basic assumptions, Dynamic equation for wide rectangular channels, classification of channel bottom slopes, classification of water surface profiles in different sloped channels, Numericals.

11Hr

Self Study Component : Control Sections



UNIT -III

GRADUALLY VARIED FLOW COMPUTATIONS - Different methods, direct integration method- Chow's solution, Bresse's Solution, direct step method, standard step method and graphical integration method. Problems.

11 Hr

Self Study Component : Application of AI in generating Backwater curves in natural channels

UNIT -IV

RAPIDLY VARIED FLOW: Concepts, hydraulic jump in rectangular channels, classification of hydraulic jump based on Froude's number, characteristics of hydraulic jump, Tail water curve and jump water curve, classification of hydraulic jump based on tail water depth, Numericals.

10 Hr

Self Study Component : Hydraulic Jumps in Sloped Channels.

UNIT -V

STILLING BASINS & SPILLWAYS: Application of Hydraulic jump as energy dissipater, Stilling basins – type- II and type – IV, Spillways: Location of Spillway, Types of Spillways, Design consideration of overflow spillways (ogee spillway) – design of crest profile, Design of Syphon spillway, Numericals.

10 Hr

Self Study Component: Hydraulic Jump in Non-rectangular channels

Text Books :

- 1 Hydraulics and Fluid Mechanics including Hydraulic Machines. Dr. P N Modi and Dr. S M Seth, Standard Book house, New Delhi.
- 2 Flow through Open Channel: R G Rangaraju: Tata McGraw Hill Publishing Co Ltd, New Delhi.
- 3 Open Channel Hydraulics: K Subramanya: Tata Mc Graw Hill Publishing Co Ltd, New Delhi
- 4 Irrigation Engineering and Hydraulic Structures: S. K Garg, Khanna Publishers, Delhi

Reference Books :

- 1 Open Channel Hydraulics: Ven Tee Chow: Mc Graw Hill Book Company, New Delhi.
- 2 Open Channel Hydraulics: French: Mc Graw Hill Book Company, New Delhi.
- 3 Fluid Mechanics: Modi and Seth: Standard Book Home, New Delhi.
- 4 Open Channel Hydraulics: Henderson: Mr. Millan Publishing Co. Ltd., New York.

Note: Self study for 5 marks only in CIE and not in SEE

Course Outcomes

After studying this course, students will be able to:

1. Apply the knowledge of fluid mechanics, conservation equations for mass, momentum, and energy to develop a strong knowledge of open channel flow.



2. Analyze and compute flow profiles using various methods.
3. Develop and apply mathematical relationships for hydraulic jumps, critical, uniform, gradually-varying flow and rapidly varied flow.
4. Knowledge of open channel flow in future to work effectively either as an individual or as a team member to satisfy the changing professional and societal needs.

Course Articulation Matrix (CAM)

Sl no	Course Outcomes	Program outcomes												Program Specific outcomes					
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
1	To apply the knowledge of fluid mechanics, conservation equations for mass, momentum, and energy to develop a strong knowledge of open channel flow.	2															2		
2	To Analyze and compute flow profiles using various methods.		2	2														2	
3	To develop and apply mathematical relationships for hydraulic jumps, critical, uniform, gradually-varying flow and rapidly varied flow.		2															2	
4	Apply the knowledge of open channel flow in future to work effectively either as an individual or as a team member to satisfy the changing professional and societal needs.					2							2						2



Course Title: ADVANCED FOUNDATION DESIGN			
Course Code: P18CV744	Semester: VII	L - T - P : H : 2-1-0: 3	Credits : 03
Contact Period: Lecture: 52 Hr	Exam Hours :03 Hr	Weightage: CIE:50; SEE:50	
Prerequisites : Geo-technical Engineering.			

Course Learning Objectives (CLOs)

The main objective of this course is to,

1. Design shallow foundation
2. Design pile and well foundation
3. Understand the requirement of foundation on expansive soil
4. Know about machine foundation
5. Learn about soil dynamics

Course Content

UNIT – I

SHALLOW FOUNDATIONS: Presumptive bearing capacity according to BIS, Factors affecting bearing capacity, Factors influencing selection of depth of foundation, types of shallow foundations and Settlement of Shallow Foundations: Immediate, consolidation, & differential settlements. Principles of Design of footing, Proportioning of footings for equal settlement. Design of isolated footing, combined footing.

10 Hr

Self-Study Component:- Design of Strap footing, Strip footing and Raft.

UNIT – II

PILE FOUNDATIONS: Introduction Necessity of pile foundations, Classification, Load bearing capacity of single pile by Static formula, Dynamic formula, Pile load test and Penetration tests. Pile Groups: Introduction, group action of piles in sand and clay, group efficiency of piles, settlement of piles, negative skin friction & under reamed piles.

10 Hr

Self-Study Component:- settlement of under reamed piles.

UNIT – III

WELL FOUNDATIONS: Introduction, Different shapes and characteristics of wells. Components of well foundation. Forces acting on well foundation. Sinking of wells, Causes and remedies of tilts and shifts. Drilled piers: Introduction and construction.

10 Hr

Self-Study Component:- Advantages and disadvantages of drilled piers.

UNIT – IV

FOUNDATIONS ON EXPANSIVE SOILS: Introduction, Definition, Identification, Mineral Structure, Index properties of expansive soils, Swell potential and swell pressure, free swell, CNS



layer, foundation treatment for structures in expansive soil. Caissons: Design of open, pneumatic and floating caissons.

10 Hr

Self-Study Component:-Advantages and disadvantages of floating caissons

UNIT – V

MACHINE FOUNDATIONS: Introduction, Types of Machine foundations, basic definitions, degree of freedom of a block foundation, general criteria for design of machine foundation, free and forced vibrations, vibration analysis of a machine foundation, determination of natural frequency.

12 Hr

Self-Study Component:-Vibration isolation and control

Text Book:

1. **Soil Mechanics & Foundation Engineering** - V.N.S. Murthy -Pub: Sai Tech.
2. **Soil Mechanics Foundations** - Dr. B.C. Punmia -Pub :Laxmi publications, pvt. Ltd.
3. **Soil Mechanics and foundation Engineering-** K.R. Arora&A.K.Jain for standard publishers & Distributors.

REFERENCE BOOKS:

1. Pile Foundation.-Chellies, McGraw Hill Book Co., Inc., New York, 1951. 64.
2. Geotechnical Engineering.- P. Purushotham Raj, Pearson Publishers

Note: Self study for 5 marks only in CIE and not in SEE

Course Outcomes (CO's)

After studying this course, students will be able to:

1. Apply the knowledge of Geology and geotechnics to differentiate shallow & deep foundation
2. Analyze shallow and deep foundations for civil engineering structures
3. Evaluate Design shallow and deep foundation for civil engineering structures
4. Interpret data to select suitable foundation for expansive soil from safety consideration.



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Course Articulation Matrix																		
Sl.No.	Course Outcomes	Program Outcomes												Program Specific Outcomes				
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
1	Apply the knowledge of Geology and geo technics to differentiate shallow & deep foundation	2														2		
2	Analyze shallow and deep foundations for civil engineering structures		2														2	
3	Evaluate Design shallow and deep foundation for civil engineering structures			3													2	
4	Interpret data to select suitable foundation for expansive soil from safety consideration				3		3											3



Course Title: ENVIRONMENTAL IMPACT ASSESSMENT			
Course Code: P18CVO751	Semester: VII	L - T - P : H :2-1-0: 3	Credits : 03
Contact Period: Lecture: 52 Hr	Exam Hours :03 Hr	Weightage: CIE:50; SEE:50	
Prerequisites: Nil			

Course Learning Objectives (CLOs):

The main objective of this course is to,

1. Understand the procedure of conducting EIA
2. Analyze different methods of EIA
3. Conduct EIA for water, air and noise environment
4. Appreciate the need for public participation in EIA
5. Enumerate the method of conducting EIA for water resource project, Highway project, Iron mining project

Course Content

UNIT –I

INTRODUCTION: Basic concept of EIA, Definition of EIA, Elements of EIA, need for EIA, EIS, FONSI, Utility of EIA, Scope of EIA, Step by step procedure of conducting EIA, REIA, CEIA, Limitations of EIA,

12Hrs

Self-study component: Frame work of EIA

UNIT –II

E I A Methodologies: Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/Benefit Analysis.

10Hr

Self study component: cost/Benefit Analysis.

UNIT -III

Environmental Audit & Environmental legislation: Objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, on-site activities, evaluation of Audit data and preparation of Audit report.

Post Audit activities: The Environmental pollution Act, The water; Act, The Air (Prevention & Control of pollution Act.), Mota Act. Wild life Act.

10Hr



Self study component: Biodiversity Rules, 2004.

UNIT -IV

ASSESSMENT AND PREDICTION OF IMPACTS ON ATTRIBUTES –

Prediction and assessment of impacts of developmental activities on surface water, land and soil, groundwater, air, biological environment etc. Prediction and assessment of visual impacts, Socioeconomic impact analysis, Evaluation of alternatives, Preparing the EIA document, Environmental impact statement (EIS),

10Hr

Self study component: Causes and effects of deforestation.

UNIT –V

EIA Case Studies and Public participation

Case studies on -Thermal Power Plant, Mining, Fertilizer, Construction Projects, Public participation in environmental decision making, objectives of public participation and public participation techniques. Practical consideration in preparing in EIA and EIS

10Hr

Self-study component: : EIA Guidelines for developmental projects

Text Books

1. **“Environment Assessment Methodologies”** Y. Anjaneyulu and ValliManickam, B.S Publications, Hyderabad, 2007.
2. **“Environmental Impact Analysis”** R.K Jain, VanNostrand, - Reinhold Company, 1977.

Reference Books:

1. **“Environmental Impact Assessment”** S. SLarry W Canter, –McGraw – Hill International Editions, 1996.
2. Guidelines for EIA of Developmental Projects, Minister of Environment and Forests, GOI.



Course outcomes

After studying this course, students will be able to:

1. Understand the strengths of EIA in regard to environmental management. Appreciate the purpose and role of EIA in the decision-making process. Understand the technical and social/political limitations of EIA
2. Understand the Environmental Acts of India
3. Understand the Screening process, scoping process and how we applied in the different projects.
4. Assess and Predict Impacts on Attributes and have knowledge of EIA Report (Environmental Impact Statement, or Environmental Statement)

Course Articulation Matrix (CAM)

Sl.No	Course Outcome	Program outcome												Program Specific outcome						
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3				
1	Understand the strengths of EIA in regard to environmental management .Appreciate the purpose and role of EIA in the decision-making process. Understand the technical and social/political limitations of EIA.	1	2															1		
2	Understand the Environmental Act of India.	1	1	2														1		
3	Understand the Screening process, scoping process and how we applied in the different projects.		2	1															2	
4	Assess and Predict Impacts on Attributes and have knowledge of EIA Report (Environmental Impact Statement, or Environmental Statement)		1	2														1		



Course Title : ATMOSPHERIC ENVIRONMENTAL POLLUTION AND CONTROL			
Course Code: P18CVO752	Semester: VII	L - T - P : H : 2-1-0:3	Credits : 03
Contact Period: Lecture: 52 Hr	Exam Hours :03 Hr	Weightage: CIE:50; SEE:50	
Prerequisites : Nil.			

Course Learning Objectives (CLOs):

The main objective of this course is to,

1. Understand the knowledge of Air Pollution, characterization and classification.
2. Effects of Meteorology on Air pollution-Fundamentals.
3. Understand the Monitoring of Particulate matter.
4. Knowledge of air pollution controlling equipment.
5. Understand the effects of Indoor Air Pollution.

Course Content

UNIT -I

Introduction: Definition of Air Pollution, sources, characterization and classification of atmospheric pollutants, air pollution episodes. Effects of air pollutants on human health, vegetation, animals and materials and monuments. Composition and structure of the atmosphere; Visibility and other related atmospheric characteristics.

12Hr

Self study component : Visibility and other related atmospheric characteristics.

UNIT -II

Meteorology: Effects of Meteorology on Air pollution-Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns-Atmospheric Diffusion Theories-Dispersion models, plume rise.

10Hr

Self study component: gas exhaust analyzer. Air Pollution Index.

UNIT -III

Monitoring of particulate matter: Respirable, non-respirable and nano - particulate matter. Monitoring of gaseous pollutants – CO, CO₂, Hydrocarbons, SOX and NOX, photochemical oxidants. Monitoring equipment and sampling devices – stack sampling (Isokinetic sampling), air samplers, gas exhaust analyzer. Air Pollution Index

10Hr

Self study component: plume rise and effective stack height calculations.

UNIT -IV

Air Pollution Control Equipment: Mechanisms, Control equipment for particulate matter – gravity settling chambers, centrifugal collectors, wet collectors, scrubbers, fabric filters, electrostatic precipitator (ESP) - Design principles and criteria with design



Control Equipment for gaseous pollutants – adsorption, absorption, condensation and combustion. Design principles.

10Hr

Self study component: absorption, condensation and combustion. Design principles.

UNIT -V

Indoor Air Pollution : Sources, indoor air contaminants, effects and control. air changes per hour (ACH), IAQ Standards

Noise - sources, measurements, effects and occupational hazards. Standards, Noise mapping, Noise attenuation equations and methods, prediction equations, control measures, Legal aspects of noise

10Hr

Self study component: Legal aspects of noise

Text Books:

1. M. N. Rao and H V N Rao, Air pollution, Tata Mc-Graw Hill Publication.
2. H. C. Perkins, Air pollution. Tata McGraw Hill Publication. Mackenzie Davis and David Cornwell, Introduction to Environmental Engineering McGraw-Hill Co.

REFERENCES

1. Crawford, M., (1980), “Air Pollution Control Theory” - TATA McGrawHill.
2. Howard S. Peavy, Donald R. Rowe and George Technobanoglous., (2017) “Environmental Engineering” – McGraw Hill International Publications.
3. Stern, A.C., Air Pollution, Vol I, II, III.
4. Stern, A. C., (1977), “Air Pollution : The Effects of Air Pollution” – 3rd-Edition, Academic Press

Note: Self study for 5 marks only in CIE and not in SEE

Course Outcomes

After studying this course, students will be able to:

1. Understand the importance of composition and structure of atmosphere, sources, classification, effects of air pollutants, and measurement of air pollutants, air pollution standards and control regulations.
2. Understand the basic concepts of various meteorological factors which influence the dispersion of air pollutants and to create wind rose diagram, Gain Knowledge about the monitoring of particulate matter.
3. Prediction of dispersion of air pollutants using different models and to evaluate the plume rise using various model equations and get a fair knowledge on stack sampling.
4. Understand and analyze the basic mechanisms involved, working principles and design aspects of various air pollution controlling equipment's through demonstration. Understand the concept of Indoor Air Pollution and Noise Source and Control



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Course Articulation Matrix (CAM)																	
Sl.No	Course Outcome	Program outcome												Program Specific outcome			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	Understand the importance of composition and structure of atmosphere, sources, classification, effects of air pollutants, and measurement of air pollutants, air pollution standards and control regulations.	2	1												1		
2	Understand the basic concepts of various meteorological factors which influence the dispersion of air pollutants and to create wind rose diagram, Gain Knowledge about the monitoring of particulate matter.			1	1												2
3	Prediction of dispersion of air pollutants using different models and to evaluate the plume rise using various model equations and get a fair knowledge on stack sampling.	1	2	1										2			
4	Understand and analyze the basic mechanisms involved, working principles and design aspects of various air pollution controlling equipment's through demonstration. Understand the concept of Indoor Air Pollution and Noise Source and Control.	2	1		1											1	



Course : BUILDING SERVICES			
Course Code: P18CVO753	Semester: VII	L - T - P : H : 2-1-0: 3	Credits : 03
Contact Period: Lecture: 52 Hr	Exam Hours :03 Hr	Weightage: CIE:50; SEE:50	
Prerequisites : Nil			

Course Learning Objectives (CLO's)

The main objective of this course is to,

1. Gain the knowledge of different building services and their types used in buildings.
2. Understand requirements and constraints in providing building services suitable for buildings.
3. Determine design factors of building services suitable for buildings.
4. Understand concepts of Elevators & Escalators, their types, working principle & design principles and type of energy conservation technologies suitable for buildings.
5. Determine factors of building services like ventilation, thermal comfort & illumination in buildings.

Course content

UNIT - I

VENTILATION: Definition, Necessity, Functional Requirements of Ventilation, Types of Ventilation- Natural Ventilation and Artificial Ventilation. Sound Amplification Equipments- Necessity, Factors affecting, Mechanism of sound amplification.

Thermal comfort in buildings: Factors affecting, heat transfer through buildings, thermal properties of building materials, insulation materials for buildings. Communication systems-terminologies, necessity, systems of communication.

12 Hr

Self study component: Types of sound amplification equipments.

UNIT - II

ELECTRICAL WIRING: Planning of Electrical Supply System, - Systems of wiring- domestic and commercial buildings, - Materials and Devices used in Wiring. Earthing- Procedure and Types, Inspection and Testing of Installation, Electrical Supply layout and conventional symbols of electrical items.

Fire protection: Necessity, fire hazards, characteristics and types of fire resistant materials, fire load and its calculation, fire resistant construction – walls and columns, floors and roofs, wall openings, escape elements and strong room construction, fire protection equipment.

10 Hr

Self study component: General fire safety requirements.



UNIT - III

ILLUMINATION OF BUILDINGS: Definition, laws of illumination, principles of illumination, artificial lighting, day lighting, flood lighting, Introduction to various types of lamps.

Acoustics:-Definition of terminologies, Behaviour of Sound in enclosures, Acoustic materials-properties, Acoustical Defects & Remedies, design of assembly halls, theatre.

10 Hr

Self study component: Auditorium and musical Studio.

UNIT - IV

NOISE CONTROL IN BUILDINGS: Sound insulation-Materials, Types- Horizontal Barriers & Vertical Barriers. **Elevators** – Components of a typical elevator, types, working principle, principles of design of an elevator. **Escalator:** Necessity, Components of a typical escalator, working principle.

10 Hr

Self study component: Design considerations of escalator.

UNIT - V

ENERGY CONSERVATION IN BUILDINGS: Necessity, Advantages and Limitations , Introduction to Zero Energy Buildings& Green Buildings , Energy efficient building design-Passive solar design technique, Thermal storage, Cooling strategies, high performance insulation.

10 Hr

Self study component: LEED Certification for buildings.

TEXT BOOKS:

1. Mechanical and Electrical Systems in Buildings, by Tao, Prentice Hall publications
2. Building construction by B.C.Punmia, Laxmi Publications.
3. A Text Book on Building Construction by P.C.Varghese, Prentice Hall of India publications
4. Architectural Lighting by Bran David.
5. Acoustics and noise control-theory, design by S.K.Kandaswamy(Ed), practice-allied publishers

REFERENCE BOOKS:

1. Mechanical Services for Buildings by Eastop, Longman Publications.
2. IS SP41 and SP32-hand book on functional requirements of buildings.

Note: Self study is for 5 marks only in CIE and not in SEE



Course outcomes:

After studying this course, students will be able to;

1. Prepare the design factors for providing ventilation, thermal comfort & in construction of buildings.
2. Interpret the knowledge of design factors of electric and fire protection in building construction.
3. Prepare the design factors for providing illumination, acoustics and noise control construction of buildings.
4. Choose & suggest type of elevators & escalators based on working principle & design principles.

<u>Course Articulation Matrix (CAM)</u>																
Sl. No	Course Outcomes	Program outcome												Program Specific outcome		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
01	Prepare the design factors for providing ventilation, thermal comfort & in construction of buildings.			3									2		2	
02	Interpret the knowledge of design factors of electric and fire protection in building construction	1		2									2	2		
03	Prepare the design factors for providing illumination, acoustics and noise control construction of buildings.			3									2		2	
04	Choose & suggest type of elevators & escalators based on working principle & design principles.	1											2		2	



Course Title: REMOTE SENSING AND INTRODUCTION TO GEOINFORMATICS			
Course Code: P18CVO754	Semester: VII	L - T - P : H : 2-1-0: 3	Credits :03
Contact Period: Lecture: 52 Hr	Exam Hours :03 Hr	Weightage: CIE:50; SEE:50	
Prerequisites : Nil			

Course Learning Objectives (CLOs)

The main objective of this course is to,

1. Gain knowledge about advantages of using remote sensing over conventional methods, electromagnetic radiation and its various interactions and to understand the concept of GIS and GPS.
2. Acquire knowledge about active and passive sensors and various earth resource satellites - IRS, LANDSAT, SPOT, ENVISAT, CARTOSAT, RESOURCESAT, IKONOS, etc.
3. Learn image enhancements; interpret visual image and digital image processing and analysis of accuracy assessment of image classification.
4. Understand basic components of GIS and GPS and to analyze their work flow.
5. Apply the knowledge of Remote Sensing, GIS and GPS in various Engineering domains.

Course Content

UNIT- I

CONCEPTS AND FOUNDATIONS OF REMOTE SENSING: Introduction, definitions of remote sensing, energy sources and radiation principles, electromagnetic energy, electromagnetic spectrum, black body radiation, energy interactions in the atmosphere, energy interactions with earth surface features, spectral reflectance of vegetation, soil and water, atmospheric influences on spectral response patterns, an ideal remote sensing system, characteristics of real remote sensing, data acquisition and interpretation, applications remote sensing.

12 Hr

Self Study component: Acquisition of reference data, spectral reflectance curves.

UNIT- II

REMOTE SENSING PLATFORMS AND SENSORS: Remote sensing platforms, satellites and orbits, geostationary and sun synchronous satellites, earth resource satellites- IRS, LANDSAT, SPOT, ENVISAT, CARTOSAT, RESOURCESAT, IKONOS etc. Sensors- active and passive sensors, sensor resolutions, (spectral, spatial, radiometric and temporal) Creation of remote sensing data, Digital and photographic data. panchromatic, multispectral and hyper spectral data.

10 Hr

Self Study component: Indian and other major Earth resource satellites.



UNIT– III

VISUAL IMAGE INTERPRETATION AND DIGITAL IMAGE PROCESSING: Elements of visual image interpretation, image display and band combinations, true and false color composites, image histogram, image rectification and restoration, geometric correction, radiometric correction, Image enhancement, Image classification (Brief introduction only)- supervised and unsupervised, accuracy assessment of image classification. Image filtering- Low pass & high pass filters.

10 Hr

Self Study Component: Classification of mixed pixels, spectral rationing.

UNIT– IV

FUNDAMENTALS OF GEOGRAPHIC INFORMATION SYSTEM: Introduction, basics of GIS- definition of GIS, components of GIS, GIS work flow, GIS functions, and representing spatial data, Raster and vector data. Coordinate systems and map projections, spatial data, Non spatial data. GIS applications.

10 Hr

Self Study Component: Database models and management

UNIT– V

GLOBAL POSITIONING SYSTEM: Introduction, definition, components of GPS, operational principle, facts and limitations of GPS, GPS receivers, differential GPS, types of DGPS, GPS applications.

APPLICATIONS OF GIS: Use of RS & GIS in Water Resources, Natural Hazards, Agriculture, Mining.

10 Hr

Self Study Component: Map numbering, map projection and classification of map projections.

TEXT BOOKS:

1. Lillesand T.M., and R.W. Kiefer, —Remote sensing and Image interpretation”, 5th edition, John Wiley & Sons – 2014.
2. Manoj K. Arora, R.C. Badjatia, “Geomatics Engineering”, Nemichand& Bros. Roorkee – 2011.
3. G.S Srivastava, “Introduction to Geoinfomatics” McGraw hill - New Dehli -2014.

REFERENCE BOOKS:

1. Carcknell Arthur P.et.al – Introduction to remote sensing, 2nd edition - 2009
2. Introduction to GIS-Kang tsuang Chang- tata McGraw hill, New Dehli 2009.
3. Peter A. Burrough& Rachel A. McDonnel “Principles of geographic information systems”- (1998), Oxford University press, Great Britain.
4. Chang, “Geographical Information Systems”, McGraw Hill Book Co., 2007.



5. Kang - Tsung Chang, "Introduction to Geographic Information Systems", McGraw Hill Publishing, 2nd Edition, 2011.

Note: Self study for 5 marks only in CIE and not in SEE

Course outcomes

After studying this course, students will be able to;

1. Apply the knowledge of basic science and Engineering to understand the advantages of using remote sensing over conventional methods, electromagnetic radiation and its various interactions and to understand the concept of GIS and GPS.
2. Understand the various sensors and platforms used in remote sensing and identify the earth surface features from satellite images, creation of remote sensing data.
3. To interpret visual image and digital image processing and analysis of accuracy assessment of image classification.
4. Understand basic components of GIS and GPS and to analyze their work flow and to understand how remote sensing, GIS and GPS are used in various Engineering applications.

Course Articulation Matrix																			
Sl.no	Course Outcomes	Program Outcomes												Program Specific Outcomes					
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
1	Apply the knowledge of basic science and Engineering to understand the advantages of using remote sensing over conventional methods, electromagnetic radiation and its various interactions and to understand the concept of GIS and GPS.		2											1			1		
2	Understand the various sensors and platforms used in remote sensing and identify the earth surface features from satellite images, creation of remote sensing data.	1	2		2												1	2	
3	To interpret visual image and digital image processing and analysis of accuracy assessment of image classification.	2			2													2	
4	Understand basic components of GIS and GPS and to analyze their work flow and to understand how remote sensing, GIS and GPS are used in various Engineering applications.	2	2														2	2	



Course Title: ENVIRONMENTAL ENGINEERING LABORATORY			
Course Code: P18CVL76	Semester: VII	L - T - P : H : 0-0-3 : 3	Credits :1.5
Contact Period: Lecture: 39 Hr	Exam Hours :03 Hr	Weightage: CIE:50; SEE:50	
Prerequisites : Environmental Engineering			

Course Learning Objectives (CLOs)

To learn the basic test involved in determination of properties of water

Course Content

1	Determination of Solids in Sewage: Total Solids, Suspended Solids, Dissolved Solids, Volatile Solids, Fixed Solids, Settleable Solids.	3 Hr
2	Electrical conductivity. Determination of Chlorides and Sulphates	3 Hr
3	Determination of Alkalinity, Acidity and pH.	3 Hr
4	Determination of Calcium, Magnesium and Total Hardness.	3 Hr
5	Determination of Dissolved Oxygen. Determination of BOD.	3 Hr
6	Determination of COD.	3 Hr
7	Determination of percentage of available chlorine in bleaching powder, Residual Chlorine and Chlorine Demand.	3 Hr
8	Jar Test for Optimum Dosage of Alum, Turbidity determination by Nephelometer.	3 Hr
9	Determination of Iron. Phenanthroline method.	3 Hr
10	Determination of Fluorides SPANDS Method.	3 Hr
11	MPN Determination	3 Hr
12	Determination Nitrates by spectrophotometer.	3 Hr
13	Determination of sodium and potassium by flame photometer	3 Hr

REFERENCE BOOKS:

1. Manual of Water and Wastewater Analysis – NEERI Publication.

2. Standard Methods for Examination of Water and Wastewater (1995), American Publication – Association, Water Pollution Control Federation, American Water Works Association, Washington DC.

- 1. IS Standards:** 10500-2012, 2490-1974, 3360-1974, 3307-1974.
- 2. Chemistry for Environment Engineering.** Sawyer and McCarthy



Course Title: CAD LABORATORY –II			
Course Code: P18CVL77	Semester: VII	L - T - P : H : 0-0-3: 3	Credits :1.5
Contact Period: Lecture: 39 Hr	Exam Hours :03 Hr	Weightage: CIE:50; SEE:50	
Prerequisites : Computer Aided Building Planning & Drawing, Design of RC / Steel Structures.			

Course learning objectives:

This course will enable students to

1. Be aware of the Scale Factors, Sections of drawings,
2. Draft the detailing of RC and Steel Structural member.

PART-I

Detailing of RCC Structures

1. Beams – Simply supported, Cantilever and Continuous.
2. Slab – One way, Two way and One-way continuous.
3. Staircase – Doglegged
4. Column footing - Column and footing (Square and Rectangle).

(NOTE: Drawings to be prepared for given structural details. Also Bar Bending Schedule should be prepared for above drawings)

15Hr

PART-II

Detailing of Steel Structures

1. Connections – Beam to beam, Beam to Column by Bolted and Welded Connections.
2. Built-up Columns with lacings and battens
3. Column bases and Gusseted bases with bolted and welded connections.

(NOTE: Drawings to be prepared for given structural details)

15 Hr

PART-III

Structural Software

Analysis of 2D structural systems using STAAD Pro. (Continuous beams, Frames and Trusses)

09 Hr

Question paper pattern:

- Two questions shall be asked each from PART-I & II and student should answer any one.
- One full question should be answered from part-III.

Text Books:

1. N Krishna Raju, “Structural Design and Drawing of Reinforced Concrete and Steel”, University Press
2. Krishna Murthy, “Structural Design and Drawing – Concrete Structures”, CBS Publishers, New Delhi

Reference Books:

1. SP 34: Handbook on Concrete Reinforcement and Detailing, Bureau of Indian Standards
2. IS 13920:2016, Ductile Design and Detailing Of Reinforced Concrete Structures Subjected To Seismic Forces - Code of Practice, Bureau of Indian Standard.



Course Outcomes (CO's)

After studying this course, students will be able to;

1. Draw detailed drawings of R.C beams, slabs element, staircase and column footing for given structural details as per codal provisions.
2. Draw detailed drawings of steel connections for simple beam to beam and built up columns and column bases, draw detailed drawings of simple beam to beam and built up columns and column bases for given structural details.
3. Analyse 2D structural systems using **STAAD Pro.** (Continuous beams, Frames and Trusses)

Course Articulation Matrix (CAM)																	
Sl. No	Course Outcomes	Programme outcome												Programme specific outcomes			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	Understand basic concepts of beam, slab staircase and column footing, draw detailed drawings of beams, slabs element, staircase and column footing for given structural details.	1	2			3								1	1	2	
2	Understand basic concepts of steel connections for simple beam to beam and built up columns and column bases , draw detailed drawings of simple beam to beam and built up columns and column bases for given structural details.	1	2			3								1	1	2	
3	Analysis of 2D structural systems using STAAD Pro. (Continuous beams, Frames and Trusses)	1	2			3								1	1	2	



Course Title: DESIGN OF PRESTRESSED CONCRETE STRUCTURES			
Course Code: P18CV81	Semester: VIII	L - T - P : H : 4-0-0:4	Credits : 04
Contact Period: 52 Hr	Exam Hours :03 Hr	Weightage: CIE:50%; SEE:50%	
Prerequisites : Strength of Materials, Design of R.C.C. Structures			

Course Learning Objectives (CLOs)

The main objective of this course is to,

1. Understand the technique behind Pre-stressing of rectangular beams, I-sections, T-sections.
2. Analyse the Pre-Stressing Beams at transfer and at working.
3. Determine the losses and deflection occurring in PSC members due to various factors.
4. Study the different types of composite beam and its behaviour in flexure and shear.
5. Design the End Block of PSC beams and PSC beams for flexure.

Course Content

UNIT- I

MATERIALS, BASIC PRINCIPLES OF PRESTRESSING:

High strength concrete and steel, Stress-Strain characteristics and properties, Pre-tensioning and Post-tensioning systems, Cable profiles, Load balancing concept, Centre of Thrust, pressure line.

10 Hr

Self study component: End anchorages of Post-tensioning systems. Kern zone, Cracking Moment.

UNIT- II

ANALYSIS OF SECTIONS FOR FLEXURE:

Stresses in concrete due to pre-stress and loads for different types of cross sections.

10 Hr

Self study component: Stresses in steel due to loads, Numericals.

UNIT- III

LOSSES OF PRE-STRESS & DEFLECTIONS:

Various losses encountered in pre-tensioning and post tensioning methods, determination of jacking force. Deflections of pre-stressed members, Short term and long term deflections, Elastic deflections under transfer loads and due to different cable profiles. Deflections limits as per IS 1343-2012. Effect of creep on deflection.

12 Hr

Self study component: Total losses allowed for design, Load verses deflection curve, methods of reducing deflection, crack widths.



UNIT- IV

LIMIT STATE OF COLLAPSE:

Flexure: IS code recommendations, Ultimate flexural strength of sections.

Shear: IS code recommendations, shear resistance of sections, shear reinforcement.

10 Hr

Self study component: Numericals.

UNIT- V

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, IS code method provision for the design of end block reinforcement.

10 Hr

Self study component: Numericals.

Text Books:

1. N Krishna Raju, “**Pre - stressed Concrete**”, Tata Mcgraw Hill, New Delhi
2. N Rajagopalan, “**Pre - stressed Concrete**”, Narosa Publishing House, New Delhi

Reference Books:

1. Lin T Y and N H Burns, “**Design of Pre - stressed Concrete Structures**”, John Wiley and Sons, New York
2. G S Pundit and S P Gupta, “**Pre - stressed Concrete**”, C B S Publishers, New Delhi

Note: Self study is for 5 marks only in CIE and not in SEE

Course outcomes

After studying this course, students will be able to;

1. Apply the knowledge of the principles of Prestressing.
2. Analyze the stresses in PSC members under flexure.
3. Evaluate various losses, deflection in members, flexural strength, shear strength and principal tensile stresses in PSC members.
4. Design PSC beams for shear and End block design as per codal provisions.



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Course Articulation Matrix (CAM)																	
Sl.no	Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	Apply the knowledge of the principles of Prestressing.	2	2												2		
2	Analyze the stresses in PSC members under flexure.	2	3												2	3	
3	Evaluate various losses, deflection in members, flexural strength, shear strength and principal tensile stresses in PSC members.	2		3											2	2	
4	Design PSC beams for shear and End block design as per codal provisions.	2		3											2	3	



Course Title: EARTHQUAKE RESISTANT DESIGN OF STRUCTURES			
Course Code: P18CV821	Semester: VIII	L – T – P : 2 -1-0: 3	Credits: 03
Contact Period :52Hr	Exam: 03 Hr	Weightage: CIE: 50 %; SEE: 50%	
Prerequisites: Strength of Materials, Design of RCC Structures.			

Course Learning Objectives (CLOs)

The main objective of this course is to,

1. Fundamentals of engineering seismology.
2. Irregularities in building which are detrimental to its earthquake performance.
3. Computation of seismic lateral forces for framed and masonry structures.
4. Geotechnical consideration and ductile detailing of RCC building.
5. Retrofitting strategies of RC and Masonry building.

Course Content

UNIT - I

ENGINEERING SEISMOLOGY: Definitions, Classification of Earthquakes, Causes of Earthquakes, Internal structure of earth, Seismic waves, Theory of plate tectonics and seismic zoning of India, Intensity of earthquake and Magnitude of earth quake, Seismographs.

Earthquake Effects on Structures: Local site effects on behavior of building during earthquake, Earthquake monitoring and seismic instrumentation.

10 Hr

Self study Component: Torsional response of buildings, concept of response Spectrum analysis.

UNIT - II

BUILDING CONFIGURATION: Vertical irregularity and plan configuration problems, Seismo-resistant building architecture lateral load resistant systems, Continuous load path, Building characteristics, and other cause of damages. Lessons Learnt from Past Earthquakes on the Performance of the Buildings Effect of Structural Irregularities on seismic performance of RC buildings.

10 Hr

Self study Component: Do's and Don'ts for protection of life and property.

UNIT - III

CONCEPTS OF EARTHQUAKE RESISTANT DESIGN: Philosophy and principle of Earthquakes Resistant Design, Guidelines for Earthquakes Resistant Design, Structural system, types of buildings for seismic resistance. Failure mechanisms of in filled frame, analysis of in filled frames, Evaluation of Earthquake forces as per IS: 1893-part-I-2016.

10 Hr

Self study Component: Numericals.

UNIT - IV

EARTHQUAKE RESISTANT DESIGN OF RCC BUILDINGS – Ductility Considerations, requirement for ductility, Ductility ratio, structural ductility and factors affecting ductility, Ductile detailing of RC structures as per IS:13920-1993.

Geotechnical Earthquake Engineering: Dynamic behavior of soil, Dynamic design parameters of soil, Soil-structure interaction. Liquefaction, factors affecting liquefaction, effects and remedial



measures.

12 Hr

Self study Component: Confinement of concrete, special confining reinforcement, Geotechnical failure of foundations during earthquake.

UNIT - V

SEISMIC BASE ISOLATION AND RETROFITTING: Basic concept of seismic base isolation-Seismic Isolation systems. Seismic retrofitting strategies of RC buildings, Retrofitting of Masonry buildings.

10 Hr

Self study Component: Necessity of seismic evaluation, Methods of seismic evaluation.

TEXT BOOKS:

1. Pankaj Agarwal and Manish Shrikhande, Earthquake resistant design of structures, PHI, India.
2. S.K.Duggal, Earthquake resistant design of structures, Oxford university press, 2007.

REFERENCE BOOKS:

1. Chopra, A.K. Dynamics of structures, Prentice-Hall of India Pvt. Ltd. New Delhi.
2. S. R. Damodaraswamy and S. Kavitha, Basics of Structural Dynamics and Aseismic design, PHI Learning Private Limited, New Delhi.
3. IS-1893 – 2016(Part-I), Indian Standard Criteria for Earthquake Resistant Design of Structures, BIS, New Delhi.

Note: Self study for 5 marks only in CIE and not in SEE

Course Outcomes:

After studying this course, students will be able to;

1. Understand the basic knowledge of earth quakes and it's relation to structural systems
2. Apply the knowledge of engineering to conceptually design of structural systems against earthquakes.
3. Analyze and design of reinforced concrete structural systems subjected to earthquake forces
4. Summarize the retrofitting of RC and masonry structures.



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Course Articulation Matrix (CAM)																		
Sl.no	Course Outcomes	Program Outcomes												Program Specific Outcomes				
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
1	Understand the basic knowledge of earth quakes and it's relation to structural systems	2	2													2	2	
2	Apply the knowledge of engineering to conceptually design of structural systems against earthquakes.	2		3												2	3	
3	Analyze and design of reinforced concrete structural systems subjected to earthquake forces		2	3												2	3	
4	Summarize the retrofitting of RC and Masonry structures	2			2											2		2



Course Title: GROUND IMPROVEMENT TECHNIQUES			
Course Code: P18CV822	Semester: VIII	L – T – P – H : 2– 1– 0 : 3	Credits :03
Contact Period: Lecture: 52 Hr	Exam Hours :03 Hr	Weight age: CIE:50; SEE:50	
Prerequisites : Geotechnical Engineering			

Course Learning Objectives (CLOs)

The main objective of this course is to,

1. Study and understand the concepts of ground improvement techniques, mechanical modification and chemical modification for different types of soil.
2. Apply knowledge of mathematics, Science and Geotechnical Engineering to solve problems in the field of modification of ground required for construction of civil engineering structures.
3. Understand the concepts of chemical compaction, grouting and other miscellaneous methods.
4. Impart the knowledge of geosynthetics, vibration, grouting and Injection.

Course Content

UNIT – I

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: Type of mechanical modification, Aim of modification, compaction, Principle of modification for various types of soils.

Compaction: Effect of grain size distribution on compaction for various soil types like BC soil, lateritic soil, coarse-grained soil. Effect of compaction on engineering behavior like compressibility, swelling and shrinkage, permeability, relative density, liquefaction potential. Field compaction – static, dynamic, impact and vibratory type, Specification of compaction. Tolerance of compaction, Shallow and deep compaction.

10 Hr

Self-Study Component:- Effect of grain size distribution on compaction for various soil types like BC soil, lateritic soil, coarse-grained soil.

UNIT – II

HYDRAULIC MODIFICATION: Definition, aim, principle, techniques. Gravity drain, lowering of water table, multistage well point, vacuum dewatering. Discharge equations.

Drainage & Preloading: Drainage of slopes, preloading, vertical drains, sand drains. Assessment of ground condition for preloading, Electro kinetic dewatering.

10 Hr



Self-Study Component:- Design of dewatering system including pipe line effects of dewatering and pre-fabricated vertical drain

UNIT – III

CHEMICAL MODIFICATION-I: Definition, aim, special effects, and methods. Techniques – sandwich technique, admixtures, cement stabilization. Hydration – effect of cement stabilization on permeability, Swelling and shrinkage. Criteria for cement stabilization.

Chemical Modification-II: Lime stabilization – suitability, process, special effects, criteria for lime stabilization. Other chemicals, chlorides, hydroxides, lignin, hydrofluoric acid. Properties of chemical components, reactions and effects.

10 Hr

Self-Study Component:- Stabilization using Fly ash and bitumen, tar or asphalt in stabilization.

UNIT – IV

GROUTING: Introduction, Effect of grouting, Chemicals and materials used, Types of grouting. Grouting procedure. Applications of grouting.

Other methods: Introduction & concepts of Soil reinforcement, Crib walls, Gabions and Mattresses, Anchors, Rock bolts and soil nailing.

10 Hr

Self-Study Component:- Thermal methods of stabilization

UNIT – V

GEOSYNTHETICS: Introduction, Geosynthetics types-raw materials, woven, non-woven, knitted, bio-degradable, nets and girds, three-dimensional mats, composites, membranes, properties of geosynthetic- material and fiber properties, geometrical aspects, mechanical properties, hydraulic properties, durability, applications of geo-synthetics- separation, filtration and fluid transmission, reinforcement, containment and barriers.

12 Hr

Self-Study Component:- Woven, non-woven, knitted, bio-degradable, nets and girds, three-dimensional mats.

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 Hausmann (1990) - McGraw Hill Pub. Co., New York.
2. **Methods of treatment of unstable ground-** Bell, F. G. (1975) Butterworths, London.

Note: Self study for 5 marks only in CIE and not in SEE



Course Outcome

After studying this course, students will be able to;

1. Apply the knowledge of Geology & Geotechnical Engineering in Ground improvement techniques
2. Analyze Mechanical Modification Techniques for soils
3. Investigate chemical modification techniques for soils
4. Select appropriate geo-synthetics and grouting methods for ground Improvements for sustainability.

Course Articulation Matrix																			
Sl.no	Course Outcomes	Program Outcomes												Program Specific Outcomes					
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3			
1	Apply the knowledge of Geology & Geotechnical Engineering in Ground improvement techniques	2															2		
2	Analyze Mechanical Modification Techniques for soils		3															2	
3	Investigate chemical modification techniques for soils				3														2
4	Select appropriate geo-synthetics and grouting methods for ground Improvements for sustainability							3									1		



Course Title :ENVIRONMENTAL IMPACT ASSESSMENT			
Course Code: P18CV823	Semester: VIII	L - T - P : H :2-1-0: 3	Credits : 03
Contact Period: Lecture: 52 Hr	Exam Hours :03 Hr	Weightage: CIE:50; SEE:50	
Prerequisites: Environmental Engineering			

Course Learning Objectives (CLOs):

1. The student will understand the procedure of conducting EIA
2. The student will be able to analyze different methods of EIA
3. The student will be able to conduct EIA for water, air and noise environment
4. The students will appreciate the need for public participation in EIA
5. The students will enumerate the method of conducting EIA for water resource project, Highway project, Iron mining project

Course Content

UNIT –I

INTRODUCTION: Basic concept of EIA, Definition of EIA, Elements of EIA, need for EIA, EIS, FONSI, Utility of EIA, Scope of EIA, Step by step procedure of conducting EIA, REIA, CEIA, Limitations of EIA,

12Hrs

Self-study component: Frame work of EIA

UNIT –II

E I A Methodologies: Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/Benefit Analysis.

10Hr

Self study component: cost/Benefit Analysis.

UNIT -III

Environmental Audit & Environmental legislation: Objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, on-site activities, evaluation of Audit data and preparation of Audit report.



Post Audit activities: The Environmental pollution Act, The water; Act, The Air (Prevention & Control of pollution Act.), Mota Act. Wild life Act.

10Hr

Self study component: Biodiversity Rules, 2004.

UNIT -IV

ASSESSMENT AND PREDICTION OF IMPACTS ON ATTRIBUTES –

Prediction and assessment of impacts of developmental activities on surface water, land and soil, groundwater, air, biological environment etc. Prediction and assessment of visual impacts, Socioeconomic impact analysis, Evaluation of alternatives, Preparing the EIA document, Environmental impact statement (EIS),

10Hr

Self study component: Causes and effects of deforestation.

UNIT –V

EIA Case Studies and Public participation

Case studies on -Thermal Power Plant, Mining, Fertilizer, Construction Projects, Public participation in environmental decision making, objectives of public participation and public participation techniques. Practical consideration in preparing in EIA and EIS

10Hr

Self-study component: EIA Guidelines for developmental projects

Text Books

1. “**Environment Assessment Methodologies**” Y. Anjaneyulu and ValliManickam, B.S Publications, Hyderabad, 2007.
2. “**Environmental Impact Analysis**” R.K Jain, VanNostrand, - Reinhold Company, 1977.

Reference Books:

1. “**Environmental Impact Assessment**” S. SLarry W Canter, –McGraw – Hill International Editions, 1996.
2. Guidelines for EIA of Developmental Projects, Minister of Environment and Forests, GOI.

Note: Self study for 5 marks only in CIE and not in SEE



Course outcomes

After studying this course, students will be able to;

1. Understand the strengths of EIA in regard to environmental management. Appreciate the purpose and role of EIA in the decision-making process. Understand the technical and social/political limitations of EIA
2. Understand the Environmental Acts of India
3. Understand the Screening process, scoping process and how we applied in the different projects.
4. Assess and Predict Impacts on Attributes and have knowledge of EIA Report (Environmental Impact Statement, or Environmental Statement)

Course Articulation Matrix (CAM)																				
Sl.No	Course Outcome	Program outcome												Program Specific outcome						
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3				
1	Understand the strengths of EIA in regard to environmental management .Appreciate the purpose and role of EIA in the decision-making process. Understand the technical and social/political limitations of EIA.		1	2															1	1
2	Understand the Environmental Act of India.		1	1	2														1	1
3	Understand the Screening process, scoping process and how we applied in the different projects.			2	1														2	
4	Assess and Predict Impacts on Attributes and have knowledge of EIA Report (Environmental Impact Statement, or Environmental Statement)			1	2														1	



Course Title: PAVEMENT ANALYSIS AND DESIGN			
Course Code: P18CV824	Semester: VIII	L – T – P – H : 2– 1– 0 : 3	Credits : 03
Contact Period: Lecture: 52 Hr	Exam Hours :03 Hr	Weight age: CIE:50; SEE:50	
Prerequisites : Transportation Engineering			

Course Learning Objectives (CLOs)

The main objective of this course is to,

1. Gain knowledge of science and engineering to acquire the fundamentals of various factors affecting design and performance of pavements.
2. Calculate the stresses and deflection in flexible pavements.
3. Calculate the stresses and deflection in rigid pavements.
4. Design of flexible pavements by IRC method.
5. Design of rigid pavements by IRC method.

Course Content

UNIT – I

INTRODUCTION: Factors Affecting Pavement Design, Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types, Tire Pressure, Contact Pressure, EAL and ESWL Concept, Lane Distributions & Vehicle Damage Factors.

10 Hr

Self study component:-Effect of Transient & Moving Loads.

UNIT – II

STRESSES AND DEFLECTIONS IN FLEXIBLE PAVEMENTS: Stresses and deflections in homogenous masses. Burmister's two-layer theory, three layer and multilayer theories, Problems on above.

10 Hr

Self study component:-Application of two layer theory in flexible pavement design.

UNIT – III

FLEXIBLE PAVEMENT DESIGN: Design Methods Principle, Empirical, semi- empirical and theoretical design approaches, design steps, advantages and applications of different pavement design methods – CBR, McLeod, IRC.

10 Hr

Self study component:-Asphalt Institute method of pavement design



UNIT – IV

STRESSES IN RIGID PAVEMENTS: Factors affecting design and performance of pavements. Types of stresses and causes, factors influencing the stresses, general considerations in rigid pavement analysis, EWL, wheel load stresses, warping stresses, frictional stresses, combined stresses. Problems on above.

10 Hr

Self study component:- Westergaard's analysis of rigid pavements

UNIT – V

RIGID PAVEMENT DESIGN: Types of joints in cement concrete pavements and their functions, joint spacing, design of CC pavement for roads and runways, design of joint details for longitudinal joints, contraction joints and expansion joints. IRC method of design by stress ratio method. Problems on above. White topping, Sustainability concepts in pavement design.

12 Hr

Self study component:- Design of continuously reinforced concrete pavements.

TEXT BOOK:

1. Yoder, E.J., and Witczak, 'Principles of Pavement Design', 2nd ed. John Wiley and Sons, 1975.
2. Yang, 'Design of Functional Pavements', McGraw Hill Book Co.
3. Khanna and Justo, 'Test Book of Highway Engineering' Nemchand brothers, Roorke-2004.

REFERENCE BOOKS:

1. Relevant IRC codes
2. Principles of Transportation Engineering- Partha Chakra Borthy, Prentice- Hall.
3. Specifications for Roads and Bridges- MoRT& H, IRC, New Delhi
4. HRB/TRB/IRC/International Conference on Structural Design of Asphalt Pavements.

Note: Self study for 5 marks only in CIE and not in SEE

Course Outcomes

After learning all the units of the course, the student is able to

1. Apply the knowledge of science and engineering to acquire the fundamentals of various factors affecting design and performance of pavements.
2. Calculate the stresses and deflection in flexible pavements.
3. Calculate the stresses and deflection in rigid pavements.
4. Design flexible and rigid pavements.

