Syllabus for B.E. VII & VIII Semester

(With effect from 2015 - 16 Academic year)

ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕವರ್ಷ 2015–16)

Bachelor Degree
In
Civil Engineering
Out Come Based Education
With
Choice Based Credit System

P.E.S. COLLEGE OF ENGINEERING,

MANDYA - 571 401, KARNATAKA

(An Autonomous Institution Affiliated to VTU, Belagavi)
Grant -in- Aid Institution (Government of Karnataka)
Accredited by NBA, New Delhi & Approved by AICTE, New Delhi.

ಪಿ.ಇ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ

ಮಂಡ್ಯ–571 401, ಕರ್ನಾಟಕ

(ವಿ.ಟಿ.ಯು, ಬೆಳಗಾವಿ ಅಡಿಯಲ್ಲಿನ ಸ್ವಾಯತ್ತ ಸಂಸ್ಥೆ)

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PREFACE

PES College of Engineering, Mandya, started in the year 1962, has become autonomous institute in the academic year 2008-09. Since, then it has been doing the academics and assessment activities successfully. The college is running eight undergraduate and eight Postgraduate programs including MBA and MCA which are affiliated to VTU, Belagavi.

India has recently become a Permanent Member of the Washington Accord. The accord was signed by the National Board of Accreditation (NBA) on behalf of India on 13th June 2014. It enables not only the mobility of our degree globally but also establishes equivalence to our degrees with that of the member nations. The implementation of Outcome Based Education (OBE) has been the core issue for enabling the equivalence and of Indian degrees and their mobility across the various countries.

Our Higher Educational Institution has adopted the Choice Based Credit System (CBCS) based semester structure with OBE scheme and grading system. Which provides the flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. There lies a shift in thinking, teaching and learning process moving towards Students Centric from Teachers Centric education which enhances the knowledge, skills & moral values of each student.

Choice Based Credit System (CBCS) provides the options for the students to select from the number of prescribed courses. The CBCS provides a 'cafeteria' type approach in which the students can Choose electives from a wide range of courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, adopt an interdisciplinary approach for learning which enables integration of concepts, theories, techniques. These are greatly enhances the skill/employability of students.

In order to increase the Industry/Corporate readiness, many Soft Skills, self learning components and Personality Development modules have been added to the existing curriculum. In order to enhance creativity and innovation Mini Project and Industrial visit & Interaction are made mandatory for all undergraduate programs.

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PES College of Engineering

VISION

"PESCE shall be a leading institution imparting quality Engineering and Management education developing creative and socially responsible professionals."

MISSION

- Provide state of the art infrastructure, motivate the faculty to be proficient in their field of specialization and adopt best teaching-learning practices.
- Impart engineering and managerial skills through competent and committed faculty using outcome based educational curriculum.
- Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs.
- Promote research, product development and industry-institution interaction.

DEPARTMENT OF CIVIL ENGINEERING

The Civil Engineering Department was started in the year 1962 as one of the first branches in P.E.S. College of Engineering, Mandya with an intake of 40. The department has carved a niche for itself by offering the most competent instructional programs to the students. The department is running an undergraduate programme with an intake of 120 and it has started PG in CAD Structures with an intake of 18 in the year 2006. The department has been recognized as research centre under VTU, Belgaum. The department is accredited by NBA, New Delhi for five years (2004-2009). The department is well equipped with laboratories, computing facilities, independent library and other infrastructure. The department has well qualified and experienced teaching faculties. The department also takes up consultancy work pertaining to planning, structural designs of buildings, testing of materials, soil investigation.

VISION

"To attain Excellence in imparting quality civil engineering education to meet the societal needs."

MISSION

- Impart civil engineering and managerial skills with state of art infrastructure, competent and committed faculty using outcome based educational curriculum.
- Promote research, project management and consultancy
- Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- Apply technical competence in the field of Civil Engineering with a strong background in basic science and mathematics.
- Analyse and interpret data to design or evaluate civil engineering systems to satisfy societal needs with the use of modern tools including higher education.
- Function effectively as an individual and or to work in a team on multi-specialized civil engineering projects with professional ethics and effective communication skills inculcating the habit of life-long learning.

PROGRAMME OUTCOMES (POs):

The BACHELOR OF ENGINEERING Programme in Civil Engineering [B.E. (CE)] must demonstrate that its graduates have

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. 65 Department of Civil Engineering, P.E.S.C.E, Mandya

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Scheme of Teaching And Examination **VII Semester B.E. (Civil)**

Sl No.	Course Code	Course Title	Teaching Dept.	Hours Pattern L:T:P:H	Total Credit	Examination Marks		
						CIE	SEE	Total
1.	P15CV71	Quantity Surveying and Estimation	Civil	4:0:0:4	4	50	50	100
2.	P15CV72	Construction Methods and Management	Civil	4:0:0:4	4	50	50	100
3.	P15CV73	Design of Steel Structures	Civil	4:0:0:4	4	50	50	100
4.	P15CV74#	(Elective 4)	Civil	4:0:0:4	3	50	50	100
5.	P15CV75#	Open Elective – 1	Civil	4:0:0:4	3	50	50	100
6.	P15CVL76	CAD Lab-2(RCC, Steel Detailing and STADD/ ETABS)	Civil	0:0:3:3	1.5	50	50	100
7.	P15CVL77	Environmental Engineering lab	Civil	0:0:3:3	1.5	50	50	100
8.	P15CVL78	Project phase – 1	Civil	0:0:4:2	2	--	50	50
				Total	23	350	400	750

List of Electives

Elective - 4			**Open Elective – 1**		
Sl. No.	**Course Code**	**Course Title**	**Sl. No.**	**Course Code**	**Course Title**
1.	P15CV741	Advanced Design of RC Structures	1.	P15CV751	Building Science and Engineering
2.	P15CV742	Ground Improvement techniques			
3.	P15CV743	Theory of Elasticity	2.	P15CV752	Energy and Environment
4.	P15CV744	Traffic Engineering			

Scheme of Teaching and Examination **VIII Semester B.E. (Civil)**

Sl No.	Course Code	Course Title	Teaching Dept.	Hours Pattern L:T:P:H	Total Credit	Examination Marks		
						CIE	SEE	Total
1.	P15CV81	Design of Prestressed Concrete Structures	Civil	4:0:0:4	3	50	50	100
2.	P15CV82#	Elective – 5	Civil	4:0:0:4	3	50	50	100
3.	P15CV83#	Elective – 6	Civil	4:0:0:4	3	50	50	100
4.	P15CV84#	Open Elective - 2	Civil	4:0:0:4	3	50	50	100
5.	P15CV85	Project Work phase-2	Civil	0:0:16:16	8	50	100	150
6	P15CV86	Internship	Civil	4:0:0:4	2	50	--	50
				Total	22	300	300	600

List of Electives

Elective - 5			**Elective - 6**			**Open Elective – 2**		
Sl. No.	Course Code	Course title	Sl. No.	Course Code	Course title	Sl. No.	Course Code	Course Title
1.	P15CV821	Open channel hydraulics	1.	P15CV831	Earthquake resistant Structures	1.	P15CV841	Environmental impact assessment and management
2.	P15CV822	Advanced Foundation Design	2.	P15CV832	Design of Bridges			
3.	P15CV823	Urban Transport Planning	3.	P15CV833	Earth and earth retaining structures	2.	P15CV842	Geographic Information system
4	P15CV824	Numerical methods in civil engineering	4	P15CV834	RCC and Steel Structural Design			

OBE Curriculum for BE Program			
A. Course Plan			
Course Title: **Quantity Surveying & Estimation**			
Course Code: **P15CV71**	Semester: **VII**	L – T – P : 4 – 0 - 0	Credits: 4
Contact Period - Lecture: **52**Hrs.; Exam: **3** Hrs.		Weightage: CIE: **50%** ; SEE: **50%**	

Prerequisites:

1. Building planning and drawing.
2. Design and drawing RCC.
3. Basic surveying.

Course Learning Objectives (CLOs)

The main objective of this course is

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

Relevance of the Course:

This course is relevant to conduct quantitative survey and estimation of various drawings

Course Content

UNIT - I

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. **18 Hrs**

UNIT-II

ESTIMATES: Steel truss (Fink and Howe truss), manhole and septic tanks, RCC and pipe culverts.

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. Estimate of one kilometer metalled road and premix carpeting. **12 Hrs**

UNIT-III

SPECIFICATIONS: Definition of specifications, objective of writing specifications, essentials in specifications, general and detail specifications of common item of works in buildings. **5 Hrs**

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. **7 Hrs**

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 – preparation of bills.

Valuation: Gross income, net income, outgoings, scrap & salvage values, depreciation and method of valuation. **10 Hrs**

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, 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.

Course Outcomes (CO's)

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

CO1:Apply the knowledge of engineering fundamentals for quantifying and cost estimate of buildings, roads, steel truss, man holes and septic tanks.
CO2: Carry out rate analysis for different items of buildings as per applicable specifications.
CO3: Estimate earth work quantity for road works.
CO4: Develop skills to work individually or in a team to prepare tenders and bills.

C. Evaluation Scheme

UNIT-I is compulsory for 40 marks

- **Student should answer One each question from UNIT-II, UNIT-III and UNIT-IV of 20 marks.**

Course Articulation Matrix

Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P1O	PO11	PO12	PSO1	PSO2	PSO3
CO1	2												3		
CO2		3		2				3						3	
CO3			3											2	
CO4									2						3

OBE Curriculum for BE Program			
A. Course Plan			
Course Title: : **Construction Engineering Management & Entrepreneurship**			
Course Code: **P15CV72**	Semester: **VII**	L – T – P : 4 – 0 - 0	Credits: 4
Contact Period - Lecture: **52**Hrs.; Exam: **3** Hrs.		Weightage: CIE: **50%** ; SEE: **50%**	

Prerequisites: Nil

Course Learning Objectives (CLOs)

This course aims to

Study and understand the concept of planning, scheduling, and the techniques necessary for construction project, also understand the valuation methods and basic ideas about entrepreneurship.

Relevance of the Course:

This course is relevant to construction business administration.

B. Course Content

UNIT – I

ENGINEERING ECONOMICS: Demand and supply, break-even analysis, Time value of money, cash flow diagrams, interest rate, simple interest, compound interest, interest formulae, compound interest factors, Equated monthly installment (EMI).Present worth comparisons method, future worth comparison method, annual worth comparison method. Introduction to depreciation causes of depreciation, basic methods of depreciation. Problems on above. **12 Hrs**

UNIT – II

MANAGEMENT OF CONSTRUCTION: Introduction, classification of construction works, various stages in the construction of a project, the construction team. Definition of an organization, management and management information system, value engineering and job plan.

Materials management: Importance, objective, cost, functions and uses of material management.

Safety management: Importance of safety causes of accidents, safety measures.

Quality management: Quality control in construction, importance and elements of quality, organization for quality control, quality assurance techniques and documentation. **12 Hrs**

UNIT – III

MANAGEMENT OF CONSTRUCTION EQUIPMENT: Introduction, need for mechanization, factors affecting selection of construction equipment, factors affecting the cost of owning and operating the construction equipment, planning of infrastructure for mechanization. **Classification of construction equipment:** Earth moving, hauling, hoisting, conveying, aggregate and concrete production equipment. Problems on above **8 Hrs**

UNIT – IV

PLANNING FOR CONSTRUCTION PROJECT: Steps involved in planning, objectives, principles and advantages of planning. Bar charts, milestone charts, job layout, work break down structure. Line of balance technique

Program evaluation and review technique (PERT): Introduction to time estimates, earliest expected time (T_E), latest allowable occurrence time (T_L), slack, critical path.

Critical path method (CPM): Earliest event time, latest event time, combined tabular form, activity time, float and critical activity. **10 Hrs**

UNIT – V

ENTREPRENEUR AND ENTREPRENEURSHIP: Concept of entrepreneur, characteristics of an entrepreneur, destination between entrepreneur and manager. Functions of entrepreneur, types of entrepreneur.

Institutional finance: KIADB, KSS IDC, DIC, KSFC

Preparation of project report: Meaning of project, project identification, project selection, project report, need and significance of project, guidelines by planning commission for project report. **10 Hrs**

TEXT BOOK:

1. **Construction engineering and management** by S. Seetharaman, Umesh publications, New Delhi
2. **Management science for civil engineering** by Gururaj, Sreehari Satish, Subhash publications, Bangalore.
3. **Management & Entrepreneurship** by K Venkataramana, Seven hill publications, Banglore.
4. **Engineering economics** by R.K.Hegde, Swapana book house, Banglore

REFERENCE BOOKS:

1. **Construction Planning Equipment's and Methods** by Peurifoy,R.L. Mc,Graw Hill publication
2. **Entrepreneurship Development** by S.S. Khanka, Published by S. Chand & Co. Ltd. New Delhi.

EVALUATION SCHEME: Student should answer one question from each unit

Course Outcomes

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

CO1. Apply the knowledge of engineering fundamentals to calculate present and future worth of money using different interest factors and comparisons

CO2. Understand the concept of construction management and computing CPM and PERT

CO3. Evaluate various construction equipments and there uses

CO4. Develop skill to work individually or in a team to efficiently manage and execute engineering projects.

Course Articulation Matrix															
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	P1 O	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	2	2											2	1	
CO2		2		2										1	
CO3			2											2	
CO4									2		2				2

Course Title: **Design of Steel Structures**			
Course Code: **P15CV73**	Semester: **VII**	L – T – P : 4 – 0 - 0	Credits: 4
Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.	Weightage: CIE: 50 %; SEE: 50%		

Prerequisites: Nil

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.

Relevance of the Course:

This course is relevant to analysis and design steel structures.

Course Content

UNIT – I

STEEL STRUCTURES AND CODAL SPECIFICATION : Advantages and Disadvantages of steel structures, Loads and Load combinations, Design considerations, 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. **9Hrs**

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 and bolted connections, types of welds, strength of welds, Defects in welds, Design of welded connections for tension members and bracket connections. **9Hrs**

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, Effective length of compression members, Design of single section compression members. **9 Hrs**

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 simple slab base and gusseted base. Design of column splices (for columns of same and different sections). **12Hrs**

UNIT – V

INTRODUCTION AND PLASTIC BEHAVIOUR OF STRUCTURAL STEEL:
Introduction, Plastic theory, Plastic hinge concept and shape factors, Plasticcollapse 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. Design of purlins**.** **13Hrs**

TEXT BOOK:

1. **Design of Steel Structures**,- N. Subramanian, Oxford, 2008.
2. **Design of steel structure -** Prof V.L.Shah and Prof.Mrs.Veena Gore, structure publication, standard publishers and distributors.

REFERENCE BOOKS:

1. **Design of steel Structures**, Ramachandravol 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.

EVALUATION SCHEME: Student should answer one question from each unit

Course Outcomes (CO's)

After learning all the units of the course, the students are able to

CO1:Apply the knowledge of engineering fundamentals to use steel as a structural material with relative pro's and cons.
CO2:Apply limit state method for the design of steel structural members and connections.
CO3:Design steel structural members and connections as per codal provisions
CO4:Interpret the design data for detailing of steel structural members and connections

Course Articulation Matrix															
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	P1 O	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	2		2										2		
CO2			3											2	
CO3			3												3
CO4			2	2										2	2

A. Course Plan			
Course Title: **Advanced Design of RC Structures**			
Course Code: **P15CV741**	Semester: **VII**	L – T – P : **4** – 0 - 0	Credits: 3
Contact Period - Lecture: **52 Hrs**; Exam: **3**Hrs.		Weightage: CIE: **50** %; SEE: **50**%	

Prerequisites:
Design of R.C.C. structures
Design and drawing of R.C.C. structures

Course Learning Objectives (CLOs):
This Course aims to

1. Understand, analyse and design reinforced concrete grid floors.
2. Understand, analyse and design reinforced concrete flat slabs.
3. Understand, analyse and design reinforced concrete silos.
4. Understand, analyse and design reinforced concrete simple cylindrical shell

Relevance of the Course:
This course relevant to study the design of grid floor, flat slabs and silos

B. Course Content

UNIT I

Design of grid floors: Introduction, Analysis of the Slabs for Moment and Shears (by Rankine's method) Design for shear.
Yield line analysis of slabs: Introduction, characteristics, location, advantages and disadvantages of yield line, sign conventions, yield line patterns, analysis of slabs by Equilibrium method and design for shear and deflection. **12 Hrs**

UNIT II

Design of flat slabs: Introduction, Proportioning of flat slab, Direct design method- Limitations of Direct design method, Distribution of moments in column strips and middle strip- Shear in Flat slabs. Analysis and design of flat slab with and without drop **14 Hrs**

UNIT III

Design of RCC overhead circular water tanks –Introduction, Analysis and Design of top dome, top ring beam, side walls of water tank and bottom slab with bottom ring beam at the outer periphery only.
Introduction to shell: Different types of shells, their forms and structural behavior. Design of simple cylindrical shell roof by beam theory. **14 Hrs**

UNIT IV

Design of silos: Introduction, Design of Silos using Janssen's method and Airy's method. **12Hrs**

Text Books:

1. **Reinforced concrete design** by S. Unnikrishna Pillai & Menon, TMH.
2. **Advanced Reinforced Concrete Design** by PC Varghese Practice Hall 2008
3. **Limit state theory and design of reinforced concrete** by Dr. S.R. Karve and Dr V L Shah, Standard publishers, Pune, 3rd Edition 1994

References:

1. **Reinforced concrete design** by Kennath Leet, TMH.
2. IS :456-2000, IS :3370-1967, IS : 4995-1974

Course Outcomes (CO's)

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

CO1: Apply the knowledge of engineering fundamentals to understand, analyze and design the grid floors and yield line analysis of slabs in line with IS codal provisions.

CO2 : Apply the knowledge of engineering fundamentals to understand flat slabs, analyze and design flat slabs in line with IS codal provisions.

CO3: Apply the knowledge of engineering fundamentals to understand, analyse and design overhead circular water tanks and shell roofs in line with IS codal provisions.

CO4 : Apply the knowledge of engineering fundamentals to understand, analyse and design of silos by Janssen's method and Airy's method in line with IS codal provisions.

EVALUATION SCHEME: Student should answer four full questions.

Course Articulation Matrix															
Course Outcomes (CO)	Program Outcomes												**Program Specific Outcomes**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P1O	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		2	1				2				1	1		
CO2	2		2	1				2				1	1	2	
CO3	2		2	1				2				1	1	2	
CO4	2		2	1				2				1	1		3

Course Plan			
Course Title: **Ground Improvement Techniques**			
Course Code: **P15CV742**	Semester: **VII**	L – T – P : 4 – 0 - 0	Credits: 3
Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.		Weightage: CIE: 50 %; SEE: 50%	

Prerequisite

Geo-technical engineering

Course Learning Objectives (CLOs)

This Course aims to

1. Study and understand the concepts of ground improvement techniques, mechanical modification and chemical modification for different types of soil.
2. Study the concepts of grouting and geosynthetic.

Relevance of the Course:

This course is relevant to study the techniques involved in the improvement of ground

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, micaceous 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.**12 Hrs**

UNIT – II

HYDRAULIC MODIFICATION: Definition, aim, principle, techniques. Gravity drain, lowering of water table, multistage well point, vacuum dewatering. Discharge equations. Design of dewatering system including pipe line effects of dewatering

DRAINAGE & PRELOADING: Drainage of slopes, preloading, vertical drains, sand drains. Assessment of ground condition for preloading, Electro kinetic dewatering. **10 Hrs**

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. Stabilization using Fly ash.

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. Bitumen, tar or asphalt in stabilization. **10 Hrs**

UNIT – IV

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

MISCELLANEOUS METHODS (ONLY CONCEPTS): Introduction, Soil reinforcement. Thermal methods. Ground improvement by confinement – Crib walls, Gabions and Mattresses. Anchors, Rock bolts and soil nailing. **12 Hrs**

UNIT – V

GEOSYNTHESIS: Introduction, geosynthetic 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 Hrs**

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) - Mc Graw Hill Pub. Co., New York.

REFERENCE BOOKS :

1. **Engineering principles of ground modification**- Manfred Hausmann(1990) - Mc Graw Hill Pub. Co., New York.
2. **Methods of treatment of unstable ground**- Bell, F. G. (1975)Butterworths, London.

Course Outcome

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

CO1:Apply the knowledge of Geology & Geotechnical Engineering in Ground improvement techniques
CO2:Analyze Mechanical Modification Techniques for soils
CO3:Investigate chemical modification techniques for soils
CO4:Select appropriate geo-synthetics and grouting methods for ground Improvements for sustainability.

EVALUATION SCHEME: Student should answer one question from each unit

Course Articulation Matrix															
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	P1 O	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	2												2		
CO2		3												2	
CO3				3											2
CO4							3						1		

Course Plan			
Course Title: **Theory of Elasticity**			
Course Code: **P15CV743**	Semester: **VII**	L – T – P : **2 : 2: 0**	Credits: 3
Contact Period - Lecture: **52Hr**.; Exam: **03Hr**		Weightage: CIE: **50** %; SEE: **50**%	

UNIT -1

Introduction to Mathematical theory of elasticity, definition of continuum, stress and strain at a. point, constitutive laws, Generalised Hooke's Law, Strain- displacement relations.
Differential equations of equilibrium, boundary conditions, compatibility equations, Airy's stress function, problems, Stress polynomials, St. Venant's principle. **12 Hrs**

UNIT- 2

Plane stress and plane strain, Principal stresses and strains, measurement of surface strains, strain rosettes, Mohr's circle of stress and strain, analytical method., **10 Hrs**

UNIT - 3

Two-dimensional problems in rectangular coordinates, bending of a cantilever beam subjected to end load, effect of shear deformation in beams, Simply supported beam subjected to UDL. **10 Hrs**

UNIT - 4

Two-dimensional problems in polar coordinates, strain-displacement relations, equations of equilibrium, compatibility equation, stress function.
Stress distribution symmetrical about an axis, Rotating discs, Lame's problem-thick cylinder. **10 Hrs**

UNIT- 5

Effect of circular holes and stress distribution in plates subjected to tension, compression and shear. Stress concentration factor, Bending of a curved bar by a force at the end.
Torsion: Inverse and Semi-inverse methods, stress function, torsion of circular and elliptical sections. **10 Hrs**

TEXT BOOKS :

1. **"Theory of Elasticity"** Timoshenko. S.P. and Goodier. J.N. - Edition, McGraw Hill Book Co. Inc., New Delhi.
2. **Applied Elasticity**- Wang. P.C.

REFERENCE BOOKS :

1. **Contiuum Mechanics Fundamentals**- Valliappan. C : Oxford and IBH Publishing Co. Ltd., New Delhi.
2. **Advanced Mechanics of Solids**- Srinath.L.S. : Tata McGraw Hill Publications Co.Ltd., New Delhi.
3. **Structural Mechanics with Introduction to Elastity and Plasticity**- Venkataraman and Patel : McGraw Hill Book Inc., New York.
4. **Mechanics of Solids**- Arbind Kumar Singh: Prentice hall of India Pvt.

Course Outcomes (CO's)

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

CO1: Explain Generalised Hooke's Law, Strain- displacement relations, St. Venant's principle, Mohr's circle of stress and strain.

CO2:Solve problems in rectangular coordinates, bending of a cantilever beam, effect of shear deformation in beams, simply supported beam subjected to UDL.

CO3: Compare strain-displacement relations and equations of equilibrium.

CO4:Distinguish stress distribution in plates subjected to tension and torsion.

EVALUATION SCHEME: Student should answer one question from each unit

Course Articulation Matrix															
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	P1 O	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3		2										2		
CO2		3												2	
CO3	3														2
CO4				3										2	

Course Title**: Traffic Engineering**			
Course Code: **P15CV744**	Semester: **VIII**	L – T – P : **2 : 2: 0**	**Credits:3**
Contact Period - Lecture: **52Hr**.; Exam: **03Hr**	Weightage: CIE: **50** %; SEE: **50**%		

Course Contents

UNIT - 1

INTRODUCTION: Definition, objectives of Traffic Engineering and scope of Traffic Engineering.

TRAFFIC CHARACTERISTICS: Road user characteristics – human factors including reaction time and vehicular characteristics affecting road design and traffic flow, power performance of vehicles, Problems on above. **10 Hrs**

UNIT - 2

TRAFFIC STUDIES: Traffic studies - data collection, analysis and interpretation of results of classified traffic volume, spot speed, delay studies, running speed and journey speed studies, origin and destination surveys.

Design of on-street and off-street parking facilities, pedestrian facilities, bus bays, safety devices Design features of expressways and different types of Urban Roads. **10 Hrs**

UNIT – 3

Accident studies: Accident characteristics, causes, studies, investigations and analysis of individual accidents, statistical analysis, problems on above. Road safety issues, various measures for road safety - engineering, educational and enforcement measures, Short term and long term measures. Road safety education and training.

Traffic flow characteristics, traffic flow variables, speed – flow – density relationship, PCU values, level of service, factors influencing roadway capacity and level of service, capacity of signalized intersections. **12 Hrs**

UNIT - 4

TRAFFIC REGULATION AND CONTROL : Traffic regulations and control - Regulation on vehicles, drivers and traffic flow, Traffic control devices – Types & objectives of markings, signs, signals and islands, delineators.

INTELLIGENT TRANSPORT SYSTEM: Definition, Necessities, Application in the present traffic scenario. **10 Hrs**

UNIT - 5

TRAFFIC REGULATION AND CONTROL: Traffic signals, signal face, amber period, Vehicle actuated and synchronized signals – Signals coordination. Webster's method of signal design, IRC method, traffic rotary elements and designs, traffic operation – Street lighting, Road side furniture, Relevant problems on above. **10 Hrs**

TEXT BOOKS:

1. Traffic Engineering & Transport Planning – L.R. Kadiyali-Khanna publishers.
2. Highway Engineering Nemchand & Bros- Khanna & Justo-Roorkee (UA).
3. Traffic Engg. - Matson & Smith:-Mc.Graw Hill and Co.
4. Traffic flow theory – Drew- Mc. Graw Hill and Co.

REFERENCE BOOKS:

1. Traffic Engineering. Pignataro- Prentice Hall.
2. Highway Capacity Manual – 2000.
3. An introduction to traffic engineering- Jotin Khistey and Kentlal-PHI.
4. Traffic Engineering- Mc Shane & Roess- PHI.

Course Outcomes

CO1: Apply the knowledge of engineering fundamentals for conducting various traffic regulations and controls and also design the traffic signal timing. (PO1, PO3)

CO2: Identify traffic stream characteristics and understand the elements of highway safety and approaches to accident studies. (PO2, PO6)

CO3: Understand the contemporary issues related to the use of advanced technology in traffic modeling and control adopting intelligent transport system. (PO2, PO5)

CO4: Perform various traffic studies and design of different highway components. (PO2, PO4).

EVALUATION SCHEME: Student should answer one question from each unit

Course Articulation Matrix (CAM)

Course Outcome – (CO)	Program outcome												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3		3										3	3	
CO2		3				2								2	
CO3		2			1									2	
CO4		3		2										2	

A. Course Plan			
Course Title: **BUILDING SCIENCE AND ENGINEERING**			
Course Code: **P15CV751**	Semester: **VII**	L – T – P : **4**– 0- 0	Credits: 3
Contact Period - Lecture: **52**Hrs.; Exam: **3**Hrs.		Weightage: CIE: **50** %; SEE:**50**%	

UNIT –I

MATERIALS FOR CONSTRUCTION: Cement concrete: introduction, ingredients of cement, grade of concrete, properties..Steel :definition , types of steel, uses of steel, market forms of steel used in construction Doors and windows : location of doors and windows, types of doors, types of windows, Stairs : requirements of good stairs, types , stairs of different materials. **10Hrs**

UNIT –II

FOUNDATION AND STRUCTURAL MEMBERS: selection of site, substructure, objectives of foundation, site inspection, soils, loads on foundations, essential requirements of good foundation, types of foundation, failure of foundation and remedial measures. Structural members: columns, lintels, roofing (flat roof and sloped roof), flooring (types of floors and floor covering), damp proofing, plastering. **10Hrs**

UNIT –III

BUILDING PLANNING AND MAINTAINENCE: plan, section and elevation .Introduction, classification of buildings, components of buildings, building bylaws, orientation of buildings, ventilation, acoustic requirements, Super structure: introduction, brick masonry, stone masonry and RCC. Building maintenance Deterioration of concrete, deterioration of masonry works, prevention of cracks and leaks, cost effective construction, anti termite treatment in building. **12Hrs**

UNIT -IV

INTERIOR DESIGN: .functional requirement of interior designer, basic elements of interior design, design problems :Interior design for spacious rooms, comfortable rooms, theme rooms, living area, cooking area, drinking area dining area, home offices, sleeping area, bathrooms, public/private buildings. **10Hrs**

UNIT -V

LANDSCAPING: Elements of Landscape architecture, specialization in landscape, landscape products, landscape materials, and water efficient landscaping, design guidelines for interior landscape. **10Hrs**

Textbooks:

1. Basic civil engineering : M.S.palanichamy fourth edition Tata Mc- graw Hill limited ,2005
2. Basic civil engineering : sateesh gopi ,pearson, 2010

Refrences :

1. Basic civil engineering : Dr.B.C.Punmia,Ashok kumar jain, Arun kumar jain Laxmi publications year of publication ,2004
2. Basic civil engineering : S.S.Bhavikatti New Age International Limited, 2010

Course outcomes (CO's):

1. Apply the knowledge of engineering fundamentals to understand, the characteristics of basic civil engineering materials.
2. Apply the knowledge of engineering fundamentals and analyze the types of foundation.
3. Develop plan, section and apply bylaws and investigate causes and remedies for cracks, have an insight to cost effective construction.
4. Understand, design and work in a team and develop the interiors and landscaping for buildings as per design guidelines.

EVALUATION SCHEME: Student should answer one question from each unit

Course Articulation Matrix (CAM)

Course Outcome	**Programme outcome**												Programme specific outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3												1		
CO2		1													
CO3	1	2	2	2		1		2		1		1		1	
CO4			2			2			1		1				

A. Course Plan			
Course Title: **ENERGY AND ENVIRONMENT**			
Course Code: **P15CV752**	Semester: **VII**	L – T – P : **4**– 0- 0	Credits: 3
Contact Period - Lecture: **52**Hrs.; Exam: **3**Hrs.		Weightage: CIE: **50** %; SEE:**50**%	

Course learning objectives/ CLOs

After studying this course, the student will be able to:

1. Explain the importance of energy, classifications of energy sources and energy demand scenario
2. Analyze the impacts of energy on environment & sustainability energy options
3. Outline the harness of various renewable energy sources
4. Discuss the positive and negative aspects of renewable energy along with hybrid technologies

UNIT – I

ENERGY: Introduction, Importance of energy, role of energy consumption in economic and social transformation, Energy needs and crisis. Energy production, utilization. Global energy scenario, Indian energy scenario, Codes, standards and legislation, Types and classification of energy sources, Conventional &unconventional energy, Renewable sources &Non renewable sources of energy advantages, limitations, comparisons. **12hrs**

UNIT- 2

ENVIRONMENT- Impact of energy on economy &environment,Concerns about change in global temperature, Regional impacts of temperature change, Global warming, Green house effect, Acid rain, Ozone layer depletion, International agreements on environment, Indian environment degradation, Environmental laws , Water Act-1974 (Prevention & control of pollution) , The environment protection act 1986 , Air act ,Energy for sustainable development. **10hrs**

UNIT- 3

Hydropower Energy– Introduction, Advantages of hydropower generation, Site selection, layout of hydro power plant, components& working, classifications, power station, structure and control, case study, Numerical.

Nuclear Energy - Introduction, Site selection, layout of power plant,components & working, reactors, adverse effects, safety measures, disposal of nuclear waste, case study, Numerical. **10hrs**

UNIT- 4

Solar Energy– Introduction, Advantages, Sun as source of energy, Site selection, layout of power plant components & working, classifications, Types of collectors, collection systems efficiency, Solar cells, cell technology, PV technology characteristics of PV, case study, Numerical

Wind Energy - Introduction, advantages/limitations, history of wind energy, global & Indian wind energy scenarioSite selection, layout of power plant, components &working, classifications, case study, Numerical **10hrs**

UNIT- 5

Biomass Energy - Introduction, advantages/limitations,Photosynthesis, biomass fuel, biomass conversion technologies, biomass gasification, biogas from waste biomass, factors affecting biogas generation, types of biogas plant – KVIC &janata model , Biomass programme in India, case study, Numerical

Hybrid / Unconventional Energy Technologies: Introduction, need, advantages, Technologies, **10hrs**

Text Books

1. N.G. AJJANNA " Energy auditing & demand side management" first edition, Gouthami Publications, Shimoga
2. Chakrabarti, M.L.Soni, P.V. Gupta,U.S. Bhatnagar " Power system Engineering" 2001, DhanpatRai&Co, New Delhi.
3. D.P.Kothari, K.C Singal, Rajesh Ranjan, "Renewable Energy sources and Emerging Technologies" second edition , PHI , India

Reference Books

1. S.Rao, Dr. BB Parulekar "Energy Technologies" Khanna Publications , New Delhi
2. David M Buchla, Thomas E Kissel, Thomas L Floyd "Renewable Energy systems" Pearson, India
3. Godfrey Boyle "Renewable Energy power for sustainable future" oxford Publications , New Delhi

Course outcomes (CO's):

CO1: Apply the knowledge of science & engineering to the contemporary issues of Energy for better humankind & environment. (PO1)

CO2: Identify, review & analyze the complex problems of Energy crises. (PO2)

CO3: Designing solutions for the energy crises in the form of renewable energy systems to meet the needs by understanding the limitations (PO3, PO4)

CO4: Understanding the complex problems of impact of energy on environment Providing Solutions for sustainable development (PO7)

EVALUATION SCHEME: Student should answer one question from each unit

Course Articulation Matrix (CAM)

	Programme outcomes												**Program specific outcomes**		
Course outcome	1	2	3	4	5	6	7	8	9	10	11	12	Pso1	Pso2	Pso3
CO1	2												2		
CO2		2												2	
CO3			3	3											2
CO4							3								2

Course Plan			
Course Title: **CAD lab-2(RCC, Steel detailing and STADD/ ETABS)**			
Course Code: **P15CVL76**	Semester: **VII**	L – T – P : 0– 0 - **3**	Credits: 1.5
Contact Period - Lecture: **39Hrs**; Exam: **3**Hrs.		Weightage: CIE: **50** %; SEE: **50**%	

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.

B.Course Content

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)

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)

Structural Software
Analysis of 2D structural systems using **STAAD Pro**. (Continuous beams, Frames and Trusses)
Question paper pattern:
• Two questions shall be asked from each part.
• One full question should be answered from each part.

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

CO1: 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.

CO2: 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.

CO3: Analysis of 2D structural systems using **STAAD Pro**. (Continuous beams, Frames and Trusses)

Course Articulation Matrix (CAM)

Sl. No	**Course Learning Outcome – CLO**	**Programme outcome**												Programme specific outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	CO1	1	2			3							1	1	2	
2	CO2	1	2			3							1	1	2	
3	CO3	1	2			3							1	1	2	

Course Plan			
Course Title: **ENVIRONEMNTAL ENGINEERING LABORTORY**			
Course Code: **P15CVL77**	Semester: **VII**	L – T – P : 0– 0 - **3**	Credits: 1.5
Contact Period - Lecture: **39Hrs**; Exam: **3**Hrs.		Weightage: CIE: **50** %; SEE: **50**%	

Prerequisites:
Environmental Engineering

Course Learning Objectives (CLOs)
To learn the basic test involved in determination of properties of water

B. Course Content

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

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.
3. **IS Standards:** 2490-1974, 3360-1974, 3307-1974.
4. **Chemistry for Environment Engineering**. Sawyer and Mc Carthy

Course Outcome

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

CO1. Apply the knowledge of science and engineering for testing water and wastewater qualities
CO2. Testing water qualities from health criteria and legal standards
CO3. Test sewage characteristics and to compare with legal standards.
CO4. Interpret the test data for design of water and wastewater treatment units.

	Programme outcomes												Program specific outcomes		
Course outcome	1	2	3	4	5	6	7	8	9	10	11	12	Pso1	Pso2	Pso3
CO1	2												2		
CO2				2		2								2	
CO3				2		2								2	
CO4			2	2										2	

Course Plan			
Course Title: **DESIGN OF PRE-STRESSED CONCRETE STRUCTURES**			
Course Code: **P15CV81**	Semester: **VIII**	L – T – P : **2** - 2 - 0	Credits:3
Contact Period - Lecture: **52 Hrs**; Exam: **3**Hrs.		Weightage: CIE: **50** %; SEE: **50**%	

Prerequisites:
Strength of materials
Design of R.C.C. structures

Course Learning Objectives (CLOs)

- To Understand the technique behind Pre-stressing of rectangular beams, I-sections etc.,
- To analyse the Pre-Stressing Beams at transfer and at working.
- To determine the losses occurring in PSC members due to various factors.
- To study the different types of composite beam and its behaviour in flexure and shear
- To design the End Block of PSC beams and PSC beams for flexure

Relevance of the Course:
This course is relevant to pre-stressing members

Course Content

UNIT- I

MATERIALS, BASIC PRINCIPLES OF PRE – STRESSING:
High strength concrete and steel, Stress-Strain characteristics and properties, Pre-tensioning and Post-tensioning systems with end anchorages, Cable profiles, Load balancing concept, Stressconcept, Force concept,Centre of Thrust. **10 Hrs**

UNIT- II

ANALYSIS OF SECTIONS FOR FLEXURE:
Stresses in concrete due to pre-stress and loads for different types of cross sections, stresses in steel due to loads. **10 Hrs**

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. Effect of creep on deflection, methods of reducing deflection. **12 Hrs**

UNIT- IV

LIMIT STATE OF COLLAPSE:
Flexure and Shear - IS code recommendations, Calculation of principal tensile stress, Ultimate flexural strength of sections, shear resistance of sections, shear reinforcement. **10 Hrs**

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, IS code method, provision for the design of end block reinforcement. **10 Hrs**

Text Books:

1., **"Pre - stressed Concrete",** N Krishna Raju, Tata Mcgraw Hill, New Delhi

2. **"Pre - stressed Concrete"**, N Rajagopalan, Narosa Publishing House, New Delhi

Reference Books:

1. **"Design of Pre - stressed Concrete Structures",** Lin T Y and N H Burns, John Wiley and Sons, New York

2. **"Pre - stressed Concrete"**, G S Pundit and S P Gupta, C B S Publishers, New Delhi

Course outcomes

CO1 :Apply the knowledge of the principles of Prestressing.

CO2 :Analyze the stresses in PSC members under flexure.

CO3 :Evaluate various losses, deflection in members, flexural strength, shear strength and principal tensile stresses in PSC members.

CO4 : Design PSC beams for shear and End block design as per codal provisions.

EVALUATION SCHEME: Student should answer one question from each unit.

	Programme outcomes												Program specific outcomes		
Course outcome	1	2	3	4	5	6	7	8	9	10	11	12	Pso1	Pso2	Pso3
CO1	2							2				1	2		
CO2		3						2				1		3	
CO3			2	1				2				1		2	
CO4			1	2				3				1		2	1

A. Course Plan

Course Title: **Open Channel Hydraulics**			
Course Code: **P15CV821**	Semester: **VIII**	L – T – P : **2** – 2 - 0	Credits: 3
Contact Period - Lecture: **52**Hrs.; Exam: **3**Hrs.		Weightage: CIE: **50** %; SEE:**50**%	

UNIT - 1

INTRODUCTION : Difference between pipe flow and open channel flow, classification of flow, energy equation, momentum equation, kinetic energy and momentum factors.

UNIFORM FLOW : Concepts, uniform flow equations, conveyance and hydraulic exponent for uniform flow, design of channels for uniform flow. **10Hrs**

UNIT - 2

CRITICAL FLOW : Concept of specific Energy – Classification of flow. Design of channel, Section Factor, Hydraulic exponent for critical flow critical depth as a flow measurement.

GRADUALLY VARIED FLOW: Concepts, GVF equation, its different forms, Basic assumptions, Dynamic equation, Characteristics of flow profile and classification. **10 Hrs**

UNIT - 3

Analysis of flows profiles, Method of singular point and transitional depth, Methods of computation, Practical problems.

Gradually Varied Flow Computations: Different methods, direct integration method, Bress's Solution, Chow's solution, direct method, standard step method.

Rapidly Varied Flow: Concepts, hydraulic jump in rectangular channels, classification of jumps, characteristics of jump – length location height, application of hydraulic jump stilling basins, shape type-2 and type-4. **12 Hrs**

UNIT - 5

Hydraulic jump in rectangular channels, Derivation of formula for simple, momentum conserving hydraulic jump in rectangular channel. Conjugate depths relationships Relationship of conjugate depths on M-y diagram, Calculations for typical parameters (energy loss, length of hydraulic jump, height of hydraulic jump) in simple hydraulic jumps in rectangular channels. **10 Hrs**

TEXTBOOKS :

1. Open Channel Hydraulic : Ven Te Chow : Mc Graw Hill Book Company, New Delhi.
2. Flow through Open Channel : R G Rangaraju : Tata McGraw Hill Publishing Co Ltd, New Delhi.
3. Open Channel Hydraulics : Subramanya : Tata Mc Graw Hill Publishing Co Ltd, New Delhi

REFERENCE BOOKS :.

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.

Course outcomes:

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

CO1. Apply the knowledge of mathematics, science, and engineering practice water resource engineering

CO2. To describe Difference between pipe flow and open channel flow, energy equation.

CO3. Gain a solid understanding of the basic principles of critical flow.

CO4. Analyze concepts of Rapidly Varied Flow, hydraulic jump in rectangular channels.

EVALUATION SCHEME: Student should answer one question from each unit

Course Articulation Matrix															
Course Outcomes (CO)	Program Outcomes												**Program Specific Outcomes**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P1O	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2			2								2	1	
CO2	1	2	2										2		
CO3	1	2		3									1	2	
CO4		2	1										1		

A. Course Plan			
Course Title: **Advanced Foundation Design**			
Course Code: **P15CV822**	Semester: **VIII**	L – T – P : **2** – 2 - 0	Credits: 3
Contact Period - Lecture: **52**Hrs.; Exam: **3**Hrs.		Weightage: CIE: **50** %; SEE:**50**%	

Prerequisite:

Geo-technical engineering

Course Learning Objectives (CLOs)

This Course aims 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 Geosynthetic

Relevance of the Course:

This course is relevant to different type of foundations

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, Strap footing, Strip footing and Raft (Proportioning only). **10 Hrs**

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: ntroduction, group action of piles in sand and clay, group efficiency of piles, settlement of piles, negative skin friction & under reamed piles. **10 Hrs**

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, construction, advantages and disadvantages of drilled piers. **8 Hrs**

UNIT – IV

CAISSONS: Design of open, pneumatic and floating caissons. Advantages and disadvantages of floating caissons.

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. **10 Hrs**

U**NIT – 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, vibration isolation and control. **14 Hrs**

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. Arrora & A.K.Jain for standard publishers & Distributors.

REFERENCE BOOKS:

1. **Pile Foundation**.- Chelles R D, , Mc Graw-Hill, New York.
2. **Soil Mechanics & Foundation Engineering**.- P. Purushotham Raj, Dorling Kindersley(India) Pvt, Ltd

Course Outcomes (CO's)

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

CO1Apply the knowledge of Geology and geotechnics to differentiate shallow & deep foundation

CO2Analyze shallow and deep foundations for civil engineering structures

CO3Evaluate Design shallow and deep foundation for civil engineering structures

CO4Interpret data to select suitable foundation for expansive soil from safety consideration

EVALUATION SCHEME: Student should answer one question from each unit

Programme outcomes													Program specific outcomes		
Course outcome	1	2	3	4	5	6	7	8	9	10	11	12	Pso1	Pso2	Pso3
CO1	2												2		
CO2		2												2	
CO3			3											2	
CO4				3		3									3

A. Course Plan			
Course Title: **URBAN TRANSPORT PLANNING**			
Course Code: **P15CV823**	Semester: **VIII**	L – T – P : **2 : 2: 0**	Credits: 3
Contact Period - Lecture: **52Hr**.; Exam: **03Hr**		Weightage: CIE: **50** %; SEE: **50**%	

Perquisites:
Transportation engineering

Course Objectives:

- To impart knowledge on understanding of urban transportation problems in planners' perspective, definition of the problem, setting clear goals and objectives to serve as guiding factors in the planning process, identification of the causal factors influencing the demand for urban travel and development of relationship between the factors and the travel demand.
- To understand Transportation from the perspective of economic and environmental efficiency.
- The course also provides adequate exposure to travel demand forecasting and application of the results of the forecasting to identify the right type of the transportation system needed to cater to the future demand and quantify the same.

Relevance of the Course:
This course is relevant to transportation.

B. Course Content

UNIT – I

Scope of urban transport planning – interdependence of land use and transportation system approach to transport planning - Stages in transport planning. Forecast of future conditions and plan synthesis. **10Hrs**

UNIT – II

Various transportation surveys – inventory of transport facilities. Trip generation: trip purpose – factors affecting trip generation and attraction – category analysis – problems. **10Hrs**

UNIT – III

Trip distribution – growth factor method, synthetic methods – Fratar and Furness methods. Gravity model. **10Hrs**

UNIT – IV

Factors affecting modal split analysis – characteristics of modal split – model split in urban transport planning - problems. Trip assignment – assignment techniques – traffic forecasting. **10Hrs**

UNIT – V

Public transport and intermediate public transport in Indian cities, intermodal transportation and coordination of different modes of transport, role of metro rail. Urban transport planning for small and medium cities. Difficulties in transport planning, computer application in transportation planning. **12Hrs**

Text Books:

1. Kadiyali, L R, "Traffic Engineering and Transport Planning, Khanna Publishers
2. Subash C Saxena, " A Coures in Traffic Planning and Desing", Dhanapat Rai & Sons, Delhi, 1989.

Reference:

1. Jothi Kristey & Lal, “Introduction to Transportation Engineering”, PHI, New Delhi
2. Huchinson AG, “Urban and Regional Models in Geography and Planning”, John Wiley and Sons, London.

Course Outcome:

CO1:Evaluate the transportation need of urban cities and suggest viable solutions in Urban transport planning.
CO2:Identify, formulate and solve engineering problems in trip generation, trip distribution by various methods.
CO3:Recognize the importance of intelligent transport system.
CO4:Provide best planning alternatives with respect to technical and cost feasibility for sustainability.

EVALUATION SCHEME: Student should answer one question from each unit.

	Programme outcomes												Program specific outcomes		
Course outcome	1	2	3	4	5	6	7	8	9	10	11	12	Pso1	Pso2	Pso3
CO1			2										1		
CO2		3												2	
CO3	1												1		
CO4											2				2

Course Plan			
Course Title: **Numerical Methods in Civil engineering**			
Course Code: **P15CV824**	Semester: **VIII**	L – T – P : **4** – 0 - 0	Credits: 3
Contact Period - Lecture: **52 Hrs**; Exam: **3**Hrs.		Weightage: CIE: **50** %; SEE: **50**%	

Unit-1

Introduction : Historical development of Numerical techniques, role in investigations, research and design in the field of civil engineering Development of algorithm/ flow charts for following methods for solution of linear simultaneous equation: a) Gaussian elimination method b) Gauss-Jordan matrix inversion method, c) Gauss-Siedel method and d) Factorization method.
Application of solution of linear system of equations to civil engineering problems
Construction planning, slope deflection method applied to beams, frames and truss analysis.
12 hrs

Unit-2

Application of root finding to civil engineering problems: Development of algorithm for a) Bisection method and b) Newton-Raphson method and its applications for solution of non linear algebraic and transcendental equations from problems in hydraulics, irrigation engineering, structural engineering and environmental engineering. **10hrs**

Unit-3

Application of numerical integration for solving simple beam problems : Development of algorithm for a) Trapezoidal rule and b) Simpson's one third rule and its application for computation of area of BMD drawn for statically determinate beams. **10hrs**

Unit-4

Development of algorithm and application of solution of ordinary differential equation to civil engineering problems by **a**) Euler's method b) Runge Kutta 4thorder method**.**
Application of finite difference technique in structural mechanics.: i. Introduction, expression of derivatives by finite difference: backward differences, forward differences and central differences. **10hrs**

Unit-5

Application of finite difference method for analysis of a) statically determinate beams, b) statically indeterminate beams. Application of Finite difference technique in structural mechanics a) Buckling of columns, b) Beams on elastic foundation. **10 hrs**

Text Books:

1. Numerical Methods In Cvil Engineering - Dr. C.P.Gandhi , Laxmi Publications Pvt. Ltd (2015)
2. Numerical Methods: Problems and Solutions- Mahinder Kumar Jain, S R K Iyangar, R K Jain, New Age International publishers

Reference:

1. Numerical methods for engineering- Chapra, Tata Mcgraw Hill Education Private Limited

Course Outcome:

CO1: understand the concepts apply them in research and design in the field of civil engineering
CO2: understand and apply knowledge on application of root finding to civil engineering problems
CO3: Development the application of numerical integration for solving simple beam problems
CO4: Develop algorithm by different methods and apply finite element difference method by different elements.

EVALUATION SCHEME: Student should answer one question from each unit

Course Outcome-CO's	Program outcomes												Program Specific outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2		2										1	1
CO2	1	2		3									1	2	
CO3	1		2										1	2	
CO4	2	2		2									2	2	

A. Course Plan			
Course Title: **Earthquake Resistant Design of Structures**			
Course Code: **P15CV831**	Semester: **VIII**	L – T – P : **2 : 2: 0**	**Credits: 3**
Contact Period - Lecture: **52Hr**.; Exam: **03Hr**		Weightage: CIE: **50** %; SEE: **50**%	

Prerequisites:

Strength of materials
Design of RCC structures

Course Learning Objectives (CLOs)

This course integrates from various engineering and scientific disciplines in order to provide a rational frame work for the design of earthquake resistant structures. The focus of the course is on building structures. The course emphasizes on understanding the fundamental factors that influence and control the response of such structures.

Relevance of the Course:

This course is relevant to seismic hazard and prevention

B. Course Content

UNIT - I

Seismic Hazard Assessment: 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. **8 Hrs**

Earthquake Effects on Structures: Local site effects on behavior of building during earthquake, Earthquake monitoring and seismic instrumentation- torsional response of buildings, Response Spectra / Average response Spectra - Design Response Spectra**. 8 Hrs**

UNIT - II

Lessons Learnt from Past Earthquakes on the Performance of the Buildings Effect of Structural Irregularities on seismic performance of RC buildings. Vertical irregularity and plan configuration problems, Seismo-resistant building architecture lateral load resistant systems, building configuration, Continuous load path, Building characteristics, and other cause of damages. **10Hrs**

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 infilled frame, analysis of infilled frames, Evaluation of Earthquake forces as per IS:1893-2002. **10 Hrs**

UNIT - IV

Geotechnical Earthquake Engineering: Dynamic behavior of soil, Dynamic design parameters of soil, Soil-structure interaction. Liquefaction, factors affecting liquefaction, effects and Remedial measures- Soil Dynamics – Geotechnical failure of foundations during earthquake – Earthquake Resistant design of Shallow foundation. **06 Hrs**

Earthquake Resistant Design Of RCC Buildings – Ductility Considerations, requirement for ductility, Ductility ratio, structural ductility and factors affecting ductility, Confinement of concrete, Special confining reinforcement, Ductile detailing of RC structures as per IS:13920-1993. **06 Hrs**

UNIT - V

Seismic Base Isolation and Retrofitting: Basic concept of seismic base isolation-Seismic Isolation systems. Necessity of seismic evaluation, Methods of seismic evaluation, Seismic retrofitting strategies of RC buildings, and Retrofitting of Masonry buildings. **10 Hrs**

TEXT BOOK :

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.

Course Outcomes:

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

1. Explain the possible causes for earthquakes understanding seismology. (p02)
2. Understand the principles of earthquake resistant design of RC and masonry buildings.(p06)
3. Analyze RC frame structures for seismic loads by Equivalent lateral force method(p05)
4. Detail the structural members for Ductile requirements.(p03).

EVALUATION SCHEME: Student should answer one question from each unit

Course Articulation Matrix

Course Outcomes (CO)	Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P1O	PO11	PO12	PSO1	PSO2	PSO3
CO1		1	2											1		
CO2			2	1											2	
CO3		2						2						1		
CO4	1	2												1	2	

Course Plan			
Course Title: **Design of Bridges**			
Course Code: **P15CV832**	Semester: **VIII**	L – T – P : **4** – 0 - 0	Credits: 3
Contact Period - Lecture: **52 Hrs**; Exam: **3**Hrs.		Weightage: CIE: **50** %; SEE: **50**%	

Prerequisites:

Design and drawing of RCC and steel structures

Course Learning Objectives (CLOs)

This Course aims to

1. To provide basic knowledge of mathematics, science and engineering in the design of bridges, using limit state design
2. Enable the students to identify, formulate and solve engineering problems design of bridges.
3. To 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. To 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. To imbibe the culture of professional and ethical responsibilities by following codal provisions in the analysis, design and detailing of bridges for strength and durability.
6. To show the impact of engineering solutions on the society and also will be aware of contemporary issues regarding failure of structures due to wrong design, use of poor quality of materials and faulty construction methods.
7. To provide factual knowledge on analysis and design of various types of bridges for those who can participate and succeed in competitive examinations.

Relevance of course:

This course is relevant to long span structures

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. **12Hrs**

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. **10Hrs**

Unit – III

RCC SLAB CULVERT: R C C Slab culvert, dead load BM & SF, BM & SF For IRC Class AA Tracked Vehicle, BM & SF For IRC Class AA Wheeled Vehicle, BM & SF For IRC Class A Loading, Structural Design and drawing of Slab Culvert. **10Hrs**

Unit-IV

Box Culvert: Loading Cases, IRC Class AA Tracked Vehicle, IRC Class AA Wheeled Vehicle, IRC Class A Loading, Moment Distribution, Structural Design of Box Culvert, Reinforcement Detail. **10Hrs**

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 drawing of main Girder.

10Hrs

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 BindraDhanpat Rai & Sons New Delhi
2. **IRC 6 – 2000** Standard Specifications And Code Of Practice For Road Bridges Section II Loads and Stresses, The Indian Road Congress New Delhi.
3. **IS: 10262** Recommended guidelines for Concrete Mix design – BIS Publications.

Course Outcome

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

CO1. Identify site locations for the bridges.
CO2. Understand the IRC loadings.
CO3. Analyse and draw slab culvert.
CO4. Analyse and draw box culvert and T beam bridge and design T-beam bridge.

EVALUATION SCHEME: Student should answer one question from each unit

Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P1O	PO11	PO12	PSO1	PSO2	PSO3
CO1	1												2		
CO2	1						2						1	1	
CO3		2												2	
CO4	2	2			2								1	2	

Course Plan			
Course Title: **Earth and Earth Retaining Structures**			
Course Code: **P15CV833**	Semester: **VIII**	L – T – P : **2 : 2: 0**	**Credits:3**
Contact Period - Lecture: **52Hr**.; Exam: **03Hr**	Weightage: CIE: **50** %; SEE: **50**%		

Unit-1

EARTH DAMS AND EMBANKMENTS :

Different types of earthen dams with sketches and their suitability. Hydraulic fill and rolled fill methods of construction – Causes of failure of earth dam – Design criteria of earth dams– Stability analysis of earthen dams – Seepage control in earthen dams. Role of Filters in Earth Dam Design.

10 Hrs

Unit-2

RETAINING WALLS :

Types of retaining walls, failure of retaining walls by sliding, overturning and bearing. Stability analysis and Principles of the design of retaining walls – Gravity retaining walls, Cantilever retaining walls, Counterfort retaining walls (no structural design) – Modes of failure of retaining walls – Drainage from the backfill. **10 Hrs**

Unit-3

BULK HEADS :

Cantilever sheet pile walls Types of sheet pile walls –Free cantilever sheet pile - cantilever sheet pile in cohesion-less soils –cantilever sheet pile in clay.

Anchored Sheet Pile Walls:

Anchored sheet pile with free earth support in cohesion-less and cohesive soil. bulkheads with fixed earth support method – Types, locations and design of anchors. **12 Hrs**

Unit-4

BRACED CUTS

Introduction, Lateral earth pressure on sheeting, Different types of sheeting and bracing systems – design of various components of bracings**.** **10 Hrs**

Unit-5

ROCK FILL DAMS

Introduction, Origin and usage of rock fill dams, types of rock fill dams, design of rock fill dams and construction of rock fill dams.

Coffer dams and cellular coffer dams : Introduction –types of coffer dams – design of cellular coffer dams on rock by Tennesse Valey Authority(TVA) method- safety against sliding, slipping, overturning, vertical shear and stability against bursting. **10 Hrs**

TEXT BOOK:

1. Soil mechanics and foundation engineering: B.C Punmia, Laxmi publications Ltd.
2. Soil mechanics and foundation engineering, Dr. V N S Murthy

REFERENCE BOOKS:

1. Geotechnical Engineering, Purushotham Raj
2. Geotechnical Engineering, Dr. C Venkataramaiah, New age publications.

Course outcomes:

CO1. Understand types of earthen dams and analyze and design of earthen dams and stability
CO2. Understand and analyze different modes of failure of retaining walls
CO3. Analyze and design bulk heads and sheet piles
CO4. Understand different types of dams and check for safety

EVALUATION SCHEME: Student should answer one question from each unit.

Course Articulation Matrix															
Course Outcomes (CO)	Program Outcomes												**Program Specific Outcomes**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P1O	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2				2					1	2	
CO2		2	2										1	2	
CO3	1	2											1	2	
CO4			2					2						2	2

Course Plan		
Course Title**: RCC and Steel Structural Design**		
Course Code: **P15CV834**	Semester: **VIII**	L – T – P : **2 : 2: 0 Credits:3**
Contact Period - Lecture: **52Hr**.; Exam: **03Hr**	Weightage: CIE: **50** %; SEE: **50**%	

Course objectives:

This course will enable students to

1. Provide basic knowledge in the areas of limit state method and concept of design of RC and Steel structures
2. Identify, formulate and solve engineering problems in RC and Steel Structures
3. Give procedural knowledge to design a system, component or process as per needs and specifications of RC Structures like Retaining wall, Footing, Water tanks, Portal Frames and Steel Structures like Roof Truss, Plate Girder and Gantry Girder.
4. Imbibe the culture of professional and ethical responsibilities by following codal provisions in the analysis, design of RC and Steel Structures.
5. Provide factual knowledge on analysis and design of RC Structural elements, who can participate and succeed in competitive examinations.

Course Content

Part A

Footings: Design of rectangular slab and Beam type combined footing. **8Hrs**
Retaining Walls: Design of cantilever Retaining wall. **8Hrs**
Design of portal frames with fixed supports. **10Hrs**

Part B

Roof Truss: Design of roof truss for different cases of loading, forces in members **8Hrs**
Plate Girder: Design of welded plate girder with intermediate stiffener, bearing stiffener and necessary checks **10Hrs**
Gantry Girder: Design of gantry girder with all necessary checks **8Hrs**

Question Paper Pattern:

- Two questions shall be asked from each part. There can be maximum of three subdivisions in each question, if necessary.
- One full question should be answered from each part.
- Each question carries 50 marks.
- Code books – IS 456, IS 800, SP (6) – Steel Tables, shall be referred for designing
- The above charts shall be provided during examinations.

Text Books:

1. N Krishna Raju, "Structural Design and Drawing of Reinforced Concrete and Steel", University Press
2. Subramanian N, "Design of Steel Structures", Oxford university Press, New Delhi
3. K S Duggal, "Design of Steel Structures", Tata McGraw Hill, New Delhi

Reference 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
3. P C Verghese, "Limit State Design of Reinforced Concrete", PHI Publications, New Delhi
4. S N Sinha, "Reinforced Concrete Design", McGraw Hill Publication.

Course Outcomes:

After studying this course, students will be able to:

1. Students will acquire the basic knowledge in design of RCC and Steel Structures.
2. Students will have the ability to follow design procedures as per codal provisions and skills to arrive at structurally safe RC and Steel members.

Course Articulation Matrix

Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P1O	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3										1	2	
CO2	2	3	3										1	2	

Course Plan			
Course Title: **ENVIRONMENTAL IMPACT ASSESSMENT**			
Course Code: **P15CV841**	Semester: **VIII**	L – T – P : **2 : 2: 0**	**Credits:3**
Contact Period - Lecture: **52Hr**.; Exam: **03Hr**		Weightage: CIE: **50** %; SEE: **50**%	

Pre-requisites:
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

Relevance of the Course:
This course is relevant to environment

Course Content

UNIT -1

Definition 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, Frame work of EIA, EIA Guidelines for developmental projects**.** **10Hrs**

UNIT -2

Developmental projects - Description of affected environment with factors and indices, Methodologies of EIA – Adhoc method, Checklist method, Matrices method, Network method and Overlay method **10Hrs**

UNIT -3

Assessment and prediction of impacts on attributes- Air environment, Water environment, Noise environment. **10Hrs**

UNIT -4

Assessment and prediction of impacts on attributes - Soil and ground water and Socio economic environment.
Public participation in environmental decision making, objectives of public participation and public participation techniques. Practical consideration in preparing in EIA and EIS. **12Hrs**

UNIT -5

EIA for water resource project, Highway project, Iron ore and Coal mining project. **10Hrs**

Text Books

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

Reference Books:

1. **"Environmental Impact Assessment" ss**Larry W Canter,–McGraw – Hill International Editions, 1996.
2. Guidelines for EIA of Developmental Projects, Minister of Environment and Forests, GOI.

Course outcome

CO1. Understands the methodology of conducting EIA
CO 2. Identify and choose a suitable methodology of EIA foe different projects
CO 3. Layout the procedure for conducting EIA for different attributes
CO 4. Understands the importance of public participation in EIA and procedure of conducting EIA for water resource, highway, mining projects

C. Evaluation Scheme

Student should answer five full questions

Course Articulation Matrix															
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	P1 O	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	2												1	2	
CO2	1			2										1	
CO3	1	1						2					1		
CO4	1	2						2		1				2	1

Course Plan			
Course Title: Geographic Information System			
Course Code: **P15CV842**	Semester: **VIII**	L – T – P : **2 : 2: 0**	**Credits:3**
Contact Period - Lecture: **52Hr**.; Exam: **03Hr**		Weightage: CIE: **50** %; SEE: **50**%	

Prerequisites

Survey I and II

Course Learning Objectives (CLOs)

- Students will be able to learn theoretical and technical concepts of remote sensing, image processing and Geographic Information System
- Students will be able to appreciate the applications of remote sensing and GIS in civil engineering and earth resources management
- Students will be able to get an exposure to latest software's and techniques, which are being used in industry, for various engineering applications
- Students will be able to demonstrate ability to effectively present research to professional and lay audiences in written and oral form

Relevance of the Course:

This course is relevant to Data base positioning systems

Course Content

UNIT – I

Geographic Information system concepts and spatial models. Introduction, spatial information, temporal information, conceptual models of spatial information, representation of geographic information. GIS Functionality-Introduction, data acquisition, preliminary data processing, data storage and retrieval, spatial search and analysis, graphics and interaction.

Computer Fundamentals of GIS and Data storage, Fundamentals of computers vector/raster storage character files and binary files, file organization, linked lists, chains, trees. Coordinate systems and map projection: Rectangular polar and spherical coordinates, types of map projections, choosing a map projection. **12 Hrs**

UNIT – II

GIS DATA MODELS AND STRUCTURES-Cartographic map model,Geo-relation model, vector/raster methods, non-spatial data base structure viz., hierarchal network, relational structures.

DIGITIZING EDITING AND STRUCTURING MAP DATA – Entering the spatial data (digitizing), the non-spatial, associated attributes, linking spatial and non-spatial data, use of digitizers and scanners of different types. **10 Hrs**

UNIT – III

DATA QUALITY AND SOURCES OF ERROR – Sources of errors in GIS data, obvious sources, natural variations and the processing errors and accuracy. Principles of Spatial data access and search, regular and object oriented decomposition, introduction to spatial data analysis, and overlay analysis, raster analysis, network analysis in GIS. **10 Hrs**

UNIT – IV

GIS and remote sensing data integration techniques in spatial decision support system land suitability and multicriteria evaluation, role based systems, network analysis, special interaction modeling, Virtual GIS. **10 Hrs**

UNIT - V

Data base positioning systems, desirable characteristics of data base management systems, components of a data base management system, understanding the data conceptual modeling.

Global positioning system, hyper spectral remote sensing, DIP techniques, hardware and software requirements for GIS, overview of GIS software. **10 Hrs**

TEXT BOOKS:

1. **Principles of GIS** - Peter A BurroughReachael A Mc. Donnel-(Oxford).
2. **The GIS Book** - George B. Korte, P.E. - 5th Edn.,ThomsonLearning.
3. **Remote sensing and image interpretation** - Lillesand - (JohnWiley and Sons).

REFERENCE BOOKS:

1. **Fundamentals of Remote Sensing –** George Joseph, Universities Press, Hyderabad.
2. **Introduction to GIS – Kang tsuang Chang** – Tata McGraw Hill, New Delhi 2009.

Course outcome

CO1. Understand the advantages of using remote sensing over conventional methods.
CO2. Understand electromagnetic radiation and its various interactions
CO3. Understand the various sensors and platforms used in remote sensing process
CO4. Understand how remote sensing and GIS can be used in various civil engineering applications.

EVALUATION SCHEME: Student should answer one question from each unit

Course Articulation Matrix

Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P1O**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2									1			1		
CO2	1	2		2									1	2	
CO3	2			2									1	1	
CO4	2	2											2	1	