SYLLABUS

(With effect from 2013-2014)
Out Come Based Education

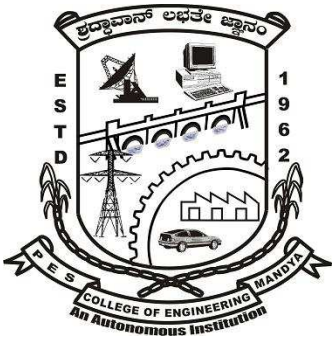
ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕವರ್ಷ 2013–14)
ಫಲಿತಾಂಶಆಧಾರಿತ ಶಿಕ್ಷಣ

VII and VIII Semester

Bachelor Degree
in

CIVIL ENGINEERING



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 in the academic year 2008-09. Since, then it has been doing the academic and examination activities successfully. The college is running eight undergraduate and eight Postgraduate programs. It consists of six M.Tech programs, which are affiliated to VTU. Other postgraduate programs are MBA and MCA.

India has recently become a Permanent Member by signing 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 such as Taiwan, Hong Kong, Ireland, Korea, Malaysia, New Zealand, Russia, Singapore, South Africa, Turkey, Australia, Canada and Japan. Among other signatories to the international agreement are the US and the UK. Implementation of Outcome Based Education (OBE), has been the core issue for enabling the equivalence and of Indian degrees and their mobility across the countries.

Our Higher Educational Institution has adopted the semester structure with OBE scheme and grading system.

The credit based OBE semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching.

The OBE, emphasize setting clear standards for observable, measurable outcomes of programs in stages. There lies a shift in thinking, teaching and learning processes moving towards Students Centric from Teacher Centric education. OBE standards focus on mathematics, language, science, attitudes, social skills & moral values.

The key features which may be used to judge, if a system has implemented an outcome based education system is mainly Standard based assessments that determines whether students have achieved the stated standard. Assessments may take any form, so long as the process actually measure whether the student knows the required information or can perform the required task. Outcome based education is a commitment that all students of all groups will ultimately reach the same minimum standards. Outcome Based Education is a method or means which begins with the end in mind and constantly emphasizes continuous improvement.

In order to increase the Industry/Corporate readiness, many Soft Skills and Personality Development modules have been added to the existing curriculum of 2013-14.Industry Interactions have been made compulsory to enhance the field experience. In order to enhance creativity and innovation Mini Project is included in all undergraduate programs.

Sri B.Dinesh Prabhu
Deputy Dean (Academic)
Associate Professor,
Dept. of Automobile Engg.

Dr. P S Puttaswamy
Dean (Academic)
Professor,
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P.E.S.COLLEGE OF ENGINEERING, MANDYA-571401
(KARNATAKA)
(An Autonomous Institution under VTU, Belagavi)

Vision

"An institution of high repute, imparting quality education to develop innovative and Humane Engineers"

Mission

"Committed to develop students potential through high quality teaching-learning processes and state of the art infrastructure"

DEPARTMENT OF CIVIL ENGINEERING

About the Department

Department of Civil Engineering

The Civil Engineering Department was started in the year 1962 as one of the first branches inP.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 programmes to the students. The department is running an undergraduate programme with an intake of 120 and it has started PG inn CAD structures with an intake of 18 in the year 2004. The department has been recognized as research center 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 facilities. The department has well qualified and experienced teaching faculties. The department also takes up consultancy work pertaining to civil engineering. Planning, structural design of buildings, testing of materials, testing of materials, soil investigation is part of the department activities.

VISION AND MISSION

- **VISION :**
  Department of Excellence developing engineers to address construction challenges.

- **MISSION:**
  Committed to
- *Develop faculty, staff and students*
- *Create and nurture ambience for learning, innovation and research*
- *Develop new construction materials and technology*
- *Partner in developing skilled labour through vocational programs*

DEPARTMENT OF CIVIL ENGINEERING

(A) Programme Educational Objectives (PEOs)

The Bachelor of Engineering Programme in Civil Engineering [B.E. (Civil)] during four years term aims to

I. Provide the students with strong fundamental and advanced knowledge in mathematics, science and engineering with respect to Civil Engineering discipline with an emphasis to solve engineering problems

II. Prepare the students through well - designed curriculum to excel in bachelor degree programme in Civil Engg. in order to engage in teaching or industrial or any technical profession and to pursue higher studies

III. Train students with intensive and extensive engineering knowledge and skill so as to understand, analyze, design and create novel products and solutions in the field of Civil engineering.

IV. Inculcate in students the professional and ethical attitude, effective communication skills, team spirit, multidisciplinary approach and ability to relate engineering issues to broader social context.

V. Provide students with an excellent academic environment to promote leadership qualities, character moulding and lifelong learning as required for a successful professional career.

(B) Programme Outcomes (POs):

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

a) An ability to apply knowledge of mathematics, science and engineering to develop art of planning and executing constructional activities.

b) An ability to design and construct Civil Engineering structures

c) An ability to function effectively as an individual and as a member of engineeringteams of other disciplines.

d) An understanding of professional and ethical responsibility at local, national and international levels.

g) An ability to effectively communicate orally and in writing on social and technical occasions in local and global scenarios.

h) The broad education to understand the impact of engineering solutions in a global and societal context.

i) An ability to engage in independent and lifelong learning in the broad context of technological change.

j) A knowledge of contemporary issues at local, national and international levels.

k) An ability to use the techniques, skills andmodernengineeringsoftware tools which are necessary for engineering practice.

These programme outcomes (POs) are achieved through an array of courses. To ensure the achievement of POs, the course learning outcomes (CLOs) are so formulated that they address the POs.

P.E.S.COLLEGE OF ENGINEERING, MANDYA-571401
(An Autonomous Institution under VTU. Belgaum)
Department ofCivil Engineering.

VII Semester B.E. (CIVIL) **Scheme of Teaching and Examination 2013- 14**

Sl. No.	Course Code	Course Title	Teaching Dept.	Hours/ Week L:T:P	Credits	Examination Marks			Exam Duration in hours
						CIE	SEE	Total Mark	
1.	P13CV71	Quantity Surveying & Estimation	CV	4:0:0:0	3	50	50	100	3
2.	P13CV72	Construction Engineering Management & Entrepreneurship	CV	4:0:0:0	4	50	50	100	3
3.	P13CV73	Design of Steel Structures	CV	4:0:0:0	4	50	50	100	3
4.	P13CV74	Advanced Concrete Technology	CV	4:0:0:0	4	50	50	100	3
5.	P13CV75	Elective -II	CV	4:0:0:0	4	50	50	100	3
6.	P13CV76	Elective-Ill	CV	4:0:0:0	4	50	50	100	3
7.	P13CVL77	Environmental Engineering Laboratory	CV	0:1:2:3	1.5	50	50	100	3
8.	P13CVL78	Concrete and Highway Materials Laboratory	CV	0:1:2:3	1.5	50	50	100	3
Total					26	400	400	800	

L**:** Lecture, T: Tutorial, P: Practical, H:Hrs/Week, CIE: Continuous Internal Evaluation, SEE: Semester End Examination, C: Credits

Courses – 1 Course One Hour Lecture= Two Hours Tutorial / Practical = 1 Credit

Elective –II

Sl.No	Course Code	Course title
1	P08CV751	Theory of Elasticity
2	P08CV752	Ground Improvement Techniques
3	P08CV753	Highway Geometric Design
4	P08CV754	Solid Waste Management

Elective-III

Sl.No	Course Code	Course title
1	P08CV761	Advanced Design of RC Structures
2	P08CV762	Photogrammetry and Remote Sensing
3	P08CV763	Design of Bridges
4	P08CV764	Pavement Materials and Construction

VIII Semester B.E. (Civil) **Scheme of Teaching and Examination 2013-14**

Sl.No	Course Code	Course Title	Teaching Dept.	Hours/ Week L:T:P	Credits	Examination Marks			Exam Duration in hours
						CIE	SEE	Total Marks	
1.	P13CV81	Design of Pre-stressed Concrete Structures	CV	2:2:0:4	3	50	50	100	3
2.	P13CV82	Design and Drawing of Steel Structures	CV	2:0:2:4	3	50	50	100	4
3.	P13CV83	Elective -IV	CV	2:2:0:4	3	50	50	100	3
4.	P13CV84	Elective-V	CV	2:2:0:4	3	50	50	100	3
5.	P13CV85	Project Work	CV	-	10	100	100	200	3
6.	P13CV86	Seminar	CV	0:0:2:2	0	50	-	50	3
Total					22	350	300	650	

L**:** Lecture, T: Tutorial, P: Practical, H:Hrs/Week, CIE: Continuous Internal Evaluation, SEE: Semester End Examination, C: Credits **HC**: Hard Core (4Credits) -4 Courses **OS**: Other subject (3 Credits) – 1 Course **PS**: Professional subject (4Credirs)-1Course : One Hour Lecture= Two Hours Tutorial / Practical = 1 Credit

Electives-IV

Sl.No	Course Code	Elective Course Title
1.	P08CV831	Advanced Foundation Design
2.	P08CV832	Pavement Design
3.	P08CV833	Earthquake Resistant Design of Structures
4.	P08CV834	Industrial Waste water Treatment

Electives-V

Sl.No	Course Code	Elective Course Title
1.	P08CV841	Alternative Building Materials
2.	P08CV842	Urban Transport Planning
3.	P08CV843	Geographic Information System
4.	P08CV844	Environment Impact Assessmen

Evaluation Scheme

Scheme	Weightage	Marks	Event Break Up				
			Test I	Test II	Quiz I	Quiz II	Assignment
CIE	50%	50	35	35	5	5	10
SEE	50%	100	Questions to Set: 10		Questions to Answer: 5		

Course Title: Quantity Surveying & Estimation			
Course Code: P13CV71	**Semester: VII**	**L – T – P : 4 – 0 - 0**	**Credits: 3**
Contact Period - Lecture: 52Hrs.; 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 Hours**

UNIT-II

ESTIMATES: Steel truss (Fink and Howe truss), manhole and septic tanks. **8 Hours**

SPECIFICATIONS: Definition of specifications, objective of writing specifications, essentials in specifications, general and detail specifications of common item of works in buildings. **6 Hours**

UNIT-III

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. **6 Hours**

MEASUREMENT OF EARTHWORK FOR ROADS: Methods for computation of earthwork – cross sections – mid section formula or average end area or mean sectional area, trapezoidal & prismoidal formula with and without cross slopes. **6 Hours**

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. **8 Hours**

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 Outcome (CO)

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

1. Read various drawings and able to calculate quantities and rates of standard items of building works.
2. Calculate volume of earthwork for roads.
3. Deal with different types of contracts.

P.E.S. COLLEGE OF ENGINEERING (AUTONOMOUS), MANDYA-571401
DEPARTMENT OF CIVIL ENGINEERING
BACHELOR OF ENGINEERING - SEVENTH SEMESTER
SUBJECT: QUANTITY SURVEYING AND ESTIMATION (P13CV71)

TIME: 3 HOURS *MAX MARKS : 100*

INSTRUCTIONS

1. Answer UNIT-I question compulsorily. 2. Answer any one full question from UNIT-II. 3. Answer any one full question from UNIT-III

4. Answer any one full question from UNIT-IV. 5. Missing data if any, may be suitably assumed.

		Marks	Levels
	MODEL QUESTION PAPER		
	UNIT-I		
1.	The details of a residential building are shown in figure. Workout the quantities & cost of the following Items of work 1. Earth work In excavation for foundation In soft soil at Rs. 60.00 per cum 2. Size stone masonry In footing Sc plinth at Rs. 1750 per cu.m. 3. First class brick work with 1:6 CM In superstructure at Rs. 1800 per cu.m. 4. RCC roof slab at Rs. 3200 per cu.m.	40	L5
	UNIT-II		
2.	The details of a septic tank is shown in fig 2. Estimate the following items of work 1. Earth work in excavation 2. First class brick work with 1:4 CM 3. 12mm cement plaster on walls and 20mm cement plaster with water proofing Compound in floor	20	L5
3	Write specifications for the following : 1. Plastering walls with 1:6 CM 2. 1st class brickwork In superstructure with 1:6 CM 3. Mosaic or terrazo flooring 4. Mangalore tile roofing	20	L6
	UNIT-III		
4	Workout from first principles, the rate analysis for any two of the following 1. Stone masonry In CM (1:4) In foundation 2. Cement concrete bed 1:4:8 In foundation 3. Cement pointing with 1:2 CM.	20	L5
5	The following are the reduced levels of the highway alignment at different chainages. The formation level Is 120.00 flat and with a formation width of 10m In banking and 8m In cutting, Side slopes In banking Is 2:1 and In cutting 1.5:1. Calculate the quantities of earthwork In cutting and filling.	20	L3

Chainage in m	0	30	60	90	120	150	180	210
. R.L. of Ground	120.60	120.70	120.50	120.40	111.30	111.40	111.20	111.10
R.L. of			120.00	Flat				
Cross slope	10:1	12:1	15:1	12:1	10:1	15:1	12:1	. 10:1

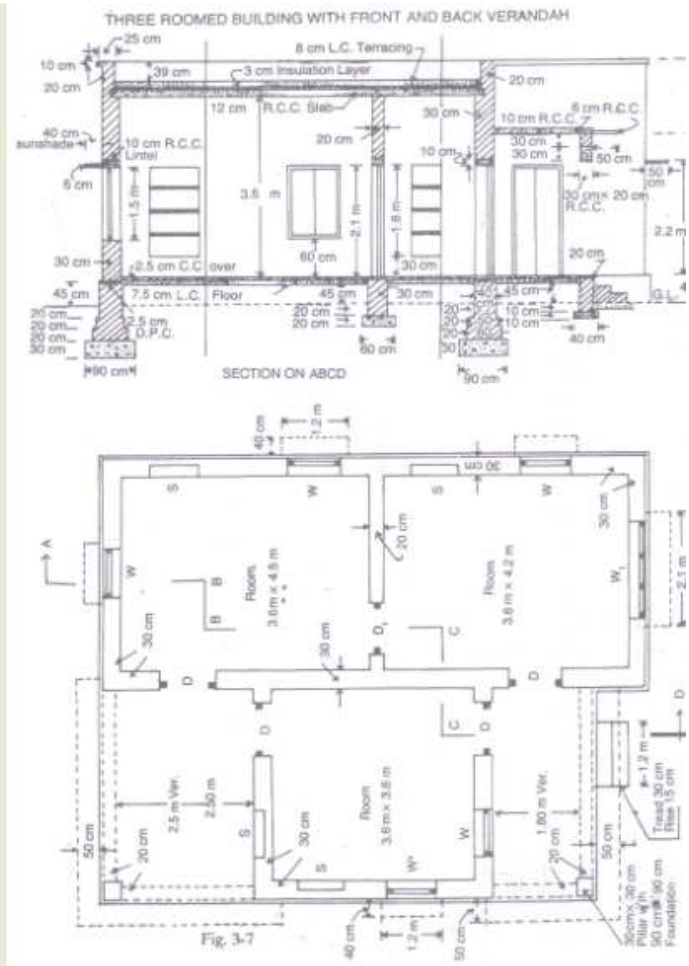
UNIT-IV

6. Explain briefly 20 L2

1. Earnest money deposit (EMD)
2. Technical sanction and administrative approval

7 Differentiate between 20 L2

1. Tender and quotation
2. Measurements book and schedule of rates



Course Title: Construction Engineering Management & Entrepreneurship			
Course Code: P13CV72	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)

This course aims to

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

Relevance of the Course:

This course is relevant to construction business administration.

Course Content

UNIT – I

INTRODUCTION TO ENGINEERING ECONOMICS:

Definition, fundamental problems in economics, economics motives, economic law, definition of economics concepts, capital, engineering economics-engineering construction, the construction industries, construction economics and engineer, construction economy and construction.

Economic models, break-even analysis, demand and supply. Time value of money, cash flow diagrams, interest rate, simple interest, compound interest, interest formulae. Continuous compoundary, compound interest factors, calculatory equated monthly installment (EMI), problems on above. **12 Hrs**

UNIT – II

PRESENT WORTH COMPARISONS: Introduction, conditions for present worth comparisons, Present worth comparisons method, future worth comparison, pay back comparison method, project feasibility reports, introduction to depreciation, causes of depreciation, basic methods of depreciation charges, tax concepts. Introduction- why annual worth comparison?Introduction to ROR, rate of return, problems on above. **8 Hrs**

UNIT – III

MANAGEMENT OF CONSTRUCTION: Introduction, classification of construction works, various stages in the construction of a project, the construction team, materials management: importance, objective, cost, functions and uses of material management. Construction safety management: importance of safety causes of accidents, safety measures.
Quality control in construction, importance and elements of quality, organization for quality control, quality assurance techniques and documentation.Economic analysis of engineering projects.Definition of an organization, management and management information system, value engineering and job plan.
Management of construction equipment: introduction, need for mechanization, factors effecting selection of construction equipment, factors effecting 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. **12 Hrs**

UNIT – IV

PLANNING FOR CONSTRUCTION PROJECT: Steps involved objectives, principles and advantages of planning. Bar charts, mild stone charts, job layout, work break down structure. Line of balance technique project management through network. Program evaluation and

review technique (PERT): Introduction 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, criticality and critical activity **10 Hrs**

UNIT – V

VALUATION ENGINEERING: Cost and value, purpose of valuation, factors affecting the values of property, classification, sinking fund, capitalized value, obsolescence, valuation of land, valuation of properties.
Enterpuner and entrepreneurship: concept of entrepreneur, characteristics of an entrepreneur, destination, between entrepreneur and manager. Functions of entrepreneur, types of entrepreneur, and concepts 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 by, subhash publications, Bangalore.
3. **Management & Entrepreneurship** by K venkataramana, seven hill publications, Banglore.

REFERENCE BOOKS:

1. **Entrepreneurship Development** by S.S. Khanka, Published by S. Chand & Co. Ltd. New Delhi

Course Outcomes

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

1. Define basics of engineering economics.(L1)
2. Describe present and future worth of the commodity.(L2)
3. Explain construction stages and practices and construction equipments.(L2)
4. Explain PERT and CPM method.(L2)
5. Understand valuation of properties and basics of entrepreneurship.(L2)

Course Title: Design of Steel Structures			
Course Code: P13CV73	**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. 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.

ANALYSIS AND DESIGN OF BOLTED CONNECTION: Moment resistant Bracket connections, Beam to Beam connections and Beam to Column framed connections, moment acting in the plane of joint, moment acting in the plane perpendicular to the joint.

12Hrs

UNIT – II

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. **6 Hrs**

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. **7Hrs**

UNIT – IV

DESIGN OF COMPRESSION MEMBERS: Introduction, Failure modes, Strength of compression members, Sections used for compression members, Effective length 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). **14 Hrs**

UNIT – V

INTRODUCTION AND 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. Design of purlins**.** **13 Hrs**

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**, Ramachandra vol I, standard bookHouse.
2. **Comprehensive Design of steel Structures**, Dr. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications.
3. **Design of Steel Structures**, Duggal.

Course Outcome

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

1. Adopt Codal provisions for the design of steel structures.(L6)
2. Analyse and design bolted and welded connections (L4)
3. Analyse and design tension members (L4)
4. Analyse and design compression members (L4)
5. Analyse and design beams members (L4)

P.E.S. COLLEGE OF ENGINEERING (AUTONOMOUS), MANDYA-571401
DEPARTMENT OF CIVIL ENGINEERING
BACHELOR OF ENGINEERING - SEVENTH SEMESTER
SUBJECT: DESIGN OF STEEL STRUCTURES (P13CV73)

TIME: 3 HOURS *MAX MARKS : 100*

INSTRUCTIONS: Answer FIVE full questions selecting at least **ONE** full question from each **UNIT**.

		Marks	Levels

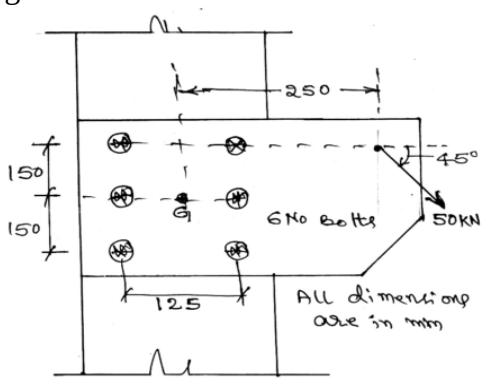
MODEL QUESTION PAPER

UNIT – I

1.a)	Explain the design considerations to be adopted in structural designs.	6	L2
b)	Draw a neat sketch of a typical double bolted lap joint providing a total of 6 No. of bolts and label the parts.	4	L4
c)	Design a double cover butt joint to connect plates of section 180x12mm (Fe 410) for the full design tensile strength of the plate. Adopt 8mm thick cover plates and bolts of property class 4.6, also sketch the connections.	10	L6

OR

2.a)	Draw the elevation and side view of a framed bolted connection between (i) the web of a secondary beam and web of main beam (ii) the flange of a column and web of a beam	10	L4
b)	Determine the force induced in the critically stressed bolt of the bolted connection shown in Fig.	10	L3



UNIT - II

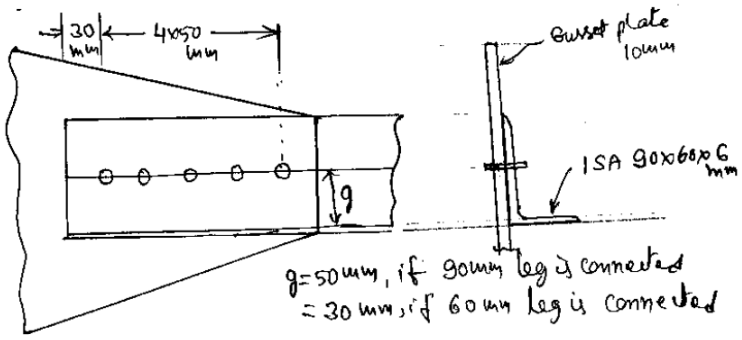
3.a)	Explain the different types of defects observed in the welds with neat sketches.	10	L2
b)	A tie member of a roof trees consists of 2 No. ISA 100x75x8 mm connected on either side of gusset plate, with their shorter legs outstanding. The member is supporting a tensile force of 400 kN. Design the welded connection between the tie member and the gusset plate. Adopt 6mm size fillet weld and draw the sketch of the connection.	10	L6
4.a)	What are the advantages and disadvantages of welded connections?	6	L1
b)	Explain different types of Welds used in practice with neat sketch.	4	L2
c)	A tie member of a roof truss consists of two numbers of ISA 90 mm x 60 mm x 8 mm. The angles are connected on either side of 12 m gusset plate. The tie member is subjected to a factored load of 400 kN. Assuming the welding to be done in working, design the welded connection.	10	L6

UNIT - III

5.a)	Draw the sketches of different types of sections used for tension members in practice	4	L4
b)	Design a single unequal angle tie member for a design tensile force of 500 kN. Also design the end connection using a lag angle to the gusset plate of 12 mm	16	L6

thickness. Adopt bolts of property class 4.6, draw the sketch of the connection.

6.a)	Draw the sketches of different types of sections used for tension members in practice.	4	L4
b)	A single unequal angle ISA (90 x 60 x 6mm) is connected to a 10 mm gusset plate at the ends with 5 nos. of 16 mm bolts to transfer tension Fig. Determine the design tensile strength of the angle, i) If the gusset is connected to 90 mm leg ii) if the gusset is connected to 60 mm let.	16	L3



UNIT - IV

7.	What are the maximum values of slenderness ratios?	4	L1
	Write down briefly about the classification of compression members. 2	2	L6
	Design a column section using double channels back to back to carry a factored load of 2000 kN. The height of the column is 5 m with both ends hinged. Assume f_{cd} = 150 MPa. Also design a suitable "Lacing system".	14	L6
8.	Design a built up column to support a load of 1000 kN using 2 No. channel sections placed back to back over a distance of 250 mm. Effective height of the column is 5 m. Also design suitable lacing connections.	20	L6

UNIT - V

9.a)	Explain the terms plastic section modules and plastic hinge.	6	L2
b)	Determine the shape factor of a hollow rectangular section of outer dimensions of 60mm wide and 120 mm deep with 5mm metal thickness all-round. 6	6	L3
c)	Determine the plastic moment capacity of two span continuous beam ABC, AB = 6 m, with plastic moment capacity 2Mp and BC = 4 m with plastic moment capacity Mp. The beam is fixed at A and C, while continuous over 'B'. The beam supports the loads at collapse of magnitude 60 kN at 2 m from 'A' and 60 kN at 4 m from "A" and a UDL of 60 kN/m over the entire span BC. Also sketch the safe and admissible BMD at collapse.	12	L3
10.a)	Distinguish between laterally restrained and un-restrained beams with the help of sketches.	4	L2
b)	A roof of a hall measuring 9 m x 21 m is to be provided with an RCC slab supported on steel beams. The beams are spaced at 3.5 m c /c. The live load = 3 kN/m2 and the finishing load on the roof = 1.5 kN/m2. Design the steel beam and apply necessary check. The hall is having an all round wall of 30 cm thickness and the roof slab is 150 mm thick. Take fy = 250 MPa.	16	L6

Course Title: Advanced Concrete Technology			
Course Code: P13CV74	**Semester: VII**	**L – T – P : 4 – 0 - 0**	**Credits: 4**
Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.		**Weightage: CIE: 50 %;**	**SEE: 50%**

Prerequisite:

Building materials and construction.
Concrete technology

Course Learning Objectives (CLOs)

This course aims to know

1. Composition, micro and macroscopic study of cement
2. Chemical admixture and mineral admixture
3. Mix design and durability
4. Ready mix concrete and Light weight concrete
5. Test on hardened concrete

Relevance of the Course:

This course is relevant to understand the behavoiur of concrete.

Course Contents

UNIT– I

INTRODUCTION:

Importance of Bogue's compounds, Structure of a Hydrated Cement Paste, Volume of hydrated product, porosity of paste and concrete, transition Zone, Elastic Modulus, factors affecting strength and elasticity of concrete, Alkali Aggregate Reaction, Rheology of concrete in terms of Bingham's parameter. **10 Hours**

UNIT– II

CHEMICAL ADMIXTURES:

Mechanism of chemical admixture, Plasticizers introduction to super Plasticizers and their effect on concrete property in fresh and hardened state, Marsh cone test for optimum dosage of super plasticizer, retarder, accelerator, Air-entraining admixtures, new generation superplasticizer.

MINERAL ADMIXTURE:

Fly ash, Silica fume, GGBS, and their effect on concrete property in fresh state and hardened state. **11 Hours**

UNIT– III

MIX DESIGN:

Factors affecting mix design, design of concrete mix by BIS, method using IS10262, introduction to current American (ACI)/ British (BS), methods. Provisions in revised IS10262-2004.

READY MIXED CONCRETE:

Manufacture, transporting, placing, precautions, Methods of concreting- Pumping, under water concreting, shotcrete.Self-compacting concrete concept, materials, tests, properties, application and typical mix. **10 hours**

UNIT– IV

FIBRE REINFORCED CONCRETE:

Fibers types and properties, Behavior of FRC in compression, behavior in flexure and shear.

LIGHT WEIGHT CONCRETE:

Materials properties and types.Typical light weight concrete mix.High density concrete and high performance concrete-materials, properties and applications, typical mix.Ferro cement - materials, techniques of manufacture, properties and application. **11 hours**

UNIT– V

DURABILITY OF CONCRETE:

Introduction, Permeability of concrete, chemical attack, acid attack, efflorescence, Corrosion in concrete. Thermal conductivity, thermal diffusivity, specific heat, IS456-2000 requirement for durability.

TEST ON HARDENED CONCRETE:

Effect of end condition of specimen, capping, H/D ratio, rate of loading, moisture condition. Compression, tension and flexure tests, tests on composition of hardened concrete-cement content, original w/c ratio. NDT tests concepts-Rebound hammer, pulse velocity methods**.**

10 hours

Text Books:

1. **Properties of Concrete**- Neville, A.M. - ELBS Edition, Longman Ltd., London
2. **Concrete Technology**- M.S. Shetty
3. **IS 10262-2004**

Reference Books:

1. **Advanced Concrete Technology Processes**- John Newman, Ban Seng Choo, - London.
2. **Advanced Concrete Technology Constituent materials** - John Newman, Ban Seng Choo- London

Course Outcome (CO)

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

1. Explain Bouge's compound and their details.(L2)
2. Design a concrete mix according to IS 10262:2009.(L1)
3. Describe different types of admixtures.(L4)
4. Explain fibre reinforced concrete and tests to be conducted hardened concrete.(L2)
5. Define the durability.(L1)
6. Design a light weight concrete mix.(L6)
7. Design SCC and Ferro cement.(L6)

P.E.S. COLLEGE OF ENGINEERING (AUTONOMOUS), MANDYA-571401
DEPARTMENT OF CIVIL ENGINEERING
BACHELOR OF ENGINEERING - SEVENTH SEMESTER
SUBJECT: ADVANCED CONCRETE TECHNOLOGY(P13CV74)

TIME: 3 HOURS **MAX MARKS : 100**

INSTRUCTIONS: Answer FIVE full questions selecting at least **ONE** full question from each **UNIT**.

	MODEL QUESTION PAPER	Marks	Levels
	UNIT – I		
1.a)	Explain factors affecting strength and elasticity.	6	L2
b)	Write short notes on: i) Bogue's compound ii) Transition Zone	8	L6
	c. Explain with neat sketch Rheology of concrete (macroscopic and microscopic).	6	L2
2.	Explain the strength and porosity relationship for concrete with the help of diagram.	6	L2
	Explain the various modulus of elasticity for concrete with the help of typical stress-strain diagram.	8	L2
	What is transition Zone in concrete? Explain the various factors which affect the strength of transition Zone.	6	L1
	UNIT - II		
3.a)	Explain super plasticizer (mechanism, classification, new generation super plasticizer)	6	L2
b)	Explain the effects of super plasticizer on fresh concrete. Explain Marsh cone test.	7	L2
c)	Classification of admixtures and construction chemicals.	7	L2
4.a)	Explain the effect of adding GGBS on workability, compressive strength and durability of concrete.	10	L2
b)	Explain the effect of adding silica fume on workability, compressive strength and durability of concrete.	10	L2
	UNIT - III		
5.	Design the first mix for M30 grade concrete using GGBS for the following data. Maximum size of aggregate 20 mm, angular Minimum cement content320 kg/m3 Maximum cement content 450 kg/m3 Exposure condition Severe Maximum w/c ratio 0.45 Workability 75 mm slump Quality Control Good Mineral admixtureGGBS at 30% Specific Gravity2.60	20	L6

Chemical admixturePlasticizer

Specific Gravity 1.10

Type of cement OPC 53 grade conforms to IS

Specific Gravity of FA 2.62

Specific Gravity of CA 2.68

Water absorption of FA 0.6%

Water absorption of CA 0.4%

Fine aggregate conforms to Zone III and is relatively fine. Free moisture content is nil for both aggregates.

6.a)	Explain pumpable concrete, design considerations and its problems	6	L2
b)	Explain mixing time, retampering of concrete and transporting concrete (different methods of transportation)	8	L2
c)	Explain self-compacting concrete (concept, materials, properties, applications)	6	L2

UNIT - IV

7.a)	Explain factors affecting the properties of fiber reinforced concrete (FRC).	6	L2
b)	Explain the properties of fresh steel fibre reinforced concrete (SRFC).	6	L2
c)	Explain high density concrete (Explanation, materials, properties and applications).	7	L2
8.a)	What is HPC? What are the various requirements of HPC?	10	L1
b)	What is structural light weight concrete? Explain the strength and workability of typical light weight concrete	10	L1

UNIT - V

9.a)	Explain the following: (i) Efflorescence (ii) corrosion of concrete (iii) thermal conductivity (iv) Alkali aggregate reaction	14	L2
b)	Explain IS: 456-2000 requirements for durability.	6	L2
10.a)	What is modulus of rupture of concrete? How is it determined in the laboratory? How is it related to compressive strength of concrete?	10	L1
b)	Explain how the UPV of concrete is determined. What are the factors which affect the UPV reading? Mention the typical ranges of UPV for quality assessment.	10	L2

Course Title: Theory of Elasticity			
Course Code: P13CV751	**Semester: VII**	**L – T – P : 4 – 0 - 0**	**Credits:4**
Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.		**Weightage: CIE: 50 %; SEE: 50%**	

Prerequisite:
Strength of materials

Course Learning Objectives (CLOs)

This course aims to

To introduce students to the fundamental concepts of the mechanics of deformable bodies along with state-of-the-art computational methods in civil engineering. The range of material behavior considered includes: Finite Deformation Elasticity

Relevance of the Course:

This course is relevant to study the elastic behavoiur of structural material

Course Content

UNIT -I

Introduction to Mathematical theory of elasticity, definition of continuum, stress and strain at a. point, constitutive laws, Generalized Hooke's Law, Strain- displacement relations. **10hours**

UNIT - II

Differential equations of equilibrium, boundary conditions, compatibility equations, and Airy's stress function, problems, Stress polynomials, and St. Venant's principle. **10hours**

UNIT- III

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

UNIT - IV

Two-dimensional problems in polar coordinates, strain-displacement relations, equations of equilibrium, compatibility equation, stress function. **10 Hours**

UNIT - V

Stress distribution symmetrical about an axis, Rotating discs, Lame's problem-thick cylinder. FE APPROACH: 2D and 3D Elements - CST, LST, Rectangular family, Tetrahedral and Hexahedra: Shape functions. **12 Hours**

Text Book:

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

Reference Books:

1. **Continuum 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.

Course Outcome

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

1. Formulate Strain- displacement relations.(L6)
2. Develop differential equations of equilibrium for different boundary conditions(L6)
3. Solve plane stress and plane strain problem. (L6)
4. Solve Two-dimensional problems in polar coordinate system. (L6)
5. Explain stress distribution concept in case of thick cylinder. (L4)

Course Title: Ground Improvement Techniques			
Course Code: P13CV752	**Semester: VII**	**L – T – P : 4 – 0 - 0**	**Credits: 4**
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 Hours

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 Hours**

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 Hours**

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 Hours**

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 Hours**

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

1. Select the best soil improvement technique based on soil condition.(L1)
2. Explain different techniques of hydraulic modification. (L2)
3. Explain different techniques of chemical modification. (L3)
4. Explain grouting and its methods. (L3)
5. Understand the properties of geosynthetic material and fibre properties. (L2)

Course Title: Highway Geometric Design			
Course Code: P13CV753	**Semester: VII**	**L – T – P : 4– 0 - 0**	**Credits: 4**
Contact Period - Lecture: 52 Hrs.; Exam: 3Hrs.		**Weightage: CIE: 50% ; SEE: 50%**	

Prerequisite

Highway engineering

Course Learning Objectives (CLOs)

This Course aims to

1. Learn about IRC and AASHTO standards
2. Design at intersection and cross sectional elements
3. Study the importance of sight distance and highway drainage
4. Learn about horizontal alignment, vertical alignment and rotary intersection

Relevance of the Course:

This course is relevant to design highway

Course Content

UNIT – I

INTRODUCTION:

Geometric Control factors like Topography –design speed – design vehicle – Traffic – Capacity – volume – environment and other factors as per IRC and AASHTO standards and specifications- PCU concept – factors controlling PCU for different design purpose.

INTERSECTION DESIGN: Principle – At grade and Grade separated junctions – Types channelization – Features of channelizing Island – median opening – Gap in median at junction. **10 Hours**

UNIT – II

CROSS SECTIONAL ELEMENTS: Pavement surface characteristics – friction – skid resistance – pavement unevenness - light reflecting characteristics – camber – objectives – types of camber – methods of providing cambers in the field – problems – carriage way – kerb – median – shoulder – foot path – parking lanes – service roads – cycle tracks – Driveways – Right of way – Factors influencing right of way – Design of Road humps as per latest I RC provisions. **10 Hours**

UNIT – III

SIGHT DISTANCE: Importance, types, Sight distance at uncontrolled intersection, derivation, factors affecting sight distance, IRC, AASHTO standards, problems on above.

HIGHWAY DRAINAGE: Importance – sub surface drainage –surface drainage – Design of cross sections – Hydrological – Hydraulically considerations and design of filter media, problems on above. **10 Hours**

UNIT – IV

HORIZONTAL ALIGNMENT: Definition, Checking the stability of vehicle, while moving on horizontal curve, Super elevation, Ruling minimum and maximum radius, Assumptions – problems – method of providing super elevation for different curves – Extra widening of pavement on curves – objectives – Mechanical widening – psychological widening – Transition curve – objectives – Ideal requirements – Types of transition curve – Method of evaluating length of transition curve – Setting the transition curve in the field, set back distance on horizontal curve and problems on above. **11 Hours**

U**NIT – V**

VERTICAL ALIGNMENT: Gradient – Types of gradient – Design criteria of summit and valley curve – Design of vertical curves based on SSD – OSD – Night visibility considerations – Design standards for hilly roads – problems on the above.

ROTARY INTERSECTION: Elements – Advantages – Disadvantages –Design guide lines – problem on the above – Grade separated intersection –Three legged intersection – Diamond inter change – Half clover leaf – clover leaf- Advantages- Disadvantages only **11 Hours**

Text Book:

1. **Principle and practice of Highway Engineering**- L R KADIYALI & N B LAL : Khanna publications
2. **Highway Engineering** – Khanna S K & Justo, Nemchand & Bros.

Reference Books:

1. **Highway Engineering**- Kadiyali L R : Khanna publications
2. **Relavent IRC** Publications
3. **Transportation Engineering and Planning**- Papa Coastas and Prevendors PHI, New Delhi.

Course Outcome

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

1. Understand the concept of design speed and traffic volume according to IRC and AASTHO(L2)
2. Define the cross-sectional elements of road(L1)
3. Explain sight distance and highway drainage(L2)
4. Explain the horizontal alignment of highway(L2)
5. Describe the requirement for vertical alignment(L2)

Course Title: Solid Waste Management			
Course Code: P13CV754	**Semester: VII**	**L – T – P : 4 – 0 - 0**	**Credits: 4**
Contact Period - Lecture: 52 Hrs; Exam: 3Hrs.		**Weightage: CIE: 50 %; SEE: 50%**	

Prerequisite:

Engineering Mechanics,Strength of Materials and Analysis of Structures I.

Course Learning Objectives (CLOs)

This Course aims to

Study and understand the concept of water supply and sanitation.

Relevance of the Course:

This course is relevant to sanitation

Course Content

UNIT – I

INTRODUCTION: Definition, Land Pollution – scope and importance of solid waste management, Material flow and waste generation functional elements of solid waste management. Sources: Classification and characteristics – municipal, commercial &industrial. Methods of quantification. **10 Hrs**

UNIT – II

COLLECTION AND TRANSPORTATION: Systems of collection, collection equipment, transfer stations – bailing and compacting, route optimization techniques and problems On moisture content and Energy content.

TREATMENT / PROCESSING TECHNIQUES: Components separation, volume reduction, size reduction, chemical reduction biological processing. **10 Hrs**

UNIT – III

INCINERATION: Process – 3 T's, factors affecting incineration process, incinerators – types, prevention of air pollution, pyrolysis, design criteria for incineration.

COMPOSTING: Aerobic and anaerobic composting, factors affecting composting, Indore and Bangalore processes, mechanical and semi mechanical composting processes. Vermi-composting. **12 Hrs**

UNIT – IV

SANITARY LAND FILLING: Different types, trench area, Ramp and pit method, site selection, basic steps involved, cell design, prevention of site pollution, leachate & gas collection and control methods, geosynthetic fabric, lining in sanitary landfill. **10 Hrs**

UNIT – V

DISPOSAL METHODS: Open dumping – selection of site, ocean disposal, feeding to hogs, incineration, pyrolsis, composting, sanitary land filling, merits and demerits, biomedical wastes and disposal by salvaging, by grinding and discharging into sewers, ploughing into fields.

RECYCLE AND REUSE: Material and energy recovery operations, reuse in other industries, plastic wastes, environmental significance and reuse. **10 Hrs**

TEXT BOOKS :

1. **Integrated Solid Waste Management:** Tchobanoglous : M/c Graw Hill.
2. **Solid Waste Management in developing countries.** Bhide and Sunderashan, Indian National Scientific Documentation Centre, .

REFERENCE BOOKS:

1. **Hand book on Solid Waste Disposal**.: Pavoni J.L.,
2. **Environmental Engineering**.: Peavy and Tchobanoglous
3. **Environmental Engineering – Vol II.**: S.K. Garg

Course Outcome

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

1. Explain the process of paper and paper board recycling and plastics recycling. (L2)
2. Explain functional elements of solid waste management. (L2)
3. Explain briefly process of Vermi composting. (L2)
4. Define solid waste and discuss the importance of solid waste management. (L2)
5. Explain the process of Pyrolysis with a neat sketch. (L2)

Course Title: Advanced Design of RC Structures			
Course Code: P13CV761	**Semester: VII**	**L – T – P : 4 – 0 - 0**	**Credits: 4**
Contact Period - Lecture: 52 Hrs; Exam: 3Hrs.		**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

Course Content

UNIT I

Design of grid floors: 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. **10 Hrs**

UNIT II

Design of flat slabs: Direct design method- Distribution of moments in column strips and middle strip- Shear in Flat slabs. Limitations of Direct design method and design (with and without drop and column head). **10 Hrs**

UNIT III

Design of RCC overhead circular water tanks with supporting towers,
Introduction to shell and folded plate roofs: Their forms and structural behavior. Design of simple cylindrical shell roof by beam theory **12 Hrs**

UNIT IV

Design of silos: Janssen's method and Airy's method **10 Hrs**

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 KennathLeet, TMH.
2. IS :456-2000, IS :3370-1967, IS : 4995-1974

Course Outcomes

After learning all the units of the course, the student is able to
1. Design of Grid floor. Science & Mathematics (Knowledge and understanding of mathematical models as applied to reinforced concrete design).

2. Analysis of Yield line analysis of slabs (broader knowledge and understanding of design processes for reinforced concrete structural elements and systems).
3. Analysis of flat slabs (broader knowledge and understanding of design processes for reinforced concrete structural elements and systems).
4. Analysis of silos and overhead water tank (broader knowledge and understanding of design processes for reinforced concrete structural elements and systems).

MODEL QUESTION PAPER

ADVANCED DESIGN OF RC STRUCTURES (P13CV751)

Time: 3 hrs **Max. Marks: 100**

Note: - 1. Answer any **FOUR** Full questions, selecting at least **ONE** from each unit.

2. Use of IS codes are permitted. **3.** Assume missing data suitably.

UNIT-I

1. A RC grid floor is to be designed to cover an area of 12mx16.5m. The floor system is simply supported on bearing walls and consists of slab cast monolithically with ribs spaced 1.5m c/c in two mutually perpendicular directions. The floor is to support live load and partition loads of 3 $kN/m^2$and 1 kN/m^2 respectively at the service state. The load due to finishes may be taken as 0.5kN/m^2. Analyse the grid floor by Rankine's method and design suitable reinforcement in the grid floor. Sketch details of reinforcement. Adopt M20 concrete and Fe415 steel. (25 marks)

OR

2. a. Briefly explain the yield line theory for analysis of slab.

   b. Design a simply supported square slab of side 3m to carry a service load of 4kN/m^2. Use M20 grade and Fe415 steel. (25 marks)

UNIT-II

3. A flat floor system consisting of 7 panels in each direction, supports live load and floor finish are 4kN/m^2 and 1.25 kN/m^2 respectively. The supporting columns are of 550x550mm. Using the provisions of IS456-2000 for the direct design method design an interior panel of size 7.5mX7.5m without column heads and drops. The materials used are M20 concrete and HYSD steel of grade 415. (25 marks)

OR

4. A flat floor system consisting of 5 panels in each direction, supports live load and floor finish are 3kN/m^2 and 2.25 kN/m^2 respectively. The supporting columns are of 550x550mm. Using the provisions of IS456-2000 for the direct design method design an interior panel of size 7mX7m with drops. The materials used are M25 concrete and HYSD steel of grade 500 (25 marks)

UNIT-III

5. Design the top dome, top ring beam, cylindrical wall and tank floor of a flat bottom elevated water tank to store 100kL of water. The ring beam is supported by 6 columns equally spaced. Adopting M-25 grade concrete and Fe-415 grade steel. Sketch the details of reinforcement. (25 marks)

OR

6. a. Explain the beam theory as applied to design of cylindrical shell roof (05 marks)
   b. Design a reinforced concrete circular shell with the following particulars
      Radius=3m
      Spam =15m
      Semi central angle =60°
      Thickness of shell =75mm
      Sketch the details. (20 marks)

UNIT-IV

7. A silo with diameter6.0m, height of cylindrical portion 20m and central opening of 0.5m is to be built to store coal (Bitumen dry broken). Design the silo, using M20 grade of concrete and F_e 415 steel. Sketch the reinforcement details. Use Jansson's theory for pressure calculation (25 marks)

OR

8. Design a silo for storing wheat using Airy's theory for following data
   a. Density of wheat =8kN/m^3
   b. For wheat μ=0.466
   c. For wheat $\mu^{|}$=0.466
   d. height of Silo=12m
   e. diameter of silo =5.5m
   f. central opening =500mm
      using M25 grade of concrete and Fe 415, sketch the details. (25 marks)

Course Title: Photogrammetry and Remote Sensing			
Course Code: P13CV762	**Semester: VII**	**L – T – P : 4 – 0 - 0**	**Credits: 4**
Contact Period - Lecture: 52 Hrs; Exam: 3Hrs.		**Weightage: CIE: 50 %; SEE: 50%**	

Perquisite

Survey 1&2

Course Learning Objectives (CLOs)

This Course aims to

Study and understand the concept of photogrammetry, stereoscope, remote sensing and properties of digital imaged date format.

Relevance of the Course:

This course is relevant to digital image data formats.

Course Content

UNIT 1

PHOTOGRAMMETRY - Introduction, basic definitions, terrestrial Photogrammetry, photo theodolite , horizontal and vertical angles from Terrestrial photographs, horizontal position of from photographic measurements, elevation of points by photographic measurements, determination of focal length, **8 Hours**

UNIT 2

AERIAL PHOTOGRAMMETRY- Advantages, vertical tilted and oblique photographs, geometry of vertical photographs, scale of vertical photograph overflat and variable terrain, ground coordinates, computation of length of a line, computation of flying height, relief displacement, overlaps, flight planning, computation of required number of photographs for a given area, ground control in photogrammetry. **9 Hours**

UNIT 3

STEREOSCOPES: Basics of stereoscopy, stereoscopes, use parallax. Basic elements in photographic interpretation introduction to digital photogrammetric**.**

REMOTE SENSING: Introduction , Ideal remote sensing system, basic of electromagnetic remote sensing, electromagnetic energy, electromagnetic spectrum, interaction with earth's atmosphere, interaction with earth-surface materials, spectral reflectance of earth surface materials . **12 Hours**

UNIT 4

REMOTE SENSING PLATFORMS AND SENSORS: Introduction platforms_ IRS, Landsat, SPOT, Cartosat, Ikonos, Envisat etc. Sensors-active and passive, MSS, AVHRR, LISS, TM, PAN, WIFS, microwave sensors, sensor resolutions (spatial, spectral, radiometric and temporal).

PROPERTIES OF DIGITAL IMAGE DATE FORMATS, Basics of digital image processing-radiometric and geometric corrections, image enhancements, image transforms based on arithmetic operation, image filtering. **12 Hours**

UNIT 5

Remote sensing image interpretation, thematic classification (supervised and unsupervised), maximum likelihood classification, introduction to accuracy assessment of classification.

Applications of remote sensing; applications in land use cover analysis, change detection, water resources, urban planning, environmental and geological applications. **11 Hours**

TEXT BOOKS:

1. Mikhail E., J Bethe, and J.C. M cGlone, Introduction to modern photogrammetric.Wiley, 2001
2. Wolf P.R, and B.A. Dewitt, Elements of photogrammetric: with application in GIS. 3rded, McGraw-Hill, 2000
3. Lille sand T.M., and R.W. Kiefer, Remote sensing and image interpretation. 4thed, John Wiley & Sons, 2000.

REFERENCE BOOKS:

1. Jensen J.R., Introductory digital image processing: a remote sensing perspective. 2nd ed Prentice Hal, 1996.
2. Richards J.A., and X. Jia, Remote sensing digital image analysis: an introduction. 3rd ed Springer, 1999.

Course Outcome

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

1. Define terrestrial photogrammetry. (L1)
2. Explain aerial photogrammetry. (L3)
3. Describe basic elements of stereoscopes. (L2)
4. Describe basics of digital image processing. (L2)
5. Understand remote sensing image interpretation. (L2)

Course Title: Design of Bridges			
Course Code: P13CV763	**Semester: VII**	**L – T – P : 4 – 0 - 0**	**Credits: 4**
Contact Period - Lecture: 52 Hrs; Exam: 3Hrs.		**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 **12Hrs**

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. **12Hrs**

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

1. Identify site locations for the bridges. (L2)
2. Understand the IRC loadings. (L2)
3. Analyse and draw slab culvert. (L3)
4. Analyse and draw box culvert. (L3)
5. Analyse and design T-beam Bridge. (L3)

Course Title: Environmental Engineering Laboratory			
Course Code: P13CVL77	**Semester: VII**	**L – T – P : 0– 0 - 3**	**Credits: 1.5**
Contact Period - Lecture: 39Hrs; Exam: 3Hrs.		**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.
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 Title: Highway Materials and Pavement Testing Lab			
Course Code: P13CVL78	**Semester: VII**	**L – T – P : – 0 - 3**	**Credits: 1.5**
Contact Period - Lecture: 39Hrs; Exam: 3Hrs.		**Weightage: CIE: 50 %; SEE: 50%**	

Prerequisites:

Materials of Construction

Course Learning Objectives (CLOs)

To learn the basic test involved in the determination of properties road aggregates and bituminous materials.

Course Content

TESTS ON SUBGRADE SOIL

1. Compaction test
2. California bearing test

TESTS ON ROAD AGGREGATES

3. Aggregate impact test
4. Los-angles abrasion test
5. Aggregatecrushing value test
6. Specific gravity and water absorption test
7. Shape test
8. Soundness test
9. Stripping value of road aggregates

TESTS ON BITUMINIOUS MATERIAL

10. Pentration test
11. Ductility and elasticity recovery test
12. Softening point test
13. Specific gravity test on bitumen
14. Viscosity test
15. Flash and fire point test
16. Test on bitumenemulsion

TESTS ON BITUMINIOUS MIXES

17. Marshal stability test and mix design

TESTS ON PAVEMENT LAYERS

18. Benkelman beamdeflection studies and analysis
19. Uneveness measurement by MERLIN

REFERENCE BOOK :

1. Relevant IRC Codes.
2. **Highway Material Testing Laboratory Manual**– Nemi Chand & Bros.
3. **Highway Material and pavementTesting**- S.K.Khanna, CEG Justo, A.veeraragavan-Nemi Chand & Bros-Rooorkee

Course Title: Design of Pre-Stressed Concrete Structures			
Course Code: P13CV81	**Semester: VIII**	**L – T – P : 2- 2 - 0**	**Credits:3**
Contact Period - Lecture: 52 Hrs; Exam: 3Hrs.		**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, Centre of Thrust. **10 HOURS**

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 HOURS**

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. Limit state of serviceability, and control of deflections, crack widths. **12 HOURS**

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 HOURS**

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 HOURS**

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 outcome

1. Student will get the capability of selecting PSC for the necessity. He will understand the requirement of PSC members for present scenario.
2. Student will be able to analyse the stresses encountered in PSC element during transfer and at working.
3. Student can understand the effectiveness of the design of PSC after studying losses and he can understand the various losses of PSC.
4. Student will get the capability of analysing the PSC element and finding its efficiency.
5. Student will get the capability to design PSC beam for different requirements.

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Eighth Semester, B.E. – Civil Engineering

Model Question paper

Design of Prestressed concrete Structures

Time: 3 hrs *Max. Marks: 100*

Note: *1. Answer five full questions selecting atleast one full question from each unit*
2. Use of IS1343 is permitted. 3. Assume data suitably.

UNIT - I

1. Write short notes on the following:
a) Stress corrosion and embrittlement of steel
b) Object of using high strength concrete and high strength steel.
c) Explain Non Prestressed reinforcement in PSC.
d) Advantages and disadvantages of PSC over RCC.

5 x 4 =20

2. Explain with sketches Hoyer's long line method of pre tensioning. 20
b. Explain load balancing and cable profile in PSC.
c. Object of using high strength steel and high strength concrete.
d. Advantages and disadvantages of pre tensioning.
e. Stress corrosion and embrittlement of steel. **5 x 4 =20**

UNIT – II

3.(a) A rectangular beam 240 mm × 500 mm in section is SS over a span of 8 m. It is prestressed with an initial prestress of 480 kN located at 100 mm from the soffit. The beam carries a load of9 kN/m in addition to its own weight. Determine stress distribution in concrete at;
i) Transfer of prestress
ii) Working load condition
Assume loss of prestress as 20%. Also draw stress distribution diagrams across the section.

12

(b) A rectangular concrete beam 250 mm × 600 mm is prestressed by means of four 14 mm diameter high tensile bars located at 200 mm from the soffit of the beam. If the effective stressin the wires is 700 N/mm2, what is the maximum bending moment that can be applied to thesection without causing tension at the soffit of the beam? **8**

(OR)

4. A simply supported beam of span 3 m is 60 mm x 120 mm in section: It carries two point loads of 2 kN each at one third span points in addition to its own weight. Find the initial prestressing force and its eccentricity so that the tensile stress in concrete will be limited to 1.5 MPa load 1 MPa at transfer and at working load respectively. Take loss ratio of 80%. Assume density of concrete as 24 kN/m3.**20**

UNIT - III

3. a. Explain the loss of pre-stress due to shrinkage, loss of pre stress due to creep and loss of prestress due to slip

3+3+2 = 8

b. A post tensioned beam 300 mm x800 mm in section is pre stressed with an initial pre-stress of 800 kN at 100 mm from the soffit.
Area of cable = 800 mm2 , modular ratio = 6
Ultimate shrinkage strain of concrete = 1.6 x 10-4
Ultimate creep strain of concrete = 3x10-5 mm/mm per N/mm2.
Modulus of elasticity of steel= 210 GPa
Determine the % loss of pre stress due to concrete. **12**

(OR)

4. a. Explain the factors affecting deflection. **4**

b. A rectangular beam 240mm x 400mm in section is simply supported over a space of 8m. It ispre stressed with a parabolic cable having a maximum eccentricity of 150mm at mid sectionand 50 mm at the supports. Effective pre stress in the cable is 500 kN. The beam is requiredto support a UDL of 20 kN/m in addition to its own weight.

Determine : a) Resultant maximum deflection b) Maximum deflection after 6 months assume the creep coefficient as 2.0.

Also state whether this deflection is within permissible limits (say L/500) assume Ec =0.36x105 N/mm2. Density of concrete 24 kN/m3. **16**

UNIT - IV

5. a. A pre-tensioned, T-section has a flange 1200mm wide and 150, thick. The width and depth ofthe rib are 300 and 1500 mm respectively. The high-tensile steel has an area of 4700mm2 andis located at an effective depth of 1600 mm. If the characteristic cube strength of the concreteand the tensile strength of steel are 40 and 1600 N/mm2 respectively, calculate the flexuralstrength of the T – section.

10

b. A post tensioned beam with unbonded tendons is of rectangular section 400 mm wide with aneffective depth of 800 mm. The cross – sectional area of the Prestressing steel is 2840 mm2.The effective Pre-stress in the steel after all losses is 900 N/mm2. The effective span of thebeam is 16 m. If fck is 40 N/mm2, estimate the ultimate moment of resistance of the sectionusing IS : 1343 code recommendations.

10

6. a. i) Explain the methods of improving shear resistance or factors reducing principal tension inpsc beams.

ii) Sketch shear stress variation diagram for standard sections. **2 x 2 =4**

b. A beam 300mm x 800mm in section is simply supported over span of 12m. It carries a UDL of 24kN/m in additional to its own weight. The beam is pre stressed with a parabolic cable which has maximum eccentricity of 300 mm at mid span. The cable is anchored 60 mm along C.G.C at support. Determine principal tension at 100mm below C.G.C across a section which lies at 2m from left support. Effective pre stress in the cable is 800 kN. Assume density of concrete as 25 kN/m3. **16**

UNIT - V

7. a. Write short notes with sketch on stress distribution in end block. Transmission of force inend block (singular double anchor plate), End blocks of post tensioned beams (idealized stress paths and bursting, tension and splitting order) and isobars of transverse tensile stress.

6

b. The end block of a post-tensioned pre stressed concrete beam 300 mm wide and 300 mm deep is subjected to a concrete an charge force of 832800 N by a Freyssinet an charge of area 11720 mm2. Design and detail the anchorage reinforcement for the end block. **14**

(OR)

8. a. Define kern point and kern distance. 4

b. Design a rectangular beam for a simply supported span of 10m. Live load on the beam is m 12 kN/m. No tension is permitted. Compressive stress in concrete is limited to 15N/mm2 12 N/mm2 at transfer and at working load respectively. Loss ratio 80%. Permissible tension in steel is 1000 N/mm2. Cover for C.G.S is 80mm. Density of concrete 24 kN/m3.

Course Title: Design and Drawing Of Steel Structures			
Course Code: P13CV82	**Semester: VIII**	**L – T – P : 2- 0 - 2**	**Credits:3**
Contact Period - Lecture: 52 Hrs; Exam: 3Hrs.		**Weightage: CIE: 50 %; SEE: 50%**	

Prerequisites:

Strength of materials
Analysis of structures-I
Analysis of structures-II

Course Learning Objectives (CLOs)

1. Learn the analysis and design of steel structures.
2. Understand the Codal provisions.
3. Learn different types of connections.
4. To draw Bolted and welded of connections.
5. To draw beam-beam, Beam-column, seated, stiffened and un-stiffened.
6. To draw Splices, Column-column of same and different sections. Lacingand battens
7. To draw Slab base and gusseted base, grillage foundation.
8. To design and drawing of Bolted and welded plate girder
9. To design and drawing of Roof Truss
10. To design and drawing of Gantry girder

Relevance of the Course:

This course is relevant to analysis and design steel structures.

Course Content

PART - A

(DRAWINGS TO BE PREPARED FOR GIVEN STRUCTURAL DETAILS)

UNIT - 1

CONNECTIONS: Bolted and welded, beam-beam, Beam-column, seated, stiffened and un-stiffened.

UNIT - 2

COLUMNS: Splices, Column-column of same and different sections. Lacingand battens.

UNIT - 3

COLUMN BASES: Slab base and gusseted base, grillage foundation.

PART - B

UNIT - 4

Design and drawing of

i) Bolted and welded plate girder
ii) Roof Truss (Forces in the members to be given)
iii) Gantry girder

Question paper pattern: students should answer one question from each part.

CIE marks: 30 marks for term work and 20 for tests conducted for 4 hours at the end of the semester similar to SEE.

TEXT BOOKS:

1. **Structural Design & Drawing** – N.Krishna Raju, Oxford University press, India.
2. **Design of Steel Structures** - N. Subramanian : Oxford University Press, India

REFERENCES:

1. **Design of Steel Structures** - Negi - Tata Mc Graw Hill Publishers.
2. **Design of Steel Structures** - Arya and Ajaman- Nem Chand &Bros. Roorkee.
3. **Design of Steel Structures.-**Raghupati
4. IS: 800 – 2007,
5. SP 6 (1) – 1984 or Steel Table.

Course Outcome

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

1. Adopt Codal provisions for the design of steel structures.(L6)
2. Students will acquire the basic knowledge in drawing Bolted and welded of connections.
3. Students will acquire the basic knowledge in drawing beam-beam, Beam-column, seated, stiffened and un-stiffened.
4. Students will acquire the basic knowledge in drawing Splices, Column-column of same and different sections. Lacingand battens
5. Students will acquire the basic knowledge in drawing Slab base and gusseted base, grillage foundation.
6. Students will have the ability to design and drawing of Bolted and welded plate girder
3. Students will have the ability to design and drawing of Roof Truss
4. Students will have the ability to design and drawing of Gantry girder

Unitwise Plan

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P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution under VTU, Belgaum)
Eighth Semester, B.E. – Civil Engineering
Model question paper
Design and Drawing of Steel Structures

Time: 3 hrs *Max. Marks: 100*

Note: *1. Answer any **ONE** full question from part-A and **ONE** full question from part-B.*
2. Use of IS-800-2007 And Steel Tables Permitted.
3. Assume Missing Data Suitably.

PART – A

1. a. A built up column is composed of two ISLC – 350 placed back to back at clear distance of 240 mm. The column is provided with single lacing system consisting of 60 mm x 12 mm flat at 45º and is connected by one 20mm diameter bolt at each end. Draw to a suitable scale the following, showing the details of connection:
i) Typical elevation ii) Typical plan of column. 10

b. A column splice is provided between upper storey column ISHB 200 @ 466N/m and lower storey column ISHB 250 @ 510N/m. The columns are coaxial. At junction between the faces of the column a base plate of 40mm thickness is provided. Four number of web cleat angles ISA 100 x 100 x 8mm are used for connecting the web of column with the base plate using two numbers of bolts along each leg of angle. Tapered flange splice plates of section 250x10mm gradually tapered to a section of 200 x 10 mm is provided with suitable filler plates. Six numbers of bolts are provided in two vertical rows at each flange of column for connection. Two numbers of extra bolts are provided at each face of upper column to connect the filler plate and flange of upper column exclusively. All the bolts used for connection are M20 (10K) HSFG type. Providing a suitable pitch and edge distance to the bolts, draw to a suitable scale:
i) Elevation of column splice ii) Side view 10+10

2. A double plated welded framed connection is provided for connecting two numbers of secondary beams to the web of main beam. The secondary beam ISLB 325 @ 431 N/m (from left side) and ISLB 500 @ 750 N/m (from right side) are connected to the web of main beam ISMB 550@ 1037 N/m. The top flange of ISLB 325 is 150mm below the top flanges of the other two beams ISLB 500 and ISMB 550 in devotion. Two plates of size 220 x 120 x 10mm are used for connection between the webs of ISLB 325 and ISMB 550, while two plates of size 350 x 120 x 10mm are used for connection between ISLB 500 and ISMB 550 with their longer edge vertical. Continuous fillet weld of 6mm size provided all round the plates for connection. Showing all the details of connections draw to a suitable scale: 10

a)Sectional Elevation (as seen from main beam ISMB) 10
b) Sectional plan 10
c) Sectional side view from left side (ISLB 325 beam side) 10

PART –B

3. The forces in the members of roof truss shown in Fig (1). Due to dead load, live load and wind load is tabulated in Table – 1. Design rafter (L0 – U3), main tie (L0 – L5) and main

Sling (u3 – L2) members and bolted joints of this truss use M20 bolts of grade 4.6. Draw to a suitable scale the following, assuming ISA 50 x 50 x 6mm for the members not designed.
i) Half elevation ii) Connection details at joints L0 and u2. 35

15
10+10

4. Design a simply supported gantry girder for the following data. The girder is electrically operated. Yield stress of steel is 250MPa. Use 16mm diameter bolts of grade 4.6.

i) Span of crane girder = 20 m
ii) Span of gantry girder = 7 m
iii) Capacity of the crane = 250 kN
iv) Self weight of crane excluding crab = 200 kN
v) Weight of crab = 60 kN
vi) Wheel base distance = 3.4 m
vii) Minimum hook approach = 1.1 m
viii) Self weight of rail = 0.3 kN/m
ix) Height of rail = 75 mm

Draw to a suitable scale:
a) The cross section of gantry gider and its attachments to supporting column and the bracket. 35
15
b) Plan details 10
c) Side elevation. 10

Course Title: Advanced Foundation Design			
Course Code: P13CV831	**Semester: VIII**	**L – T – P : 2 – 2 - 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. 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 Hours**

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 reamedpiles.

10 Hours

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 Hours**

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 Hours**

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 Hours**

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.

REFERENCE BOOKS:

1. **Pile Foundation**.- Chellies
2. **Geotechnical Engineering**.- P. Purushotham Raj

Course Outcome

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

1. Define the proportioning of shallow foundation.(L1)
2. Describe pile foundation(L1)
3. Design well foundation(L6)
4. Define and design foundations on expansive soil(L1)
5. Describe machine foundation and geosynthesis(L1)

P13CV831 *Page No... 1*

Eighth Semester, B.E. – Civil Engineering
Model question paper
Advanced Foundation Design

Time: 3 hrs *Max. Marks: 100*

Note: *Answer any **FIVE** full questions, selecting atleast **ONE**full questions from each part.*

UNIT- I

1. a. List the factors influencing the selection of depth of foundational and explain any two of them. 8

b. What do you understand by prismptive bearing capacity? Explain with example. 6

c. A soft clay layer, which is normally consolidated in 8 m thick with a natural water content of 32%. The clay has a saturated unit weight of 17 kN/m3, a specific gravity of 2.7 and a liquid limit of 50%. The ground water level is at the surface of the clay. Estimate the consolidation settlement of the clay layer, if the foundation load increases the pressure at the centre of clay layer by □□P = 12 kN/m2. 6

(OR)

2. a. Explain the procedure for proportioning of footing for equal settlement. 6

b. Explain the factors that influence the bearing capacity of soils. 6

c. Proportion a combined booting for the following details, two columns 300 mmx300 mm in size spaced at 3 m centre to centre carry a load of 600 kN and 400 kN. The footing cannot extend beyond the edges of the column lengthwise. Allowable bearing pressure is equal to 100 kPa. 8

UNIT- II

3. a. Discuss the classification of pile foundation based on function, Draw neat sketches wherever necessary. 6

b. Explain negative skin friction. 6

c. A pile foundation system is proposed for a structure 4 m x 4 m base carrying a load of 4000 kN to rest on 20 m thick clay layer underlained by a hard rock. The ground water table is at the surface. The unconfined compressive strength at bulk density of clay are 240 kPa and 18 kN/m3 respectively. Design the pilegroup. Assume factor of safety is equal to 3 and shear mobilization factor is equal to 0.7. 8

(OR)

4. a. Describe the various components of well foundation with neat sketch, indicating the functions of each. 10

b. Discuss the various kinds of forces likely to act on a well foundation. 10

UNIT- III

5. a. What are the advantages and disadvantages of drilled peir foundations? 6

b. Explain the method of construction of drilled peir foundation. 6

c. An open caisson, 20 m deep, is of cylindrical shape with external diameter of 9m and internal diameter 6m respectively, If the water level is 2m below the top of the caisson, determine minimum thickness of the seal required. Check the perimeter shear also. Assume □c = 2400 kN/m2 and □c = 24 kN/m3 for concrete. Allowable permeter shear stress is equal to 650 kN/m2. 8

(OR)

6. a. Define the terms: i) Free swell ii) Differential Swell and iii) Swelling pressure. 6

b. What are the different methods of foundation treatment for structures on expensive soil and explain any two of them? 6
c. Explain the construction technique and advantages of under reamed pile foundation. 8

UNIT- IV

7. a Discuss the method of identifying expansive soil from laboratory tests. Explain how swelling potential of a soil is evaluated. 8
b. What are the different methods of foundation treatment for structure on expansive soil? Explain any two of them. 6
c. Explain the laboratory method of finding the swelling pressure of an expansive soil. 6

(OR)

8. a. Discuss the method of identifying expensive soil from laboratory tests. 6
b. What are the different methods of foundation treatment for structure on expansive soil? Explain any two of them. 8
c. Determine the capacity of 4.0 m long single bulb of 50 cm stem diameter. Average cohesion value both within the shaft of pile depth and below the toe is 100 kN/m2. 6

UNIT- V

9 a. Derive the expression for natural frequency of un-damped for vibration of single degree of freedom system. 8
b. When is vibration isolation required? Describe the method of vibration control. 6
c. Determine the natural frequency of a machine foundation having a base area 2 m x 2 m and a mass of 15 mg including the mass of the machine, taking Cu = 4x104 kN/m3. 6
10.a. Give Barken's method for machine foundation. What are the limitations? 10
b. Derive the expression for natural frequency of undamped free vibration of single degree of freedom system. 10

Course Title: Pavement Design			
Course Code: P13CV832	**Semester: VIII**	**L – T – P : 2– 2- 0**	**Credits: 3**
Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.	**Weightage: CIE: 50 %; SEE:50%**		

Prerequisites:
Highway engineering
Soil mechanics-I
Soil mechanics –II

Course Learning Objectives (CLOs):

To select appropriate pavement and surfacing materials, types, layer thicknesses and configurations to ensure that the pavement performs adequately and requires minimal maintenance under the anticipated traffic loading for the design life adopted.

Relevance of the Course:
This course is relevant to roads and pavements.

Course Content

UNIT– I

Introduction: Factors affecting design and performance of the pavements. Pavement composition, Parameters for the Pavement Analysis- Elastic Modulus, Passion's ratio, Wheel Load, Wheel configuration and Tyre Pressure, Temperature. Concepts of analysis of bituminous pavement structure and concrete pavement structure**.** **12Hours**

UNIT– II

Stresses and Deflections in Flexible Pavements: Stresses and deflections in homogenous masses, wheel load stresses and various factors in traffic wheel load- ESWL [graphical method only] for multiple wheel loads, repeated loads and EWL factors. **10Hours**

UNIT– III

Design Methods for Flexible pavements for Highways: Mc Leod method, Kansas Method, California Resistance Value method, IRC Method- according to the IRC38-2001

10Hours

UNIT– IV

Stresses in Rigid Pavements: Types of stresses and causes, factors influencing the stresses, general considerations in rigid pavement analysis, EWL, wheel load stresses, warping stresses, frictional stresses and combined stresses. **10Hours**

UNIT– V

Design of Cement Concrete pavement: Designing thickness of Concrete Pavement [IRC 58, 2002]. Types of joints in cement concrete pavements and their functions, joint spacing: design of joints, details of longitudinal joints, contraction joints and expansion joints. **10Hours**

Text Books:

1. ***"Highway Engineering, Nem Chand Bros"Khanna SK and Justo C E G***,Roorkee
2. ***Principles & practices of highway Engineering***- L R Kadiyalli& N B Lal

Reference books:

1.***Principles of pavement design*** – yoder and witzack – 2nd edition,johnwileys and sons
2. ***Principles of pavement design*** – subha Rao

Course outcomes:

This course focuses on the design of roadway pavement. The course goals are to enable students to:

1. Concepts of pavement components in flexible and rigid pavement.
2. Concepts of stresses and strains in flexible pavements based on the layered elastic and viscoelastic solutions.
3. Concepts of Stresses and deflections in rigid pavements.
4. Evaluation of pavement performance, failure criteria, and pavement condition rating

P13CV832 *Page No... 1*

Eighth Semester, B.E. - Civil Engineering
Model question paper
Pavement Design

Time: 3 hrs Max. *Marks: 100*

***Note**: Answer **FIVE** full questions, selecting at least **one** full question from unit.*

UNIT - I

1. a. Briefly explain the factors affecting pavement design
   b. Briefly explain the performance of the pavements. (10+10=20)

(OR)

2. a. List the various Parameters for the Pavement Analysis- Elastic Modulus.
   b. List the various Parameters for the Pavement Analysis- Possion's ratio. (10+10=20)

UNIT - II

3. a. Briefly explain the Stresses in homogenous masses
   b. Briefly explain the deflections in homogenous masses
   c. Briefly explain the wheel load stresses (7+7+6=20)

(OR)

4. a. List the various factors in traffic wheel load- ESWL [graphical method only]
   b. List the various factors in traffic wheel load for multiple wheel loads, repeated loads and EWL factors. (10+10=20)

UNIT - III

5 a. Write a short note on Mc Leod method,
   b.Write a short note on Kansas Method, (10+10=20)

(OR)

6. a. Write a short note on California Resistance Value method
   b. What are the various types of failure in flexible pavements? Explain the cause. (10+10=20)

UNIT - IV

7. a. Write short note on rigid pavement failure
   b. Write short note on design factors for runway pavements.
   c. Write short note on equivalent wheel load factor (6+7+7=20)

(OR)

8. Write short on : i.warping stresses
   ii.frictional stresses
   iii. combined stresses.

UNIT – V

9. Write a short note on
   i. joint spacing
   ii. Design of joints
   iii. Details of longitudinal joints
   iv. contraction joints (5x4=20)

(OR)

10. a. Explain briefly how properties of concrete affecting the design of cement concrete pavements.
    b. Explain briefly how temperature variations affecting the design of cement concrete pavements. (10+10=20)

Course Title: Earthquake Resistant Design of Structures			
Course Code: P13CV833	**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

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.

REFERENCES 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 Outcome

On completion of this course, students are able to

1. Establish a performance – based framework to asses seismic response.
2. Select appropriate structural systems, configurations and proportions.
3. Use design procedures capable of reliably achieving specified performance goals.

Eighth Semester, B.E. – Civil Engineering
Model question paper
EARTHQUAKE RESISTANT DESIGN OF STRUCTURES (P13CV833)

Time: 3 hrs *Max. Marks: 100*

Note: *i) Answer any **FIVE** full questions, selecting at least**ONE** fullquestions from each unit.*
ii) Assume data suitably.

UNIT-I

1. a. List the Classification of Earthquakes and causes of Earthquakes 10 marks
   b. Write a short note on Internal structure of earth 10 marks

OR

2. Discuss Response Spectra - Average response Spectra / Design Response Spectra**.** 20 marks

UNIT – II

3. a. Briefly explain the lessons Learnt from Past Earthquakes on the Performance of the Buildings 10 marks

b.Briefly explain the effect of Structural Irregularities on seismic performance of RC buildings. 10 marks

OR

4. a. List the Vertical irregularity and plan configuration problems 10 marks
   b.Write a short note on Seismo-resistant building architecture 10 marks

UNIT – III

5.a. List the Guidelines for Earthquakes Resistant design 10 marks
b. List the different types of Structural system 10 marks

OR

6.a.Write a short note on Evaluation of Earthquake forces as per IS: 1893-2002. 10 marks
Write a short note on Equivalent lateral force method 10 marks

UNIT – IV

7. a.Write a short note on Dynamic design parameters of soil, Soil-structure interaction. 10 marks
   b.Write a short note on Concept of Liquefaction, 10 marks

OR

8. a.Write a short note on Ductility ratio, structural ductility and factors affecting ductility, Confinement of concrete 10marks
   b.Write a short note on Ductile detailing of RC structures as per IS:13920-1993 10marks

UNIT – V

9. Write a short note on Basic concept of seismic base isolation and list the Different types Seismic Isolation systems and explain any one. 20marks

OR

10. Write a short note on Necessity of seismic evaluation and Condition assessment for evaluation 20marks

Course Title: Industrial Wastewater Treatment			
Course Code: P13CV834	**Semester: VIII**	**L – T – P : 2: 2: 0**	**Credits: 3**
Contact Period - Lecture: 52Hr.; Exam: 03Hr		**Weightage: CIE: 50 %; SEE: 50%**	

Prerequisites:
Environmental engineering

Course Learning Objectives (CLOs)
1. Ability to **apply** knowledge of mathematics, science, and engineering in industrial waste water treatment, like planning, analysis and designing of treatment units including details of statuary rules and regulations.
2. Ability to **identify**, **formulates**, and **solves**various types of industrial pollution
3. Ability to **design** a system, components, or processes to meet desired needs in industrial waste water treatment.
4. Ability to **function** on multi-disciplinary teams in the areas of different types of industries to reduce, recycle and reuse the waste from industries.

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

Course Content

UNIT – I

Industrial scenario in India - Industrial activity and Environment - Uses of Water by industry - Difference between domestic and industrial wastewater- Parameters of pollution and their effects receiving streams- Classification of streams based on the mixing of effluents-Self purification of streams - Oxygen sag curve- Derivation of streeter – phelps equation – Numerical problems. **12Hrs**

UNIT – II

Environmental standards for industrial effluents - Effluent sampling – grab and composite sampling Treatment methods of industrial effluent -– pre treatment of waste - Equalization – Neutralization- Flotation- Sedimentation- Numerical problems - Volume reduction and strength reduction - recycling of waste water. **10 Hrs**

UNIT – III

Introduction to Secondary treatment of industrial effluents – Design of an aeration unit – design of a trickling filter – design of an oxidation pond - Introduction and feasibility of combined treatment- municipal waste and industrial waste -volume ratio -Rental charges and economics – mixing of effluents - Problems associated with mixing of effluents and combined treatment-. Management of effluents – Environmental modelling **10 Hrs**

UNIT – IV

Manufacturing process flow sheet with source of wastewater, Characteristics of waste, effects of untreated waste on streams or on land and the treatment of the following industrial effluents Cotton textile Industry, Dairy industry, Sugar Mill **10 Hrs**

UNIT – V

Manufacturing process flow sheet with source of wastewater, Characteristics of waste, effects of untreated waste on streams or on land and the treatment of the following industrial effluents Paper and pulp Industry, Distillery industry, Plating industry **10 Hrs**

Text Books:

1. Nelson L Nemerow (1971) – "Liquid Waste of industry, Theories**,** "Practices and Treatment. Addison Willey New York.
2. Rao M N and Dutta A.K (2008) - waste water treatment, Third edition, Oxford & IBH Publications co pvt ltd, NewDelhi.

Reference Books:

1. Mahajan S P.(1985) - Pollution control in Process Industries—Tata McGraw hill Company, New Delhi
2. Eckenfelder (2000)- "**Industrial Water pollution Control"-** McGraw hill Company, New Delhi American Chemical Society, Washington D.C. USA

Course outcome

1. Graduates will develop planning skill in designing water pollution control systems in industries.
2. Graduates will differentiate red category industries from green category industries.
3. Graduates will be able to characterize the different types of industrial effluents
4. Graduates will be able to advise the regulating authority about the possible danger specific industries.

INDUSTRIAL WASTE WATER TREATMENT
MODEL QUESTION PAPER

Subject Code : P13CV834 **Max. Marks: 100**

Note: Answer any FIVE full questions selecting at least ONE full question from each unit

UNIT-I

1(a) Discuss the effect of Industrial pollutants on stream water quality OR Sewage treatment plants. **10Marks**

(b) Distinguish between Stream standards and Effluent standards. **4 Marks**

(c) Bring out difference between Domestic and Industrial waste **6 Marks**

OR

2(a) What is Self Purification of Stream? Briefly explain DO sag curve with sketch and mark zones of pollution. 10 Marks

(b) Write Streeter-Phelps formulations. 6 Marks

(c) Calculate the DO and BOD of mixture at the point of discharge of industrial waste water to river from the following data:

		River	Waste water
Flow	cumecs	20	1.2
DO	mg/L	6	zero
BOD5	mg/L	2	750.

4 Marks

UNIT-II

3(a) Explain in brief methods of Strength reduction **OR** Volume reduction of industrial waste water. 10 Marks

(b) Bring out briefly different methods of Neutralization of industrial effluent. 10 Marks

OR

4(a) Bring out removal methods of any TWO of the following impurities;

(i) Inorganic SS **(ii)** Organic solids **(iii)** Colloidal solids. 10 Marks

(b) Explain methods of treatments of Sludge solids. 10 Marks

UNIT-III

5(a) Explain the feasibility of treating the Industrial wastewater along with municipal wastewater. 10 Marks

(b) Bring out briefly effect of partially treated and completely treated industrial waste water on receiving streams. 10Marks

OR

6a) Give the sources and characteristics of tannery waste water along with treatment methods. 10 Marks

b) With the help of flow diagram discuss the sources and treatment of wastewater from distilleries OR Cane Sugar industry. 10 Marks

UNIT-IV

7. Explain along with flow sheet treatment of effluent from the industries

(i) Dairy and (ii) Canning 20Marks

OR

8. Explain treatment of waste water from any Two of the following industry.

i) Paper and pulp industry.

ii) Pharmaceuticals
iii) Food processing industry. 20 Marks

UNIT-V

9. a. List the Manufacturing process flow sheet with source of wastewater 10 Marks
   b. List the effects of untreated waste on streams or on land and the treatment of the Paper and pulp Industry. 10 Marks

OR

10. a. List the effects of untreated waste on streams or on land and the treatment of the Distillery industry 10 Marks
    b. List the effects of untreated waste on streams or on land and the treatment of the Plating industry 10 Marks

Course Title: Alternative Building Materials and Technologies			
Course Code: P13CV841	**Semester: VIII**	**L – T – P : 2 : 2: 0**	**Credits: 3**
Contact Period - Lecture: 52Hr.; Exam: 03Hr	**Weightage: CIE: 50 %; SEE: 50%**		

Prerequisite:

Building material and construction

Course Learning Objectives (CLOs)

This Course aims to

Study and understand the concept of alternative building technologies and IS Codal provisions.

Relevance of the Course:

This course is relevant to building materials.

Course Content

UNIT – I

Introduction: energy in building materials, environmental issues related to building materials, global warming, and environmental friendly and cost effective building technologies. Building in different climatic regions, traditional building materials and vernacular architecture.

Alternative building blocks: characteristics of building blocks for walls, stone and laterite blocks, bricks and hollow clay blocks, concrete blocks.

Stabilized blocks; mud blocks, steam curved blocks, stone masonry blocks. Selection of building blocks. Machines for production of stabilized blocks. **12 Hrs**

UNIT – II

Lime pozzolona cement: raw materials, manufacturing process, properties and uses, FRC, matrix and reinforcing materials, applications.

Fiber reinforced polymer composite-matrix materials, fillers and other additives, reinforcing fibers, applications. Building materials from agro and industrials waste, types of agro wastes, types of industrial and mine wastes, properties and applications.. **10 Hrs**

UNIT – III

Alternative building technologies: alternative for wall construction, types, construction method, masonry mortar, types, preparation properties, Ferro cement and Ferro concrete building components, materials and specifications, alternative roofing system concepts, filler slabs, composite beam panel roofs, masonry vaults and dooms. Mould and methods of production of precast elements.. **10 Hrs**

UNIT – IV

Structural masonry: stress in masonry in compression, compressive strength of masonry elements, factor effecting compressive strength, strength of units, prism bar wallets and walls. Effect of brick work bond on strength, bond strength of masonry. Flexure and shear, elastic properties of masonry materials and masonry design of masonry under vertical gravity loads. **10 Hrs**

UNIT – V

IS code provisions, design of masonry compression elements, concepts in lateral load resistance. Cost effective building design: cost concept in buildings, cost saving techniques in planning. Design and construction, cost analysis, case studies using alternatives. **10 Hrs**

Text Book:

1. Alternative building materials and technologies by K.S.Jagadish, B.V.Venkatramana Reddy and K.S.Nanjunda Rao. New age international publishers.
2. Structural masonry by Arnold.W.Hendry

REFERENCE BOOKS:

1. Relevant IS codes
2. Proceedings of the national workshop on alternative building methods 16-18 January 2002 organised by department of civil engineering, IISc Bangalore.
3. QIP short term intensive course on alternative building methodologies for architects and engineers December 14-19 1998, IISc Bangalore.

Course Outcome

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

1. Explain alternative building blocks and stabilized blocks.(L3)
2. Define fibre reinforced polymer composite.(L1)
3. Describe alternative roofing system.(L2)
4. Explain structural behaviour of structural masonry.(L3)
5. Describe cost analysis and case studies on alternative materials.(L2)

P13CV841 *Page No... 1*

Eighth Semester, B.E. - Civil Engineering
Model question paper
Alternative Building Materials and Technologies

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer five full questions selecting atleast one full question from each part*

UNIT I

1 a. List out environmental friendly and cost effective building technologies. Explain any two briefly. 7

b. Write short notes on Global warming. 5

c. Discuss the influence of density and cement content on block strength. 8

(OR)

2.a. List out the different blocks used as the masonry units briefly explain any two. 7

b. List out the factors which are considered for selecting the building blocks. Briefly explain any two. 6

c. Explain the process of manufacture of stabilized mud block . 7

UNIT II

3 a. Discuss Pozzolona as a raw material and also explain the process of manufacture by rice husk ash and fly ash as raw materials. 10

b. List out the different types of reinforcing materials in fiber reinforced concrete. Explain: (i) Natural fibres (ii) Mineral fibres. 10

(OR)

4 a. List the properties and requirements of mortar. Briefly explain any one. 7

b. List out the components of ferrocement and explain any two. 7

c. Explain the procedure for determing the flow of mortar using sketch as per B.S. 4551-1980. 6

UNIT III

5 a. List out the factors influencing compressive strength of masonry.
Explain: i) Moisture absorption ii) Thickness of mortar iii) Modular ratio. 12

b. Write a short notes on:
i) Types of masonry specimen and their strength evaluation ii) Effect of slenderness ratio. 8

(OR)

6 a. Define : i) Column ii) Effective height
iii) Slenderness ratio iv) Basic compressive stress
v) Stress reduction factors. 5

b. The plan and cross section of a 3 storied load bearing building as shown in Fig. (1). Design and specify the compressive strength of masonry unit using IS – 1905. For M2 type mortar,
i. Design middle wall designated as A
ii. Portion of masonry between door and window opening shown as wall C, 15

Details :
a. Thickness of wall using burnt bricks = 230 mm
b. Burnt brick size : 230 x 105 x 75 [L x B x H]
c. Thickness of plaster on either faces = 15 mm
d. Density of brick masonry = 20 kN/m3
e. Roof and floor slabs are solid reinforced concrete
f. Door size 1.0 × 2.1 m

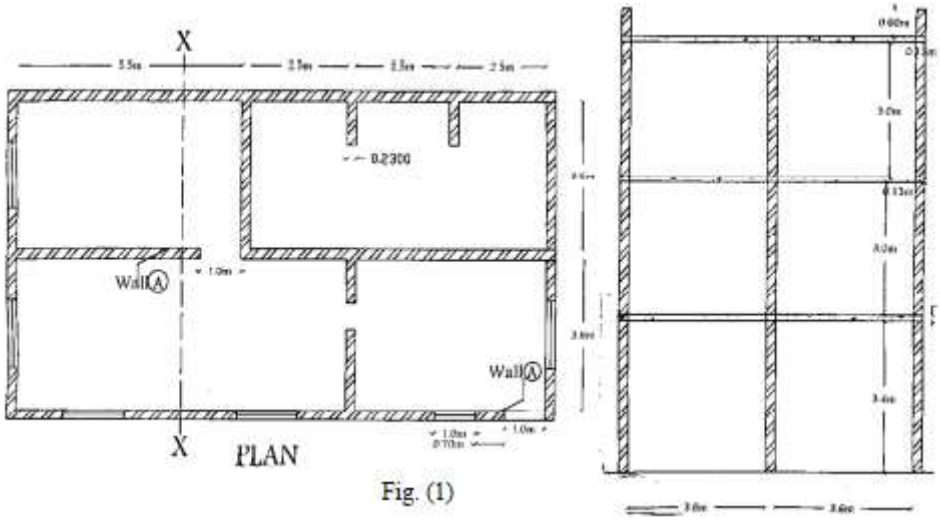

Fig. (1)

UNIT IV

7 a. List out the cost reduction technique through construction process efficiency. Explain any two. 6

b. Fig. 7 (b) shows the moments, if a slab with width radio of spaces < 2. Design it for area of steel and also check for serviceability. Draw the reinforcement layout.

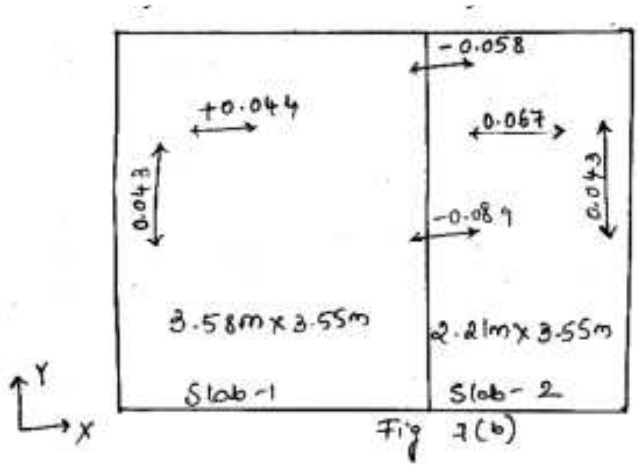

Fig 7(b)

14

(OR)

8 a. Explain with sketches, the typical construction of roof assembly. 5

b. Explain in detail with sketches of casting process and beams for curved shape (jack arch) panels. 15

UNIT V

9 a. What is the cost effective building design? Explain the cost saving techniques in design and construction. 10

b. Write short notes on cost concepts in building. 10

(OR)

10.write a short note on:

i. Design and construction,
ii. cost analysis,
iii. case studies using alternatives 20

Course Title: URBAN TRANSPORT PLANNING			
Course Code: P13CV842	**Semester: VIII**	**L – T – P : 2 : 2: 0**	**Credits: 2**
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.

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, inter modal 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, " ACoures in Traffic Planning and Desing", Dhanapat Rai & Sons, Delhi, 1989.

Reference:

1. JothiKristey&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:

1. The students will be able to plan the transportation need of Urban cities and suggest viable solutions to assist the administration in Urban transportation Planning.
2. The students will identify, formulate and solve engineering problems in Trip generation, Trip distribution by various methods.
3. Facilitate the students' independent research to gain depth in at least one particular area suggest Transportation problems and solutions presented within the context of social change, technological advancement and environmental constraints.

Eighth Semester, B.E. – Civil Engineering
Model question paper
Urban Transport Planning

Time: 3 hrs *Max. Marks: 100*

NOTE: Answer five full questions selecting atleast one full question from each part

UNIT-I

1 a) Explain the scope of transport planning process 10Marks

b) What are the processes involved in traffic system approach to transportation planning? 10 Marks

OR

2 a) What are the stages in urban transport planning? Write flow diagram 10 Marks

b) Explain the following i) Trip generation ii) Trip distribution 10 Marks

UNIT-II

3 a) Explain briefly the method of home interview surveys 10 Marks

b)Explain the Inventory of Land Use and Economic Activities 10 Marks

OR

4 a) What are the factors governing trip generation and attraction rates? 10 Marks

b) What do you understand by Category Analysis? State its assumptions. 10 Marks

UNIT-III

5 a) Explain with example the method of average factor method. 10 Marks

b) Explain with example the Fratar method of obtaining future trips. 10 Marks

OR

6 a) What are the factors affecting Modal Split? Explain 10 Marks

b) Write a flow diagram for Modal Split carried out after trip distribution. 10 Marks

UNIT-IV

7 a) What are the different techniques of trip assignment are available? Explain. 10 Marks

b) Write a short note on traffic forecasting 10 Marks

OR

8 a) What are the difficulties in transport planning for small and medium cities? 10 Marks

b) Explain Quick-response techniques 10 Marks

UNIT-V

9 a) Write a short note on Intermodal transportation 10 Marks

b) Write a short note on Urban transport planning for small and medium cities. 10 Marks

OR

10 a) Write a short note on Role of metro rail. 10 Marks

b) Write a short note on Computer application in transportation planning. 10 Marks

Course Title: Geographic Information System			
Course Code: P13CV843	**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 Hours**

UNIT – II

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

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 Hours

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 Hours**

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 Hours**

TEXT BOOKS:

1. **Principles of GIS** - Peter A Burrough Reachael 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

- Understands the advantages of using remote sensing over conventional methods. Understands electromagnetic radiation and its various interactions
- Understands the various sensors and platforms used in remote sensing process
- Understands the concept of GIS and its applications
- Understands how remote sensing and GIS can be used in various civil engineering applications

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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Eighth Semester, B.E. - Civil Engineering

Model question paper

Geographic Information System

Time: 3 hrs Max. *Marks: 100*

***Note**: Answer **FIVE** full questions, selecting at least **one** full question from unit.*

UNIT - I

1 a. What do you mean by GIS? Explain the components of GIS. 6

b. With a sketch explain workflow process of GIS. 6

c. Explain the advantages of GIS and list the applications of GIS. 8

(OR)

2.a. Differentiate between ;

i) Data and information

ii) Entities and objects

iii) Spatial data and non spatial data. 6

b. Compare and contrast Raster and Vector data model. 6

c. Briefly explain different types of data models for storage and management of attribute data. 8

UNIT - II

3 a. Define map. Explain the types of maps. 6

b. What do you mean by map projection? What is the necessity of projection system? Explain different types of map projections. 8

c. Explain briefly the methods of Georeferriry of data. 6

(OR)

4 a. What are the various methods of data input in GIS? Explain briefly any one. 6

b. Define digitization process giving its advantages and disadvantages. 6

c. Explain scanning with emphasis on different types of scanners. 8

UNIT - III

5 a. Define Error. Explain various types of sources of errors. 6

b. Explain in detail different types of spatial data analysis. 6

c. Write a note on:

i) Buffering ii) Overlaying. 8

(OR)

6. a. Explain the principles of spatial data access and search 8

b. Explain raster and network analysis in GIS. 12

UNIT - IV

7 a. What do you mean by remote sensing? Explain the remote sensing process. 8

b. Write a note on multi criteria decision analysis. 6

c. Briefly explain virtual GIS. 6

(OR)

8. a.what are the factors needed for planning of GIS 6
b.What are the situations encountered during GIS visualization. 8
c.Briefly explain role based systems 6

UNIT – V

9 a. Determine DBMS listing the functions and desirable characteristics of DBMS. 8
b. Explain various components of DBMS. 6
c. Write a note on conceptual modelling. 6

(OR)

10a. Write short notes on any TWO of the following:
i) GPS
ii) Hyper spectral remote sensing
iii) DIP Techniques
iv) Hardware and software requirements of GIS.

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Course Title: Environmental Impact Assessment			
Course Code: P13CV844	**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, nuclear power plant projects, 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"** Larry W Canter,–McGraw – Hill International Editions, 1996.
2. Guidelines for EIA of Developmental Projects, Minister of Environment and Forests, GOI.

Course outcome

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

P.E.S.COLLEGE OF ENGINEERING, MANDYA-571401
(An Autonomous Institute under VTU, Belgaum)
Eight Semester B.E. Degree Examination – Model Question Paper
Course with Code: Environmental Impact Assessment (P13CV844)

Time: 3 Hrs **Max. Marks: 100**

Note: i) Answer five full questions selecting at least ONE full question from each unit.

UNIT - I

1. a) Define EIA and explain relationship between EIA,EIS and FONSI 10Marks
   b) Explain in brief baseline information in EIA.. 10Marks

(OR)

2. a) Explain the following i. Need for EIA studies ii. Limitations of EIA. 10Marks
   b) Explain in detail, the step by step procedure for conducting EIA. 10Marks

UNIT - II

3. a) Explain adhoc method used in EIA. 10Marks
b) Define environment setting. List the major environment components to be considered during EIA and explain any one of them. 10Marks

(OR)

4. a) Explain network method used in EIA. 10Marks
b) Explain overlay method used in EIA. 10Marks

UNIT - III

5. a) explain the basic step for prediction and assessment impact on water 10Marks
b) Discuss the various steps involved in assessment and prediction of impact on air attribute. 10Marks

(OR)

6. a. Discuss the various steps involved in assessment and prediction of impact on water environment. 10Marks
b. Discuss the various steps involved in assessment and prediction of impact on noise environment 10Marks

UNIT - IV

7.a).Discuss the assessment and prediction of impacts on attributes - Soil and ground water 10 Marks
b) Discuss the assessment and prediction of impacts on attributes – socio economic environment. 10 Marks

(OR)

8.a) What is the importance of public participation in environmental decision making? State the advantages and disadvantages of public participation. 10 Marks
b) Outline the salient features of project activity and environmental parameters relationship. 10 Marks

UNIT - V

9.a) Briefly explain the assessment procedure in the following activities.
i. highway project ii. Thermal power plants. 10 Marks
b) Bring out clearly the guidelines of EIA for development project substantiate with an example. 10 Marks

(OR)

10.a) Write short note on the following:
i. Environmental impact of nuclear power plants
ii. EIA for water resource project 10 Marks
b) Briefly explain the assessment procedure in the following activities.
Iron ore and Coal mining project. 10 Marks