SYLLABUS
(With effect from 2017-18)

ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕವರ್ಷ 2017–18)

VII & VIII Semester

Bachelor Degree
in
Civil Engineering

Out Come Based Education
with
Choice Based Credit System

P.E.S. College of Engineering
Mandya - 571 401, Karnataka
(An Autonomous Institution Affiliated to VTU, Belagavi)
Grant -in- Aid Institution
(Government of Karnataka)
Accredited by NBA, New Delhi
Approved by AICTE, New Delhi.

ಪಿ.ಇ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ
ಮಂಡ್ಯ–571 401, ಕರ್ನಾಟಕ
(ವಿ.ಟಿ.ಯು, ಬೆಳಗಾವಿ ಅಡಿಯಲ್ಲಿನ ಸ್ವಾಯತ್ತ ಸಂಸ್ಥೆ)

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PREFACE

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

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

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

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

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

Dr. Umesh D.R.   **Dr. Nagarathna**
Deputy Dean (Academic)   Dean (Academic)
Associate Professor,   Professor,
Dept. of Computer Science & Engg.   Dept. of Computer Science & Engg.

PES College of Engineering

VISION

"PESCE shall be a leading institution imparting quality engineering and management education, developing creative and socially responsible professionals"

MISSION

- Provide state of the art infrastructure, motivate the faculty to be proficient in their field of specialization and adopt best teaching -learning practices

- Impart engineering and managerial skills through competent and committed faculty using Outcome Based Educational curriculum

- Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs

- Promote research, product development and industry-institution interaction.

DEPARTMENT OF CIVIL ENGINEERING

The Civil Engineering Department was started in the year 1962 as one of the first branches in P.E.S. College of Engineering, Mandya with an intake of 40. The department has carved a niche for itself by offering the most competent instructional programs to the students. The department is running an undergraduate programme with an intake of 120 and it has started PG in CAD Structures with an intake of 18 in the year 2006. The department has been recognized as research centre under VTU, Belgaum. The department is accredited by NBA, New Delhi for five years (2004-2009), for three years from (2017-2020) and again accredited for three years from (2020-2023). The department is well equipped with laboratories, computing facilities, independent library and other infrastructure. The department has well qualified and experienced teaching faculties. The department also takes up consultancy work pertaining to planning, structural designs of buildings, testing of materials, soil investigation.

Academic Programs:

Bachelor of Engineering, M.Sc (Research)/ Ph.D The programme focuses on training undergraduate students in the field of Civil Engineering.

Post graduate courses (M. Tech.): Computer Aided Design (CAD): The programme focuses on training postgraduate students in the field of Structural Civil Engineering.

Academic Research The Department has been recognized as a research center and qualified students can register for M.Sc. (Engg.) by Research and Ph. D programmes. They will be governed by the regulations prescribed by the visvesvaraya Technological

University (VTU), Belgaum from time to time. The following are a few areas of interest in which the specializations are available for carrying out research in the department.

Environmental Engineering - Water quality, wastewater treatment, industrial waste treatment, Air quality modeling, Physical modeling (Wind tunnel simulation studies).

- Structural Engineering- Composite material, aerodynamic effects on structures (aerodynamics study).

- Geotechnical studies- Environmental Geotechnology. Hydrogeology, sedimentology, geophysics, Environmental geology.

- Transportation Engineering- Highway design, highway materials.

Vision

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

Mission

- Impart civil engineering and managerial skills with state of art infrastructure, competent and committed faculty using outcome based educational curriculum.

- Promote research, project management and consultancy

- Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs.

The Program Educational Objectives (PEOs)

- Apply technical competence in the field of Civil Engineering with a strong background in basic science and mathematics.

- Analyse and interpret data to design or evaluate civil engineering systems to satisfy societal needs with the use of modern tools including higher education.

- Function effectively as an individual and or to work in a team on multispecialized civil engineering projects with professional ethics and effective communication skills inculcating the habit of life-long learning.

Program Specific Outcomes (PSOs)

The Program specific outcomes have been derived from the PSC's defined by ASCE. By the time of graduation, Civil Engineering students will be able to

PSO1: Apply knowledge of basic science to analyze and solve problems in the core area of Civil Engineering such as Structural, Geotechnical, Transportation, Environmental, Hydraulics and Water resources engineering.

PSO2: Analyse, Plan, design, quality assessment and cost estimate of Civil Engineering structures with professional ethics.

PSO3: Work in a consulting organization or can be an entrepreneur to investigate and supervise Civil Engineering structures using modern tools and technology to provide sustainable solutions to meet the societal needs.

Programme Outcomes (PO)

Engineering program must demonstrate that their students attain the following outcomes:

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

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

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

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

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

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

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

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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

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

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

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

Core Course: This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirement of a programme in a said discipline of study.

1.
    a. **Foundation Course:** The course based upon the content that leads to Knowledge enhancement.
    b. **Foundation Elective:** Elective Foundation courses are value-based and are aimed at man-making education.

2. **Elective:** This is the course, which can be chosen from the pool of papers. It may be supportive to the discipline / providing extended scope/ Enabling an Exposure to some other discipline domain / nurturing student proficiency skills.

3. **Self Study Course and Seminar**: The courses related to the program discipline which is studied by the students with her/his own efforts under the guidance of a Course Instructor/Project guide, using study materials available in open sources. The intention of the course is to encourage the habit of self learning. Such courses may be devised with the guidance of Course Instructor/Project guide and introduced during **8th** Semesters of Bachelors of Engineering program. It shall carry two credits.

    The Assessment marks (CEE) shall be based on the evaluation during 8th semester by a committee consisting of Head of the concerned department, two senior faculty members of the department, one of them may be the internal guide. The work may be evaluated for award of Assessment marks (CEE) based on a Report, presentation and viva voce, by the committee.

    The students are required to enroll for certification either in NPTEL/ SWAYAM as far as possible. Need to prepare a syllabus for about 15 – 20 Hrs, with the consultation of guide and as to submit a detailed report with a maximum of two students in a batch followed by seminar presentation.

4. **Open Elective**: The course offered by a competent department/discipline of

specialization in order to help a candidate of any other discipline to gain knowledge and reasonable extent of expertise in an area, wherein the student wishes to acquire some support for development in either of his own academic or research interests, etc. As such the course content shall be simple enough to be understood by interdisciplinary candidates. An Open Elective will be offered by a hosting department, to other departments in a given semester. Such a course shall be introduced during 7th and 8th Semester of Bachelors Program. (10-12 Courses/Semester shall be offered to other disciplines from 5 hosting streams [CS, CE, E & E, ME, MBA/MCA] having an elementary Syllabus designed).

The number of open electives to be offered will be 15 – 16 courses. The offering of the course will be on first come first serve basis for maximum of 60 students in each course. ii. Each department can offer maximum two Open Electives.

PROJECT WORK

1. The Project Work (Phase I+ Phase II) carries 10 credits (2 credits+8 credits) and spreads over TWO semesters, i.e. during 7th and 8th semesters. The topic and title of the project shall be chosen by the candidate in consultation with the guide and co-guide (if any) during the seventh semester itself. However, modification of only the title but not the field of work is permitted at the time of final submission of project report during the eighth semester.

2. The project work shall be carried out by candidate(s) independently/in a group (maximum of four) during the seventh and eighth semester under the guidance of one of the faculty members of the Department of study. If the project work is of inter-disciplinary nature, a co-guide shall be taken from the same or any other relevant Department. If a project work has to be carried out in any industry / factory / organization, outside the campus, the permission for the same and the name of co-guide at any of these organizations shall be intimated to the authorities at the beginning of seventh semester by the Head of the Department.

3. The weekly progress of the Project work shall be monitored and reviewed by the Project Guide assigned by DUGC. The method of evaluation, including intermediate assessment shall be evolved by the pertinent DUGC.

4. The extent of work (mandatory) to be completed for Project Work - Phase I is synopsis, Introduction, Literature survey, Objective and Methodology of the approved Project work.

5. The Assessment marks (SEE) in the case of Project Work - Phase I, shall be based on the evaluation at the end of the 7th semester by a committee consisting of Head of the concerned department, two senior faculty members of the department, one of them may be the internal guide. The work may be evaluated for award of Assessment marks (SEE) based on a Report [comprising of synopsis, Introduction, Literature survey, Objective and Methodology], presentation and viva voce, by the committee.

6. A candidate shall submit N+3 (No. of candidates+3) copies of the Report of the Project Work to Head, DUGC on or before the specified date. The report shall be in the format prescribed by the Institute. The candidate shall submit a report of the project work (dissertation) duly approved by the guide and co-guide. The project report shall be countersigned by the guide, co-guide (if any) and the Head of the Department.

7. The last date for the submission of Report shall be Two weeks before the closure of the semester in which the project work credits have been registered for and is expected to be completed or as announced by the COE. The date of submission of the dissertation may be extended up to a maximum of eight academic years, from the date of commencement of the first semester in which the candidate has taken admission to the course.

8. The final evaluation (CIE & SEE) for Project Work - Phase II is done by a Project Work Evaluation Committee (PWEC) constituted by the pertinent DUGC. There shall be an open seminar followed by a viva – voce examination as part of the final evaluation. After the final evaluation, appropriate letter grade is awarded.

9. If in the opinion of the PWEC, the Project Report is acceptable with minor modifications for the minimum passing grade 'E'(Fair) in the case of project, the PWEC shall value and instruct the candidate suitably to incorporate the necessary modifications and to resubmit it to the Chairman, PWEC. After such resubmission, the Chairman, PWEC will certify that the necessary modification has been incorporated.

10. The title of the Project Report shall be indicated in the Student Progress Report.

11. The Assessment marks in case of Project Work - Phase II and seminar shall be based on the evaluation, as per the guidelines, at the end of the 8th semester by a committee consisting of Head of the concerned department, two senior faculty members of the department (one of them may be the internal guide).

12. The Assessment marks sheet shall bear the signature of all those concerned, along with the date and seal of the Principal.

SCHEME OF TEACHING AND EXAMINATION
VII Semester B.E. (Civil)

Sl No.	Course Code	Course Title	Teaching Dept.	Hours Pattern L:T:P:H	Total Credit	Examination Marks		
						CIE	SEE	Total
1.	P17CV71	Quantity Surveying and Estimation	Civil	4:0:0:4	4	50	50	100
2.	P17CV72	Construction Engineering Management & Entrepreneurship	Civil	4:0:0:4	4	50	50	100
3.	P17CV73	Design of Steel Structures	Civil	4:0:0:4	4	50	50	100
4.	P17CV74X	Elective - 4	Civil	4:0:0:4	3	50	50	100
5.	P17CVO75X	Open Elective – 1	Civil	4:0:0:4	3	50	50	100
6.	P17CVL76	CAD Lab Laboratory -II	Civil	0:0:3:3	1.5	50	50	100
7.	P17CVL77	Environmental Engineering Laboratory	Civil	0:0:3:3	1.5	50	50	100
8.	P17CVL78	Project work phase – 1	Civil	0:0:4:2	2	--	50	50
		Total			23	350	400	750

List of Electives					
Elective - 4			**Open Elective – 1**		
Sl. No.	Course Code	Course Title	Sl. No.	Course Code	Course Title
1.	P17CV741	Advanced Design of RC Structures	1.	P17CVO751	Building Science and Engineering
2.	P17CV742	Ground Improvement Techniques	2.	P17CVO752	Basic Transportation Engineering
3.	P17CV743	Remote Sensing and GIS Applications in Water Resource Engineering	3.	P17CVO753	Remote Sensing and Introduction to Geoinformatics
4.	P17CV744	Traffic Engineering			

SCHEME OF TEACHING AND EXAMINATION
VIII Semester B.E. (Civil)

Sl No.	Course Code	Course Title	Teaching Dept.	Hours Pattern L:T:P:H	Total Credit	Examination Marks		
						CIE	SEE	Total
1.	P17CV81	Design of Prestressed Concrete Structures	Civil	4:0:0:4	3	50	50	100
2.	P17CV82X	Elective – 5	Civil	4:0:0:4	3	50	50	100
3.	P17CV83X	Elective – 6	Civil	4:0:0:4	3	50	50	100
4.	P17CV84OX	Open Elective - 2	Civil	4:0:0:4	3	50	50	100
5.	P17CV85	Project Work phase – II	Civil	0:0:16:16	8	50	100	150
6	P17CV86	Internship	Civil	----	2	50	50	100
		Total			22	300	350	650

List of Electives								
Elective - 5			**Elective - 6**			**Open Elective – 2**		
Sl No	Course Code	Course title	Sl No	Course Code	Course title	Sl. No.	Course Code	Course Title
1.	P17CV821	Open Channel Hydraulics	1.	P17CV831	Earthquake Resistant Design of Structures	1.	P17CVO841	Municipal Solid waste Management
2.	P17CV822	Advanced Foundation Design	2.	P17CV832	Design of Bridges	2.	P17CVO842	Highway Traffic And Safety Measures
3.	P17CV823	Urban Transport Planning	3.	P17CV833	Earth And Earth Retaining Structures	3.	P17CVO843	Occupational Health and safety
4	P17CV824	Theory of Elasticity	4	P17CV834	RCC And Steel Structural Design			

OBE Curriculum for BE Program
A. Course Plan
Course Title : QAUANTITY SURVEYING AND ESTIMATION

Course Code: P17CV71	Semester: VII	L – T – P : 4 – 0 - 0 :04	Credits: 4
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 roof.

18 Hrs

Self Study Component: Sloped RCC roofs with all Building components

UNIT-II

ESTIMATES: Steel truss (Fink and Howe truss), manhole and septic tanks,
Self Study Component: RCC and pipe culverts.
MEASUREMENT OF EARTHWORK FOR ROADS: Methods for computation of earthwork – cross sections – mid section formula or average end area or mean sectional area, trapezoidal & prismoidal formula.

12 Hrs

Self Study Component: Estimate of one kilometer metalled road and premix carpeting.

UNIT-III

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

buildings.

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

RATE ANALYSIS: Definition and purpose. Working out quantities and rates for the following standard items of works – earth work in different types of soils, cement concrete of different mixes, bricks and stone masonry, flooring, plastering, RCC works, centering and form work for different RCC items.

12 Hrs

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

UNIT-IV

CONTRACTS: Types of contract – essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – Tender, earnest money deposit, security deposit, tender forms, documents and types. Comparative statements, acceptance of contract documents and issue of work orders. Duties and liabilities, termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval – Technical sanction. Nominal muster roll, measurement books – procedure for recording and checking measurements

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

10 Hrs

Self Study Component: – Preparation of bills.

TEXT BOOKS:
1. **Estimating and costing** – B. N. Dutta, UBS publishers Distributors Ltd, India.
2. **Quantity Surveying**- P.L. Basin S. Chand and company, New Delhi.
3. **Estimating & Specification** - S.C. Rangwala,Charotar publishing house, Anand.
4.

REFERENCE BOOKS:
1. **Text book of Estimating & Costing**- G.S. Birde, Dhanpath Rai and sons: New Delhi.
2. **A text book on Estimating, Costing and Accounts**- D.D. Kohli and R.C. Kohli
   S. Chand: New Delhi.

Course Outcomes (CO's)

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

C. Evaluation Scheme

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

Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P1O	PO11	PO12	PSO1	PSO2	PSO3
Apply the knowledge of engineering fundamentals for quantifying and cost estimate of buildings, roads, steel truss, man holes and septic tanks	2												3		
Carry out rate analysis for different items of buildings as per applicable specifications		3		2				3						3	
Estimate earth work quantity for road works.			3											2	
Develop skills to work individually or in a team to prepare tenders and bills									2						3

OBE Curriculum for BE Program
A. Course Plan
Course Title: : CONSTRUCTION ENGINEERING MANAGEMENT & ENTREPRENEURSHIP

Course Code: P17CV72	Semester: VII	L – T – P : 4 – 0 - 0 :04	Credits: 4
Contact Period - Lecture: 52Hrs.; Exam: 3 Hrs.		Weightage: CIE: 50% ; SEE: 50%	

Prerequisites: Nil

Course Learning Objectives (CLO's)	
This Course aims to,	
1	Understand the concept of Engineering economics and to study the different comparison methods.
2	To know the concept of construction management and understand the different managements.
3	To evaluate various construction equipment.
4	Study and understand the concept of planning, scheduling and the techniques necessary for construction project.
5	To know the basic ideas about entrepreneurship and develop skill to work individually as a entrepreneur.

B. Course Content
UNIT – I

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

12 Hrs

Self Study Component: *Concept of rate of return (ROR)*

UNIT – II

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

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

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

Quality management: Quality control in construction, importance and elements of quality,

quality control, quality assurance techniques and documentation.

12 Hrs

Self Study Component: *Management information system*

UNIT – III

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

8 Hrs

Self Study Component: *Pumping and dewatering Equipment*

UNIT – IV

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

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

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

10 Hrs

Self Study Component: *Line of balance technique*

UNIT – V

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

Institutional finance: KIADB, KSSIDC, 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

Self Study Component: *SIDO, NSIC*

TEXT BOOK:
1. **Construction Engineering and Management** by S. Seetharaman, Umesh publications, New Delhi
2. **Management Science for Civil Engineering** by Gururaj, Sreehari Satish, Subhash publications, Bangalore.
3. **Management & Entrepreneurship** by K Venkataramana, Seven hill publications, Banglore.
4. **Engineering Economics** by R.K.Hegde, Swapana book house, Banglore

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

EVALUATION SCHEME: Student should answer one question from each unit

Course Outcomes

After learning all the units of the course, the student is able to
1. Apply the knowledge of engineering fundamentals to calculate present and future worth of money using different interest factors and comparisons
2. Understand the concept of Construction management
3. Understand the concept of project planning and computing CPM and PERT
4. Evaluate various construction equipment and develop skill to work individually as a entrepreneur

Course Articulation Matrix															
Course Outcomes (CO)	**Program Outcomes**												**Program Specific Outcomes**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Apply the knowledge of engineering fundamentals to calculate present and future worth of money using different interest factors and comparisons.	2	2											2	1	
Understand the concept of Construction management		2		2										1	
Understand the concept of project planning and computing CPM and PERT			2											2	
Evaluate various construction equipment and develop skill to work individually as a entrepreneur									2		2				2

OBE Curriculum for BE Program		
A. Course Plan		
Course Title: DESIGN OF STEEL STRUCTURES		
Course Code: P17CV73	**Semester: VII**	**L – T – P : 4 – 0 - 0 :04**
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.

B. Course Content
UNIT – I
STEEL STRUCTURES AND CODAL SPECIFICATION: Advantages and Disadvantages of steel structures, Principles of Limit state method(LSM) of design, failure criteria for steel, codes, specifications and section classification.
ANALYSIS AND DESIGN OF BOLTED CONNECTION
Introduction to bolted connections, Behavior of Bolted joints, Design strength of ordinary Black Bolts, Design strength of High strength friction Grip bolts (HSFG), pin connections, simple Bolted connections of tension members. Efficiency of joints. Beam to Beam connections and Beam to Column framed connections.

9 Hrs

Self Study Component: Loads and Load combinations, Design considerations.
UNIT – II
ANALYSIS AND DESIGN OF BOLTED CONNECTION: Moment resistant Bracket connections, moment acting in the plane of joint, moment acting in the plane perpendicular to the joint.

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

9 Hrs

Self Study Component: Defects in weld
UNIT – III
DESIGN OF TENSION MEMBERS:
Introduction, types of tension members, Slenderness ratio, Behaviour of tension members, Modes of failure, Design strength of tension members, Design of splices, Design of tension members, Lug angles.
DESIGN OF COMPRESSION MEMBERS: Introduction, Failure modes, Strength of compression members, Sections used for compression members, Effective length of

compression members, Design of single section compression members.

9 Hrs

Self Study Component: Prying forces

UNIT – IV

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

DESIGN OF COLUMN SPLICE AND BASES:
Design of simple slab base and gusseted base. Design of column splices (for columns of same and different sections).

12 Hrs

Self Study Component: Grillage foundation

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.

13 Hrs

Self Study Component: Plastic Analysis of portal frames

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

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

EVALUATION SCHEME: Student should answer one question from each unit

Course Outcomes (CO's)

After learning all the units of the course, the students are able to
CO1: Apply the knowledge on steel as a structural material to understand its area of application and the design principle involved as per IS code.

CO2: Apply limit state design method for the connection of steel members by bolting and welding.

CO3: Apply limit state design method for the design of tension and compression members and understand the behavior of steel members under axial tension and compression.

CO4: Ability to apply the concepts of plastic behavior of steel members for the plastic analysis of structural system and to apply the limit state design method for the design of beams.

Course Articulation Matrix															
Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P1O	PO11	PO12	PSO1	PSO2	PSO3
Apply the knowledge on steel as a structural material to understand its area of application and the design principle involved as per IS code.	2		2										2		
Apply limit state design method for the connection of steel members by bolting and welding.			3											2	
Apply limit state design method for the design of tension and compression members and understand the behavior of steel members under axial tension and			3												3

compression.																			
Ability to apply the concepts of plastic behavior of steel members for the plastic analysis of structural system and to apply the limit state design method for the design of beams.			3	2														2	2

A. Course Plan
Course Title: Advanced Design of RC Structures

Course Code: P17CV741	Semester: VII	L – T – P : 4 – 0 - 0 :04	Credits: 03
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

B. Course Content
UNIT I

Design of grid floors: Introduction, Analysis of the Slabs for Moment and Shears (by Rankine's method) Design for shear.

Yield line analysis of slabs: Introduction, analysis of slabs by Equilibrium method and design for shear and deflection.

12 Hrs

Self Study Component: Characteristics, location, advantages and disadvantages of yield line, sign conventions, yield line patterns,

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

14 Hrs

Self Study Component: Flat slab with column head
UNIT III
Design of RCC overhead circular water tanks –Introduction, Analysis and Design of top dome, top ring beam, side walls of water tank and bottom slab with bottom ring beam at the outer periphery only.
Introduction to shell: Design of simple cylindrical shell roof by beam theory.

14 Hrs

Self Study Component: Different types of shells, their forms and structural behavior
UNIT IV
Design of silos: Introduction, Design of Silos using Janssen's method.

12Hrs

Self Study Component: Airy's method

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

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

Course Outcomes (CO's)

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

CO1:   Apply the knowledge of engineering fundamentals to understand, analyze and design the grid floors and yield line analysis of slabs in line with IS codal provisions.
CO2   : Apply the knowledge of engineering fundamentals to understand flat slabs, analyze and design flat slabs in line with IS codal provisions.
CO3: Apply the knowledge of engineering fundamentals to understand, analyse and design overhead circular water tanks and shell roofs in line with IS codal provisions.
CO4   : Apply the knowledge of engineering fundamentals to understand, analyse and design of silos by Janssen's method and Airy's method in line with IS codal provisions.

EVALUATION SCHEME: Student should answer four full questions.

Course Articulation Matrix															
Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Apply the knowledge of engineering fundamentals to understand, analyze and design the grid floors and yield line analysis of slabs in line with IS codal provisions.	2		2	1				2				1	1		
Apply the knowledge of engineering fundamentals to understand flat slabs, analyze and design flat slabs in line with IS codal provisions.	2		2	1				2				1	1	2	
Apply the knowledge of engineering fundamentals to understand, analyse and design overhead circular water tanks and shell roofs in line with IS codal provisions.	2		2	1				2				1	1	2	
Apply the knowledge of engineering fundamentals to understand, analyse and design of silos by Janssen's method and Airy's method in line with IS codal provisions.	2		2	1				2				1	1		3

OBE Curriculum for BE Program			
Course Plan			
Course Title: **Ground Improvement Techniques**			
Course Code: **P17CV742**	Semester: **VII**	L – T – P : 4 – 0 - 0 :04	Credits: 3
Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.		Weightage: CIE: 50 %;	SEE: 50%

Prerequisite
Geo-technical engineering

Course Learning Objectives (CLOs)

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

Course Content
UNIT – I

GROUND IMPROVEMENT: Definition, Objectives of soil improvement, Classification of ground improvement techniques, Factors to be considered in the selection of the best soil improvement technique.
MECHANICAL MODIFICATION: Type of mechanical modification, Aim of modification, compaction, Principle of modification for various types of soils.
COMPACTION: Effect of grain size distribution on compaction for various soil types like BC soil, lateritic soil, coarse-grained soil. Effect of compaction on engineering behavior like compressibility, swelling and shrinkage, permeability, relative density, liquefaction potential. Field compaction – static, dynamic, impact and vibratory type, Specification of compaction. Tolerance of compaction, Shallow and deep compaction.

10 Hrs

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

UNIT – II

HYDRAULIC MODIFICATION: Definition, aim, principle, techniques. Gravity drain, lowering of water table, multistage well point, vacuum dewatering. Discharge equations.
DRAINAGE & PRELOADING: Drainage of slopes, preloading, vertical drains, sand drains. Assessment of ground condition for preloading, Electro kinetic dewatering.

8 Hrs

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

UNIT – III

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

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

10 Hrs

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

UNIT – IV

GROUTING: Introduction, Effect of grouting. Chemicals and materials used. Types of grouting. Grouting procedure. Applications of grouting.
MISCELLANEOUS METHODS (ONLY CONCEPTS): Introduction, Soil reinforcement.. Ground improvement by confinement – Crib walls, Gabions and Mattresses. Anchors, Rock bolts and soil nailing.

12 Hrs

Self-Study Component:- Thermal methods of stabilization

UNIT – V

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

12 Hrs

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

TEXT BOOKS :
1.**Ground Improvement Techniques**- Purushothama Raj P. (1999), Laxmi Publications, New Delhi.
2.**Construction and Geotechnical Method in Foundation Engineering**, Koerner R.M. (1985) - Mc Graw Hill Pub. Co., New York.
REFERENCE BOOKS :
1.**Engineering principles of ground modification**- Manfred Hausmann (1990) - Mc Graw Hill Pub. Co., New York.
2.**Methods of treatment of unstable ground**- Bell, F. G. (1975) Butterworths, London.

Course Outcome

After learning all the units of the course, the student is able to
CO1   : Apply the knowledge of Geology & Geotechnical Engineering in Ground improvement techniques
CO2:   Analyze Mechanical Modification Techniques for soils
CO3   : Investigate chemical modification techniques for soils
CO4   : Select appropriate geo-synthetics and grouting methods for ground Improvements for sustainability.

EVALUATION SCHEME: Student should answer one question from each unit

Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Apply the knowledge of Geology & Geotechnical Engineering in Ground improvement techniques	2												2		
Analyze Mechanical Modification Techniques for soils		3												2	
Investigate chemical modification techniques for soils				3											2
Select appropriate geo-synthetics and grouting methods for ground Improvements for sustainability							3						1		

OBE Curriculum for BE Program			
Course Title : Remote Sensing And GIS Applications in Water Resource Engineering			
Course Code : P17CV743	Semester : VII	L-T-P : H : 4-0-0:4	Credits :3
Contact Period : 52 Hrs	Exam Hours : 3 Hrs	Weight age : CIE :50% , SEE : 50%	

Prerequisites : NIL

Course Learning Objectives (CLO's)

This Course aims to,

1. Learn about satellite remote sensing, GIS, DEM and GPS.
2. Learn about digital image processing for image rectification, enhancement and information extraction
3. Apply the knowledge of RS, GIS and DEM in various domains of water resources engineering.
4. Understand concepts of Spatial data analysis, Georeferencing of earth's surface.
5. Apply the knowledge of RS and GIS in Morphometric and Hypsometric analysis.

Course content
UNIT -I

Concepts and foundations of remote sensing: Definition of remote sensing, remote sensing process, ideal remote sensing system. Principles of electromagnetic remote sensing, electromagnetic energy, electromagnetic spectrum, black body radiation, laws governing electromagnetic radiation, atmospheric effects, scattering and absorption, atmospheric windows, Interaction with earth surface materials, spectral reflectance curves. Concept of spatial data, need for spatial data, Data acquisition methods, ground based and image based methods of data acquisition.

10Hrs

Self Study Component: Spectral Library.

UNIT -II

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

10 Hrs

Self Study Component : Characteristics of Indian and other major earth resource Satellites

UNIT -III

Visual image interpretation and digital image processing: Introduction, Elements of visual image interpretation, equipment Basics of digital image processing (Brief introduction only): image display and band combinations, true and false color composites. Image pre processing , image histogram, radiometric and geometric corrections, image enhancements, image transforms based on arithmetic operations, image filtering, low pass and high pass filters, edge detection, multi image manipulation, spectral rationing.

10 Hrs

Self Study Component : Classification of mixed pixels, fuzzy classification.

UNIT -IV

Fundamentals of geographic information system: Introduction, basics of GIS- definition of GIS, components of GIS, GIS work flow, representing spatial data, raster and vector data. Coordinate systems and map projections, datums Spatial data input, Non spatial data.
Spatial data analysis: Brief introduction to measurements in GIS, reclassification, georeferencing, map overlays, neighbourhood functions, spatial interpolation, network analysis, DEMs, surface analysis, data retrieval and queries, GIS data modelling, spatial data output.

10 Hrs

Self Study Component : database models and management (brief introduction only)
,Common image processing and GIS software.

UNIT -V

Morphometric analysis and Hypsometric analysis: Applications of remote sensing and GIS : Land use/cover mapping, Urban and regional planning applications, Applications in water resources and management, Environmental applications, Disaster management applications.

12 Hrs

Self Study Component: Self-Learning Exercise: Agricultural and forestry applications.

Text Books :
1   Lillesand T.M., and R.W. Kiefer, ―Remote sensing and Image interpretation", 4th edition, John Wiley & Sons – 2012.

2   Manoj K. Arora, R.C. Badjatia, " Geomatics Engineering", Nemichand & Bros. Roorkee – 2011.

3   An Introduction to Geographical Information Systems, I. Heywood, S. Cornelius and S. Carver, Pearson Education, 1998.

Reference Books :
1   Mather P.M., "Computer processing of remotely sensed images: an introduction", Wiley. – 1988.
2   Jensen J.R., "Introductory digital image processing: A remote sensing perspective", 2 nd Edition, Prentice Hall – 1996.
3   Richards J A., X. Jia, "Remote sensing digital image analysis: an introduction", 3rd Edition, Springer - 1999.

4   Peter A. Burrough & Rachel A. McDonnel "Principles of geographic information systems"- (1998), Oxford University press, Great Britain.

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

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

1. Describe the concepts of RS and GIS
2. Explain and understand the function of satellites and sensors
3.. Gain the knowledge of Visual image interpretation and digital image processing
4. Articulate the use of RS and GIS application in water resource engineering.

Course Articulation Matrix (CAM)

Sl. no	Course Outcomes (CO's)	Program outcomes (PO's)												Program Specific outcomes (PSO's)		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Describe the concepts of RS and GIS	2					2	3	2		2			2		
2	Explain and understand the function of satellites and sensors	2						2			2				2	
3	Gain the knowledge of Visual image interpretation and digital image processing	2					2	2			2					3
4	Articulate the use of RS and GIS application in water resource engineering	2	3	3	2	3		2		3	2	2	2			3

OBE Curriculum for BE Program			
A. Course Plan			
Course Title: Traffic Engineering			
Course Code: P17CV744	Semester: VII	L – T – P : 2 : 2: 0 04	Credits:3
Contact Period - Lecture: 52Hr.; Exam: 03Hr		Weightage: CIE: 50 %; SEE: 50%	

Course Learning Objectives (CLO's)

This Course aims to,

1. Understand the knowledge of various traffic characteristics and its planning.
2. Understand the importance of traffic surveys and its types.
3. Understand the importance of Traffic Design and Visual Aids in the present scenario.
4. Understand the importance of Traffic Safety and Environment.
5. Understand the basic concept of Traffic Management.

B. Course Content

UNIT - 1

Traffic Planning and Characteristics: Definition and scope of traffic engineering, Road Characteristics-Road user characteristics, PIEV theory, Vehicle Performance characteristics, Fundamentals of Traffic Flow, Urban Traffic problems in India and remedies, Sustainable approach- land use & transport.

Self-study: Integrated planning, modal integration.

10 Hrs

UNIT - 2

Traffic Surveys: Traffic Surveys- Speed, journey time and delay surveys, Vehicles Volume Survey including non-motorized transports, Methods and interpretation, Origin Destination Survey, Methods and presentation, Parking Survey, Accident analyses-Methods, interpretation and presentation, Level of service-Concept.

Self-study: Statistical applications in traffic studies and traffic forecasting.

12 Hrs

UNIT – 3

Traffic Design and Visual Aids: Intersection Design- channelization, Rotary intersection design, Signal design, Coordination of signals, Grade separation, Traffic signs including VMS, Significant roles of traffic control personnel, Networking pedestrian facilities & cycle tracks

Self-study: Road markings

10 Hrs

UNIT - 4

Traffic Safety and Environment: Road accidents: Causes, effect, prevention and cost; Traffic and environment hazards, Air and Noise Pollution, causes, abatement measures, Promotion and integration of public transportation, Promotion of non-motorized transport.

Self-study: Vibration, Street lighting

10 Hrs

UNIT - 5

Traffic Management: Area Traffic Management System, Traffic System Management (TSM) with IRC standards, Traffic Regulatory Measures, Travel Demand Management (TDM), Direct and indirect methods, All segregation methods- Coordination among different agencies, Intelligent Transport System for traffic management, enforcement and education.

Self-study: Congestion and parking pricing

10 Hrs

TEXT BOOKS:
1. Traffic Engineering & Transport Planning – L.R. Kadiyali-Khanna publishers.
2. Highway Engineering – S.K. Khanna, C.E.G Justo, and A.Veeraragavan, Nem Chand and
Bros, Roorkee, Revised 10 th Edition.
3. Highway Engineering Nemchand & Bros- Khanna & Justo-Roorkee (UA).
4. Traffic Engg. - Matson & Smith:-Mc.Graw Hill and Co.
5. Traffic flow theory – Drew- Mc. Graw Hill and Co.

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

Course Outcomes

After studying this course, students will be able to:

a. Understand the human factors and vehicular factors in traffic engineering design. (PO1, PO3)
b. Conduct different types of traffic surveys and analysis of collected data using statistical concepts. (PO2, PO4)
c. Use an appropriate traffic flow theory and to comprehend the capacity & amp; signalized intersection analysis. (PO2, PO6)
d. Understand the basic knowledge of Intelligent Transportation System. (PO2, PO5)

Course Articulation Matrix (CAM)

Sl. No	Course Outcome – CO	Program outcome												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
01	Understand the human factors and vehicular factors in traffic engineering design.	3		2										3	2	
02	Conduct different types of traffic surveys and analysis of collected data using statistical concepts.		3		2										2	
03	Use an appropriate traffic flow theory and to comprehend the capacity & amp; signalized intersection analysis.		2			1									2	
04	Understand the basic knowledge of Intelligent Transportation System.		3			2									2	

OBE Curriculum for BE Program

A. Course Plan

Course Title: BUILDING SCIENCE AND ENGINEERING

Course Code: P17CVO751	Semester: VII	L – T – P : 4– 0- 0-04	Credits: 3
Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.		Weightage: CIE: 50 %; SEE:50%	

Course Learning Objectives (CLO's)	
This Course aims to,	
1	Understand the basic materials in civil engineering
2	Analyse the types of foundation, have an insight to different types of doors, windows
3	Gain the knowledge of bylaws for the planning of a public/private building
4	Understand the different methods and materials of interiors for building
5	Understand the concept of landscaping

B. Course content

UNIT –I

MATERIALS FOR CONSTRUCTION: Cement concrete: introduction, ingredients of cement, grade of concrete, properties of Steel, definition , types of steel, uses of steel, Doors and windows : location of doors and windows, types of doors, types of windows, Stairs : requirements of good stairs, types , stairs of different materials.

10Hrs

 Self Study Component: Market forms of steel used in construction

UNIT –II

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

Self Study Component: Importance of Ground water table in substructures.

UNIT –III

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

12Hrs

Self Study Component: Planning of Residential Buildings with vastu.

UNIT -IV

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

10Hrs

Self Study Component: Interior design of a residential building/commercial building.

UNIT -V

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

10Hrs

Self Study Component: Latest Technology in Landscapping.

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

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

Course outcomes (CO's):

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

EVALUATION SCHEME: Student should answer one question from each unit

Course Articulation Matrix (CAM)

Sl. No	Course Outcome	Program outcome												Program specific outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Apply the knowledge of engineering fundamentals to understand, the characteristics of basic civil engineering materials	3												1		
2	Apply the knowledge of engineering fundamentals and analyze the types of foundation		1													
3	Develop plan, section and apply bylaws and investigate causes and remedies for cracks , have an insight to cost effective construction	1	2	2	2		1		2		1		1		1	
4	Understand, design and work in a team and develop the interiors and landscaping for buildings as per design guidelines.			2			2			1		1				

OBE Curriculum for BE Program			
A. Course Plan			
Course Title: Basic Transportation Engineering			
Course Code: P17CVO752	**Semester: VII**	**L – T – P : 4– 0- 0 :04**	**Credits: 3**
Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.		**Weightage: CIE: 50 %; SEE:50%**	

Course Learning Objectives (CLO's)

This Course aims to,

1. Understand the knowledge of different modes of transportation and its importance
2. Understand the importance of Highway cross elements and different types of pavements.
3. Understand the importance of Railway components and its role.
4. Understand the importance of Airport engineering and components of harbor.
5. Understand the basic concept of advance transportation system and role of public transport.

B. Course content
UNIT -I

Introduction: Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport, Jayakar committee recommendations and implementation – Central Road Fund, Indian Roads Congress, Central Road Research Institute, Classification of roads as per Nagpur road plan, Scope of highway engineering.

Self Study Component: KSHIP and KRIDL   **10 Hrs**

UNIT -II

Highway Engineering: Ideal Alignment, Factors affecting the alignment, obligatory points, Importance of geometric design, design control and criteria, highway cross section elements - cross slope or camber, medians, carriageway, kerbs, road margins, cross section details, Object of highway pavements, requirements of highway pavements, types of pavement structures and comparisons & their limitations, flexible/rigid pavements – components and their functions.

Self Study Component : Road patterns, NHDP & PMGSY   **10 Hrs**

UNIT -III

Railway Engineering: Permanent Way, Requirements of an ideal permanent way, Gauges in Railway Track, Selection of Gauges, Functions of Rails, Requirements, Types of Rail Sections, Rail Joints, Requirements, types of joints, Welding of Rails, Sleepers-function and requirements, Classification of Sleepers, Spacing of Sleepers and Sleeper Density, Ballast- Functions, requirements and types.

Self Study Component: Comparison of Different types of sleepers, Comparison of   **12 Hrs**
Rail sections.

UNIT -IV

Airport Engineering: Introduction to airport engineering, Airport site selection Runway Design -Orientation of runway by using wind rose diagram - Basic runway length, Corrections for Elevation, Temperature and Gradient to runway length by ICAO and FAA specification - runway cross sections problems on above.

Harbors Engineering: Introductions, classifications, natural phenomenon affecting the design of harbor viz. wind, wave, tide and currents. Harbor layout with component parts.

Self Study Component : Regional planning, exit taxiway   **10 Hrs**

UNIT -V

Advanced Transportation System: Introduction to ITS- definition, objectives, benefits and

historical background, data collection techniques employed in ITS, Promotion and integration of public transportation, Promotion of non-motorized transport, role of metro rail.

Self Study Component: Fly bus technology, MAGLEV Train technology**.**   **10 Hrs**

Text Books :
1   Highway Engineering – S.K. Khanna, C.E.G Justo, and A.Veeraragavan, Nem Chand and Bros, Roorkee, Revised 10th Edition.
2   Railway Engineering- Saxena and Arora, Dhanpat Rai and Sons, New Delhi.
3   Airport Planning and Design – Khanna, Arora and Jain – Nemchand Roorkee.
4   Dock & Tunnel Engineering- Srinivasan R Harbour, Charotar Publishing House.

Reference Books :
1   Highway Engineering- Kadiyali, L.R., Khanna Publishers, New Delhi
2   Railway Engineering- Satish Chandra and Agarwal, M.M., Oxford University Press, New Delhi

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

Course Outcomes

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

1.   Apply the knowledge of science and engineering to acquire the fundamentals of basic modes of transportation (PO1, PO12, PSO1)
2.   Study of different cross section elements of highway and different types of pavements (PO1, PO2, PO12, PSO2)
3.   Identify different components of railway track, design of airport runway and to understand the components of harbor (PO1, PO4,PO12, PSO2)
4.   To understand the advanced developments in transportation systems (PO4, PO12,PSO3)

Course Articulation Matrix (CAM)

Course Outcomes (CO's)	Program outcomes (PO's)												Program Specific outcomes (PSO's)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Apply the knowledge of science and engineering to acquire the fundamentals of basic modes of transportation.	3											2	3		
Study of different cross section elements of highway and different types of pavements.	1	1										2		2	
Identify different components of railway track, design of airport runway and to understand the components of harbor.	2			2								2		2	
To understand the advanced developments in transportation systems.				3								2			2

OBE Curriculum for BE Program			
A. Course Plan			
Course Title: REMOTE SENSING AND INTRODUCTION TO GEOINFOMATICS.			
Course Code: P17CVO753	Semester: VII	L – T – P : 4– 0- 0:04	Credits: 3
Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.		Weightage: CIE: 50 %; SEE:50%	

Course Learning Objectives (CLOs)

This course aims to

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

Course Content

UNIT– I

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

12 Hrs

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

UNIT– II

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

10 Hrs

Self Study Component Characteristics of Indian and other major earth resource satellites.

UNIT– III

Visual Image Interpretation and Digital Image Processing: Introduction, Elements of visual image interpretation, image display and band combinations, true and false color composites, image histogram, image rectification and restoration, geometric correction, radiometric correction, Image enhancement, Image classification (Brief introduction only) methods, supervised and unsupervised, accuracy assessment of image classification. Image filtering- Low pass & high pass filters.

10 Hrs

Self Study Component: Classification of mixed pixels, spectral rationing

UNIT– IV

Fundamentals of Geographic Information System: Introduction, basics of GIS-definition of GIS, components of GIS, GIS work flow, GIS functions, representing spatial data, raster and vector data. Coordinate systems and map projections, datums spatial data input, Non spatial data.GIS applications.

10Hrs

Self Study Component: Database models and management

UNIT– IV

Global Positioning System: Introduction, definition, components of GPS, operational principle, facts and limitations of GPS, GPS receivers, differential GPS, types of DGPS, GPS applications and status in India.

10 Hrs

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Carcknell Arthur P.et.al – Introduction to remote sensing, 2nd edition - 2009
2. Introduction to GIs-Kang tsuang Chang- tata McGraw hill, New Dehli 2009.
3. Peter A. Burrough & Rachel A. McDonnel "Principles of geographic information systems"- (1998), Oxford University press, Great Britain.
4. Chang, "Geographical Information Systems", McGraw Hill Book Co., 2007.
5. Kang - Tsung Chang, "Introduction to Geographic Information Systems", McGraw Hill Publishing, 2nd Edition, 2011.

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

<u>Course outcomes</u>

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

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

Course Articulation Matrix															
Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Apply the knowledge of basic science and Engineering to understand the advantages of using remote sensing over conventional methods, electromagnetic radiation and its various interactions and to understand the concept of GIS and GPS.	2									1			1		
Understand the various sensors and platforms used in remote sensing and identify the earth surface features from satellite images, creation of remote sensing data.	1	2		2									1	2	
To interpret visual image and digital image processing and analysis of accuracy assessment of image classification.	2			2										2	
Understand basic components of GIS and GPS and to analyze their work flow and to understand how remote sensing, GIS and GPS are used in various Engineering applications.	2	2											2	2	

OBE Curriculum for BE Program

A. **Course Plan**

Course Title: CAD LABORATORY –II (RCC, Steel detailing and STADDPRO/ ETABS)

Course Code: P17CVL76	Semester: VII	L – T – P : 0– 0 – 3 :03	Credits: 1.5
Contact Period - Lecture: 39Hrs; Exam: 3Hrs.		Weightage: CIE: 50 %; SEE: 50%	

Course learning objectives:

This course will enable students to
1. Be aware of the Scale Factors, Sections of drawings,
2. Draft the detailing of RC and Steel Structural member.

B. Course Content

Detailing of RCC Structures

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

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

15 Hrs

Detailing of Steel Structures

1. Connections – Beam to beam, Beam to Column by Bolted and Welded Connections.
2. Built-up Columns with lacings and battens
3. Column bases and Gusseted bases with bolted and welded connections.
(NOTE: Drawings to be prepared for given structural details)

15 Hrs

Structural Software

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

09 Hrs

Question paper pattern:
• Two questions shall be asked from each part.
 • One full question should be answered from each part.

Text Books:

1. N Krishna Raju, "Structural Design and Drawing of Reinforced Concrete and Steel", University Press

2. Krishna Murthy, "Structural Design and Drawing – Concrete Structures", CBS Publishers, New Delhi

Reference Books:

1.SP 34: Handbook on Concrete Reinforcement and Detailing, Bureau of Indian Standards

2. IS 13920:2016, Ductile Design and Detailing Of Reinforced Concrete Structures Subjected To Seismic Forces - Code of Practice, Bureau of Indian Standard.

Course Outcomes (CO's)

After learning all the units of the course, the student is able to
CO1   : Understand basic concepts of beam, slab staircase and column footing, draw detailed drawings of beams, slabs element, staircase and column footing for given structural details.

CO2:   Understand basic concepts of steel connections for simple beam to beam and built up columns and column bases , draw detailed drawings of simple beam to beam and built up columns and column bases for given structural details.

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

Course Articulation Matrix (CAM)

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

OBE Curriculum for BE Program			
Course Plan			
Course Title: **ENVIRONEMENTAL ENGINEERING LABORATORY**			
Course Code: **P17CVL77**	Semester: **VII**	L – T – P : 0– 0 – **3 :3**	Credits: 1.5
Contact Period - Lecture: **39Hrs**; Exam: **3**Hrs.		Weightage: CIE: **50** %; SEE: **50%**	

Prerequisites:
Environmental Engineering

Course Learning Objectives (CLOs)

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

Course Content

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

REFERENCE BOOKS:

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

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

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

Course Outcome

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

1. Apply the knowledge of science and engineering for testing water and wastewater qualities
2. Testing water qualities from health criteria and legal standards
3. Test sewage characteristics and to compare with legal standards.
4. Interpret the test data for design of water and wastewater treatment units.

Course Articulation Matrix (CAM)

Sl. No	Course Outcomes CO's	Program outcome												Program specific outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Apply the knowledge of science and engineering for testing water and wastewater qualities	2												2		
2	Testing water qualities from health criteria and legal standards				2		2								2	
3	Test sewage characteristics and to compare with legal standards.				2		2								2	
4	Interpret the test data for design of water and wastewater treatment units			2	2										2	

OBE Curriculum for BE Program				
Course Plan				
Course Title: DEISGN OF PRE-STRESSED CONCRETE STRUCTURES				
Course Code: P17CV81	Semester: VIII	L – T – P : 4 - 0 – 0 :04		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 behavior in flexure and shear
- To design the End Block of PSC beams.

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, Stress concept ,Cable profiles, Load balancing concept, Centre of Thrust, Pressure line.

10 Hrs

Self Study Component: Post tensioning systems with end anchorages, Applications of prestressed concrete. .

UNIT- II
ANALYSIS OF SECTIONS FOR FLEXURE:
Stresses in concrete due to pre-stress and loads for different types of cross sections.

10 Hrs
Self Study Component: Kern zone, cracking moment, stresses in steel due to loads.

UNIT- III
LOSSES OF PRE-STRESS & DEFLECTIONS:
Various losses encountered in pre-tensioning and post tensioning methods, determination of jacking force. Deflections of pre-stressed members, Short term and long term deflections, Elastic deflections under transfer loads and due to different cable profiles. Deflections limits as per IS 1343. Effect of creep on deflection, methods of reducing deflection.

12 Hrs

Self Study Component: Total losses allowed for in design, load verses deflection curve, methods of reducing deflection, crack widths.

UNIT- IV

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

10 Hrs

Self study Component: Different modes of flexural failure

UNIT- V

DESIGN OF END BLOCKS:
Transmission length, Anchorage stress in post-tensioned members. Bearing stress and bursting tensile force, stresses in end blocks, IS code method, provision for the design of end block reinforcement.

10 Hrs

Self study Component: Transmission of pre-stress in pre-tensioned members

Text Books:
1., **"Pre - stressed Concrete",** N Krishna Raju, Tata Mcgraw Hill, New Delhi
2. **"Pre - stressed Concrete"**, N Rajagopalan, Narosa Publishing House, New Delhi
Reference Books:
1. **"Design of Pre - stressed Concrete Structures",** Lin T Y and N H Burns, John Wiley and Sons, New York
2. **"Pre - stressed Concrete"**, G S Pundit and S P Gupta, C B S Publishers, New Delhi

Course outcomes

CO1 :Apply the knowledge of the principles of Prestressing.
CO2 :Analyze the stresses in PSC members under flexure.
CO3 :Evaluate various losses, deflection in members, flexural strength, shear strength and principal tensile stresses in PSC members.
CO4 : Design PSC beams for shear and End block design as per codal provisions.

EVALUATION SCHEME: Student should answer one question from each unit

Course Articulation Matrix															
Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Apply the knowledge of the principles of Prestressing.	2	2											2		
Analyze the stresses in PSC members under flexure.	2	3											2	3	
Evaluate various losses, deflection in members, flexural strength, shear strength and principal tensile stresses in PSC members.	2		3										2	2	
Design PSC beams for shear and End block design as per codal provisions.	2		3										2	3	

OBE Curriculum for BE Program			
Course Plan			
Course Title : OPEN CHANNEL HYDRAULICS			
Course Code: P17CV821	**Semester : VIII**	**L-T-P : H : 4– 0 – 0 : 04**	**Credits :3**
Contact Period : 52 Hrs	**Exam Hours : 3 Hrs**	**Weight age : CIE : 50% , SEE : 50%**	
Prerequisites: Knowledge of Fluid Mechanics, Hydraulics.			

Course Learning Objectives (CLO's)

This Course aims to,

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

Course content

UNIT -I

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

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

Self Study Component : Surges in open channels   **10 Hrs**

UNIT -II

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

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

Self Study Component : Control Sections   **11Hrs**

UNIT -III

Gradually Varied Flow Computations - Different methods, direct integration method-Chow's solution, Bresse's Solution, direct step method, standard step method and graphical integration method. Problems.

Self Study Component : Backwater curves in natural channels   **11 Hrs**

UNIT -IV

Rapidly Varied Flow: Concepts, hydraulic jump in rectangular channels, classification of hydraulic jump based on Froude's number, characteristics of hydraulic jump, Tail water curve and jump water curve, classification of hydraulic jump based on tail water depth,

Numericals.
Self Study Component : Location of hydraulic jump   **10 Hrs**

UNIT -V

Hydraulic Jump in non rectangular channels, jump in exponential channels, jump in Sloping channels, application of hydraulic jump as energy dissipater, stilling basins – type-II and type – IV, overflow spillways(ogee spillway) – design of crest profile, Numericals..
Self Study Component : Siphon spillways   **10 Hrs**

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

Reference Books :
1   1. Open Channel Hydraulics: Ven Tee Chow: Mc Graw Hill Book Company, New Delhi.
2   Open Channel Hydraulics: French: Mc Graw Hill Book Company, New Delhi.
3   Fluid Mechanics: Modi and Seth: Standard Book Home, New Delhi.
4   Open Channel Hydraulics: Henderson: Mr. Millan Publishing Co. Ltd., New York.
 Note: Self study is for 5 marks only in CIE and not in SEE

Course Outcomes

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

1.   To apply the knowledge of fluid mechanics, conservation equations for mass, momentum, and energy to develop a strong knowledge of open channel flow. (PO1) (PSO1)

2.   To Analyze and compute flow profiles using various methods. (PO2 and PO3) (PSO2)

3.   To develop and apply mathematical relationships for hydraulic jumps, critical, uniform, gradually-varying flow and rapidly varied flow. (PO2) (PSO2)

4.   Apply the knowledge of open channel flow in future to work effectively either as an individual or as a team member to satisfy the changing professional and societal needs.(PO5, PO9, PO11) (PSO3)

Course Articulation Matrix (CAM)

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

OBE Curriculum for BE Program
A. Course Plan
Course Title: Advanced Foundation Design

Course Code: P17CV822	Semester: VIII	L – T – P : 4 – 0 – 0 :04	Credits: 3
Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.		Weightage: CIE: 50 %; SEE:50%	

Prerequisites:

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 soil dynamics

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.

10 Hrs

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

UNIT – II

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

10 Hrs

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

UNIT – III

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

8 Hrs

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

UNIT – IV

FOUNDATIONS ON EXPANSIVE SOILS: Introduction, Definition, Identification, Mineral Structure, Index properties of expansive soils, Swell potential and swell pressure, free swell, CNS layer, foundation treatment for structures in expansive soil.
CAISSONS: Design of open, pneumatic and floating caissons.

10 Hrs

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

UNIT – V

MACHINE FOUNDATIONS: Introduction, Types of Machine foundations, basic definitions, degree of freedom of a block foundation, general criteria for design of machine foundation, free and forced vibrations, vibration analysis of a machine foundation, determination of natural frequency.
Self-Study Component:- Vibration isolation and control   **14 Hrs**

Text Book:

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

REFERENCE BOOKS:

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

Course Outcomes (CO's)

After learning all the units of the course, the student is able to
CO1   Apply the knowledge of Geology and geotechnics to differentiate shallow & deep foundation
CO2   Analyze shallow and deep foundations for civil engineering structures
CO3   Evaluate Design shallow and deep foundation for civil engineering structures
CO4   Interpret data to select suitable foundation for expansive soil from safety consideration

EVALUATION SCHEME: Student should answer one question from each unit

Course Articulation Matrix															
Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Apply the knowledge of Geology and geo technics to differentiate shallow & deep foundation	2												2		
Analyze shallow and deep foundations for civil engineering structures		2												2	
Evaluate Design shallow and deep foundation for civil engineering structures			3											2	
Interpret data to select suitable foundation for expansive soil from safety consideration				3		3									3

OBE Curriculum for BE Program			
A. Course Plan			
Course Title: URBAN TRANPORT PLANNING			
Course Code: P17CV823	**Semester: VIII**	**L – T – P : 4 – 0- 0 :04**	**Credits : 03**
Contact Period - Lecture: 52Hrs. Exam: 03Hr		**Weightage: CIE: 50 %; SEE: 50%**	

Perquisites:

Transportation engineering.

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

Relevance of the Course:

This course is relevant to transportation.

B. Course Content

UNIT – I

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

Self Study Component: Urbanization; causes & effects, Co ordination

10Hrs

UNIT – II

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

Self Study Component: Study area, zoning, sampling Techniques

10Hrs

UNIT – III

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

Self Study Component: Regression methods; single and multiple

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.

Self Study Component: Probit analysis, logit analysis, discriminant analysis

10Hrs

UNIT – V

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

Self Study Component: Fuel consumption of motor vehicles

12Hrs

Text Books:
1. Kadiyali, L R, "Traffic Engineering and Transport Planning, Khanna Publishers
2. Subash C Saxena, " A Coures in Traffic Planning and Desing", Dhanapat Rai & Sons, Delhi, 1989.
Reference:
1. Jothi Kristey & Lal, "Introduction to Transportation Engineering", PHI, New Delhi
2. Huchinson AG, "Urban and Regional Models in Geography and Planning", John Wiley and Sons, London.

Course Outcome:

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

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

Course Articulation Matrix															
Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Evaluate the transportation need of urban cities and suggest viable solutions in Urban transport planning.			2										1		
Identify, formulate and solve engineering problems in trip generation, trip distribution by various methods.		3												2	
Recognize the importance of intelligent transport system	1												1		
Provide best planning alternatives with respect to technical and cost feasibility for sustainability										2					2

Curriculum for BE Program			
Course Plan			
Course Title: Theory of Elasticity			
Course Code: P17CV824	**Semester: VIII**	**L – T – P : 4 -0 -0: 04**	**Credits: 3**
Contact Period - Lecture: 52Hr.; Exam: 03Hr		**Weightage: CIE: 50 %; SEE: 50%**	

Course Learning Objectives (CLOs)

This course aims to

1   Understand the basic principles of mechanics of deformable bodies
2   Introduction to stresses and strains in 2D and 3D Cartesian and polar co-ordinates
3   Understand the relationships between stress and strains
4   Understanding the application of principles of theory of elasticity in the field of civil engineering
5   Understanding of plastic behavior of materials and theories of failures

UNIT -1

Analysis of Stress: Introduction, Definition of stress at a point, Rectangular and Polar coordinates in 2D and 3D, Components of stresses, Equilibrium equations, Principal stresses and stress invariants, Maximum shear stresses, Stress transformation, Octahedral Stresses, Stress boundary Conditions. (All Topics to be discussed in both rectangular and polar co-ordinate systems in 2D and 3D treatments).
*Self-Study Component :*Mohr's Circle for stresses   **12Hrs**

UNIT- 2

Analysis of Strain: Definition of a Strain at a point and Strain components in rectangular and polar coordinates (2D and 3D), Strain displacement relationships, strain compatibility, Principal strain, Maximum shear strain & octahedral strains.(All Topics to be discussed in both rectangular and polar co-ordinate systems in 2D and 3D treatments).
Self-StudyComponent: Strain Rossette   **10Hrs**

UNIT - 3

Stress-Strain Relationship: Hooke's law, General Constitutive Relationship, Definition of Plane stress and Plane strain idealizations, Constitutive relation for plane stress and plane strain cases, Compatibility equations.
Airy's Stress Function: Airy's stress function approach to2D problems of elasticity. Solution by Polynomials –End Effects, Saint –Venant's Principle.
Self-StudyComponent: Stress –strain relationship in polar co-ordinates.   **10Hrs**

UNIT - 4

Applications Problems: Solution of some simple beam problems, including working out of displacement components. Applications in polar coordinates: Axi- symmetric stress distribution, Analysis of Thick cylinders, Hollow and solid Rotating discs. The effect of a small circular hole on stress distribution in large plates subjected to uni-axial tension and

pure shear.

Self-Study Component: Application of theory of elasticity to obtain **10Hrs** solutions forPure bending of curved bars.

UNIT- 5

Theory of Plasticity: Stress – strain diagram in simple tension, perfectly elastic, Rigid – Perfectly plastic, Linear work – hardening, Elastic Perfectly plastic, Elastic Linear work hardening materials, Failure theories, yield conditions, stress – space representation of yield criteria through Westergard stress space, Tresca and Von-Mises criteria of yielding.

Self-Study Component::Elastic plastic problems in bending and torsion   **10Hrs**

TEXT BOOKS:
1   Timoshenko and Goodier, "Theory of elasticity", McGraw Hill Book Company, III Edition, 1983
2   Valliappan. S, "Continuum Mechanics fundamentals", Oxford and IBH.
3   J. Chakrabarty, Theory of Plasticity, McGraw-Hill Book Company, New York 1990

REFERENCE BOOKS:
1   Srinath. L.S., Advanced Mechanics of Solids", Tata McGraw-Hill Publishing Co ltd., New Delhi

2   T.G.Sitharam and L.Govindaraju, "Elasticity for Engineers", IK International publishing house Pvt, Ltd.
3   Irving H.Shames and James,M.Pitarresi, Introduction to Solid Mechanics, Prentice Hall of India Pvt. Ltd., New Delhi -2002.
4   W.F.Chen and D.J.Han., Plasticity for structural Engineers., Springer-Verlag., NY., 1988.

Course Outcomes (CO's)

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

1. Understand the concept of stresses and analyse the various mathematical operations involved in analyzing stresses in 2D and 3D problems in Cartesian and polar co-ordinates.

2. Apply the concept of stain at a point and to get acquaint with the various mathematical operations involved in analysis strains in 2D and 3D problems in Cartesian and polar co-ordinates.

3. Develop general stress strain relations and to understand its application in various cases.

4. Apply the basic principles of theory of plasticity to understanding the plastic behavior of materials and theories of failure.

EVALUATION SCHEME: Student should answer one question from each unit

Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Understand the concept of stresses and analyse the various mathematical operations involved in analyzing stresses in 2D and 3D problems in Cartesian and polar co-ordinates.	3		2										2		
Apply the concept of stain at a point and to get acquaint with the various mathematical operations involved in analysis strains in 2D and 3D problems in Cartesian and polar co-ordinates.		3												2	
Develop general stress strain relations and to understand its application in various cases.	3														2
Apply the basic principles of theory of plasticity to understanding the plastic behavior of materials and theories of failure.				3										2	

OBE Curriculum for BE Program				
Course Plan				
Course Title: Earthquake Resistant Design of Structures				
Course Code: P17CV831	Semester: VIII	L – T – P : 4 -0 -0 :04		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)

Course Learning Objectives: This course will enable students to learn about

1. Fundamentals of engineering seismology

2. Irregularities in building which are detrimental to its earthquake performance

3. Computation of seismic lateral forces for framed and masonry structures

4. Geotechnical consideration and ductile detailing of RCC building

5. Seismic evaluation, retrofitting strategies of RC and Masonry building

Relevance of the Course:

This course is relevant to seismic hazard and prevention

B. Course Content

UNIT - I

Seismic Hazard Assessment: Engineering Seismology – Definitions, Classification of Earthquakes, Causes of Earthquakes, Internal structure of earth, Seismic waves, Theory of plate tectonics and seismic zoning of India, Intensity of earthquake and Magnitude of earth quake, Seismographs
Earthquake Effects on Structures: Local site effects on behavior of building during earthquake, Earthquake monitoring and seismic instrumentation-

10 Hrs

Self Study Component: Torsional response of buildings, Response Spectra

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,

10 Hrs

Self Study Component: Building characteristics, and other cause of damages.

UNIT - III

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

10 Hrs

Self Study Component: Numericals.

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.
Earthquake Resistant Design Of RCC Buildings – Ductility Considerations, requirement for ductility, Ductility ratio, structural ductility and factors affecting ductility, Ductile detailing of RC structures as per IS:13920-1993.

12 Hrs

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

UNIT - V

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

TEXT BOOK :
1. Pankaj Agarwal and Manish Shrikhande, Earthquake resistant design of structures,

PHI, India.

2. S.K.Duggal, Earthquake resistant design of structures, Oxford university press, 2007.

REFERENCE BOOKS:

1.Chopra, A.K. Dynamics of structures, Prentice-Hall of India Pvt. Ltd. New Delhi.
2. S. R. Damodaraswamy and S. Kavitha, , Basics of Structural Dynamics and Aseismic design, PHI
Learning Private Limited, New Delhi.

Course Outcomes:
After learning all the units of the course, the student is able to
Co 1. To provide the students with basic knowledge of earth quakes and it's relation to structural systems
Co2 Ability to apply the knowledge of engineering to conceptually design of structural systems against earthquakes.
CO3. Ability to analyze and design of reinforced concrete structural systems subjected to earthquake forces
CO4. Summarize the seismic evaluation and retrofitting of structures.

EVALUATION SCHEME: Student should answer one question from each unit

Course Articulation Matrix																
Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
To provide the students with basic knowledge of earth quakes and it's relation to structural systems	2	2											2	2		
Ability to apply the knowledge of engineering to conceptually design of structural systems against earthquakes.	2		3										2	3		
Ability to analyze and design of reinforced concrete structural systems subjected to earthquake forces and Geo technical considerations		2	3										2	3		
Summarize the seismic evaluation and retrofitting of structures	2				2								2		2	

OBE Curriculum for BE Program
<u>Course Plan</u>
Course Title: Design of Bridges

Course Code: P17CV832	Semester: VIII	L – T – P : 4 – 0 - 0 :04	Credits: 3
Contact Period - Lecture: 52 Hrs; Exam: 3Hrs.		Weightage: CIE: 50 %; SEE: 50%	

<u>Prerequisites:</u>

Design and drawing of RCC and steel structures

<u>Course Learning Objectives (CLOs)</u>

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.

<u>Relevance of course:</u>

This course is relevant to long span structures

<u>Course Content</u>

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

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

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

10Hrs

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

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

Self study Component: Design of skew slab culvert**.**

Unit-IV

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

10Hrs

Self study component: Structural design of pipe culvert.

Unit – V

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

10Hrs

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

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

REFERENCE BOOK:

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

Course Outcome

After learning all the units of the course, the student is able to
1. Identify site locations for the bridges.
2. Understand the IRC loadings.
3. Analyse and design slab culvert.
4. Analyse and design box culvert and T Beam Bridge and design T-beam bridge.

EVALUATION SCHEME: Student should answer one question from each unit

Course Articulation Matrix															
Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Identify site locations for the bridges	1												2		
Understand the IRC loadings.	1						2						1	1	
Analyse and design slab culvert.		2												2	
Analyse and design box culvert and T beam bridge and design T-beam bridge.	2	2			2								1	2	

OBE Curriculum for BE Program			
Course Plan			
Course Title: Earth and Earth Retaining Structures			
Course Code: **P17CV833**	Semester: **VIII**	L – T – P : **4 -0- 0 :04**	**Credits:3**
Contact Period - Lecture: **52Hr**.; Exam: **03Hr**		Weightage: CIE: **50 %**; SEE: **50%**	

This Course aims to,
1. Design Earth dams and Embankments.

2. Design of retaining walls

3. Design of bulk heads

4. Understand the requirement of braced cuts

5. Design and construction of rock fill dams

Unit-1
EARTH DAMS AND EMBANKMENTS:
Different types of earthen dams with sketches and their suitability. Hydraulic fill and rolled fill methods of construction – Causes of failure of earth dam – Design criteria of earth dams– Stability analysis of earthen dams–Seepage control in earthen dams.

10 Hrs

Self study component: Role of Filters in Earth Dam Design**.**

Unit-2
RETAINING WALLS:
Types of retaining walls, failure of retaining walls by sliding, overturning and bearing. Stability analysis and Principles of the design of retaining walls – Gravity retaining walls, Cantilever retaining walls, Counter fort retaining walls (no structural design)

10 Hrs
Self study component: 6 Modes of failure of retaining walls – Drainage from the backfill.

Unit-3

BULK HEADS:
Cantilever sheet pile walls Types of sheet pile walls –Free cantilever sheet pile - cantilever sheet pile in cohesion-less soils –cantilever sheet pile in clay.
Anchored Sheet Pile Walls:
Anchored sheet pile with free earth support in cohesion-less and cohesive soil. bulkheads with fixed earth support method. –

12 Hrs

Self study component: Types, locations and design of anchors.

Unit-4

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

Self study component: Different types of sheeting   **10 Hrs**

Unit-5

ROCK FILL DAMS
Introduction, Origin and usage of rock fill dams, types of rock fill dams, design of rock fill dams and construction of rock fill dams.
Coffer dams and cellular coffer dams : Introduction –types of coffer dams –- safety against sliding, slipping, overturning, vertical shear and stability against bursting.

                                      10 Hrs

Self study component: Design of cellular coffer dams on rock by Tennesse Valey Authority (TVA) method

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

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

Course outcomes:

1. Understand types of earthen dams and analyze and design of earthen dams and stability
2. Understand and analyze different modes of failure of retaining walls
3. Analyze and design bulk heads and sheet piles
4. Understand different types of dams and check for safety

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

Course Articulation Matrix															
Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Understand types of earthen dams and analyze and design of earthen dams and stability	2	2	2	2				2					1	2	
Understand and analyze different modes of failure of retaining walls		2	2										1	2	
Analyze and design bulk heads and sheet piles	1	2											1	2	
Understand different types of dams and check for safety			2					2						2	2

OBE Curriculum for BE Program			
Course Plan			
Course Title: RCC and Steel Structural Design			
Course Code: P17CV834	**Semester: VIII**	**L – T – P : 2 : 2: 0 :04**	**Credits:3**
Contact Period - Lecture: 52Hr.; Exam: 03Hr		**Weightage: CIE: 50 %; SEE: 50%**	

Course objectives:

This course will enable students to ,

1. Give procedural knowledge to design a system, component or process as per needs and specifications of RC Structures like Retaining wall Combined, Footing, Water tanks, Portal Frames and Steel Structures like Roof Truss, Plate Girder and Gantry Girder.

2. Imbibe the culture of professional and ethical responsibilities by following codal provisions in the analysis, design of RC and Steel Structures.

Course Content

Part A

1. Combined Footings: Design of rectangular slab and Beam type combined footing.
2. Retaining Walls: Design of cantilever Retaining wall.
3. Design of portal frames with fixed supports.

Self Study Component: Slab type combined footing, Counter fort retaining wall Portal frames writes hinged support.

28 Hrs

Part B

1. Roof Truss: Design of roof truss for different cases of loading, forces in members to be given.
2. Plate Girder: Design of welded plate girder with intermediate stiffener, bearing stiffener and necessary checks
3. Gantry Girder: Design of gantry girder with all necessary checks.

Self Study Component: Load calculation & Analysis of trusses, Theory on tension field & simple post critical methods, Gantry girders supported on corbels.

24 Hrs

Question Paper Pattern:

• Two questions shall be asked from each part. There can be maximum of three subdivisions in each question, if necessary.

• One full question should be answered from each part.

• Each question carries 50 marks.

• Code books – IS 456, IS 800, SP (6) – Steel Tables, shall be referred for designing

• The above charts shall be provided during examinations.

Course Outcomes:

After studying this course, students will be able to:

• Apply the basic knowledge in design of RCC and Steel Structures.

• Ability to follow design procedures as per codal provisions and skills to arrive at structurally safe RC and Steel members.

Text Books:

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

Reference Books:
1. Charles E Salman, Johnson & Mathas, "Steel Structure Design and Behaviour", Pearson Publications
2. Nether Cot, et.al, "Behaviour and Design of Steel Structures to EC -III", CRC Press
3. P C Verghese, "Limit State Design of Reinforced Concrete", PHI Publications, New Delhi 4. S N Sinha, "Reinforced Concrete Design", McGraw Hill Publication.

Course Outcomes (CO)	Program Outcomes												Program Specific Outcomes		
Apply the basic knowledge in design of RCC and Steel Structures.	2	3	3										1	2	
Ability to follow design procedures as per codal provisions and skills to arrive at structurally safe RC and Steel members.	2	3	3										1	2	

OBE Curriculum for BE Program			
Course Plan			
Course Title : MUNCIPAL SOLID WASTE MANAGEMENT			
Course Code: P17CVO841	**Semester: VIII**	**L – T – P – H : 4– 0 – 0 :04**	**Credits:3**
Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.		**Weightage: CIE:50 %; SEE:50%**	

Course Learning Objectives (CLOs)

This course aims to

1. To understand material flow and different elements of solid waste management from generation of solid waste to disposal.
2. To Study the different methods of solid waste management system in par with statutory rules.
3. To Analyze different processing technologies of conversion of municipal solid waste to compost or biogas.
4. To Evaluate landfill site and to study the sanitary landfill reactions.

Course Content

UNIT – I

INTRODUCTION: Definition, 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.

9Hrs

Self study Component: Types of Solid waste and factor affecting generation rates.

UNIT – II

COLLECTION AND TRANSPORTATION: Systems of collection, collection equipment, transfer stations – bailing and compacting, problems on moisture content and Energy content. TREATMENT / PROCESSING TECHNIQUES: Components separation, volume reduction, size reduction.

9 Hrs

Self study Component: Chemical reduction and biological processing.

UNIT – III

INCINERATION: **Process –** 3 T's, factors affecting incineration process, incinerators – pyrolysis, COMPOSTING: Aerobic and anaerobic composting, factors affecting composting, Indore and Bangalore processes, mechanical and semi mechanical composting processes, Vermin-composting**.**

8 Hrs

Self study Component: Prevention of air pollution and Types of incinerators.

UNIT – IV

SANITARY LAND FILLING: Different types, trench area, Ramp and pit method, site selection, basic steps involved, leachate & gas collection and control methods.

Self study Component: Prevention of land pollution, geosynthetic fabric and lining in sanitary landfill.

8 Hrs

UNIT – V

DISPOSAL METHODS: Open dumping – selection of site, ocean disposal,incineration, pyrolysis, composting, sanitary land filling, merits and demerits, biomedical wastes. RECYCLE AND REUSE: Material and energy recovery operations, plastic wastes, environmental significance and reuse.

Self study Component: Ploughing into fields, feeding to hogs and reuse of material in other industry.

8 Hrs

TEXT BOOKS:

    1. Integrated Solid Waste Management: Tchobanoglous: M/c GrawHill.

    2. Solid Waste Management in developing countries. Bhide and Sunderashan,

Indian National Scientific, Documentation Centre.

REFERENCES:

1. Hand book on Solid Waste Disposal.: Pavoni J.L., Published by Van Nost. Reinhold,1975.
2. Environmental Engineering, Howard S. Peavy, George Tchobanoglous and Donald R. Rowe's Environmental Engineering, published by Tata McGraw-Hill Education.
3. Environmental Engineering – Vol II: S.K. Garg, Khanna publishers.

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

Course Outcomes

Student will be able to

1. Understand the importance, source, classification of solid waste [PO2,PSO1]
2. Learn different methods of collection, transportation and management of solid waste [PO2, PO3, PO4, PSO1]
3. Learn different methods of treatment of solid waste like incineration composing, sanitary land filling and design of sanitary land fill. [PO1, PO3,PSO1]
4. Learn different disposal methods of solid waste, recycling and reusing of solid waste. [PO2,PSO2]

Course Articulation Matrix(CAM)

Sl. No	Course Outcome-CO's	Program outcome												Program Specific outcome		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
01	Understand the importance, source, classification of solid waste.		2											2		
02	Learn different methods of collection, transportation and management of solid waste.		1	2	2									2		
03	Learn different methods of treatment of solid waste like incineration composing, sanitary land Filling and design of sanitary landfill.	1		3										2		
04	Learn different disposal methods of solid waste, recycling and reusing of solid waste.		2												2	

OBE Curriculum for BE Program		
Course Plan		
Course Title: HIGHWAY TRAFFIC AND SAFETY MEASURES		

Course Code: P17CVO842	**Semester: VIII**	**L – T – P : 4 -0- 0 :04**	**Credits:3**
Contact Period - Lecture: 52Hr.; Exam: 03Hr		**Weightage: CIE: 50 %; SEE: 50%**	

Course Learning Objectives (CLO's)

This Course aims to,
1   Understand the knowledge of various traffic characteristics.
2   Understand the importance of traffic studies and design of parking facilities.
3   Understand the importance of accident studies in the present scenario.
4   Understand the importance of traffic regulation and control.
5   Understand the basic concept of various types of traffic intersection and its design.

Course Contents

UNIT - 1

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

TRAFFIC CHARACTERISTICS: Road user characteristics – human factors including reaction time and vehicular characteristics affecting road design and traffic flow, resistance to the motion of vehicles – Reaction time of driver – Problems on above.

Self study: PCU concept for mixed traffic condition

10 Hrs

UNIT - 2

TRAFFIC STUDIES:

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

Design of on-street and off-street parking facilities, pedestrian facilities, safety devices and different types of Urban Roads.

Self study: Bus bays, Design features of expressways

12 Hrs

UNIT – 3

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

Self study: Cost of road accidents

10 Hrs

UNIT - 4

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

10 Hrs

UNIT - 5

TRAFFIC INTERSECTION: Geometric Design of Intersections : Types of Intersections; Design Principles for Intersections; Design of At-grade Intersections – Channelization, Objectives; Rotary Intersection – Concept, Advantages and Disadvantages; Grade separated Interchanges – Types, warrants and Design standards.
Self study: Traffic Islands and Design standards

10 Hrs

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

REFERENCE BOOKS :
1. Traffic Engineering. Pignataro- Prentice Hall.
2. Highway Capacity Manual – 2000.

Course Outcomes

a. Apply the knowledge of engineering fundamentals for understanding various road user and vehicular characteristics. (PO1, PO6, PSO1)
b. Identify traffic stream characteristics and understand the elements of highway safety and approaches to accident studies. (PO2, PO6, PSO2)
c. Understand the concept of traffic regulations and traffic control devices. (PO1, PO5, PSO3)
d. Perform various traffic studies and design of different highway components. (PO3, PO6, PSO1)

Course Articulation Matrix (CAM)

Sl. No	Course Outcome – CO	Program outcome												Program Specific Outcomes		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
01	Apply the knowledge of engineering fundamentals for understanding various road user and vehicular characteristics.	3					2							3		
02	Identify traffic stream characteristics and understand the elements of highway safety and approaches to accident studies.		3				2								2	
03	Understand the concept of traffic regulations and traffic control devices.	2				2										**2**
04	Perform various traffic studies and design of different highway components.			2			2							2		

OBE Curriculum for BE Program
Course Plan
Course Title: OCCUPATIONAL HEALTH AND SAFETY

Course Code: **P17CVO843**	Semester: **VIII**	L – T – P : **4 : 0: 0 :04**	Credits:**3**
Contact Period - Lecture: **52Hr**.; Exam: **03Hr**		Weightage: CIE: **50** %; SEE: **50%**	

Course learning objectives (CLo's)	
This course aims to,	
1	Gain an historical, economic, and organizational perspective of occupational safety and health;
2	Investigate current occupational safety and health problems and solutions.
3	Identify the forces that influence occupational safety and health.
4	Demonstrate the knowledge and skills needed to identify workplace problems and safe work practice

Course content	
UNIT -I	
Occupational Hazard and Control Principles: Safety, History and development, National Safety Policy. Occupational safety and Health Act (OSHA), Occupational Health and Safety administration - Laws governing OSHA and right to know. Accident – causation, investigation, investigation plan.	
Self-Study Component: Methods of acquiring accident facts, Supervisory role in accident investigation.	**10 Hrs**
UNIT -II	
Ergonomics at Work Place: Ergonomics Task analysis, Preventing Ergonomic Hazards, Work space Envelops, Visual Ergonomics, Ergonomic Standards, Ergonomic Programs. Hazard cognition and Analysis.	
Self-Study Component: Human Error Analysis – Fault Tree Analysis – Emergency Response - Decision for action – purpose and considerations.	**12 Hrs**
UNIT -III	
Fire Prevention and Protection: Fire Triangle, Fire Development and its severity, Effect of Enclosures, early detection of Fire, Classification of fire and Fire Extinguishers.	
Self-Study Component: Electrical Safety, Product Safety: Technical Requirements of Product safety.	**10 Hrs**

UNIT -IV	
Health Considerations at Work Place: types of diseases and their spread, Health Emergency. Personal Protective Equipment (PPE) – types and advantages, effects of exposure and treatment for engineering industries, municipal solid waste.	
Self-Study Component: Environment management plans (EMP) for safety and sustainability	**10 Hrs**
UNIT -V	
Occupational Health and Safety Considerations: Water and wastewater treatment plants, Handling of chemical and safety measures in water and wastewater treatment plants and labs, Construction material manufacturing industries like cement plants, RMC Plants, precast plants and construction sites.	
Self-Study Component: Policies, roles and responsibilities of workers, managers and supervisors	**10 Hrs**

Text Books :	
1	Goetsch D.L., (1999), "Occupational Safety and Health for Technologists, Engineers and Managers", Prentice Hall.
2	Heinrich H.W., (2007), "Industrial Accident Prevent ion - A Scientific Approach", McGraw-Hill Book Company National Safety Council and Associate (Data) Publishers Pvt. Ltd., (1991),
3	"Industrial Safety and Pollution Control Handbook

Reference Books :	
1	Colling D.A., (1990), "Industrial Safety Management and Technology", Prentice Hall, New Delhi.
2	Della D.E., and Giustina, (1996), "Safety and Environmental Management", Van Nostrand Reinhold International Thomson Publishing Inc.

Course Outcomes

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

1. Identify hazards in the workplace that pose a danger or threat to their safety or health, or that of others.
2. Control unsafe or unhealthy hazards and propose methods to eliminate the hazard.
3. Present a coherent analysis of a potential safety or health hazard both verbally and in writing, citing the occupational Health and Safety Regulations as well as supported legislation.
4. Discuss the role of health and safety in the workplace pertaining to the responsibilities of workers, managers, supervisors.

Course Articulation Matrix (CAM)

Sl.no	Course Outcomes (CO's)	Program outcomes (PO's)												Program Specific outcomes (PSO's)		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Identify hazards in the workplace that pose a danger or threat to their safety or health, or that of others.	2						2	2							
2	Control unsafe or unhealthy hazards and propose methods to eliminate the hazard	2					2									
3	Present a coherent analysis of a potential safety or health hazard both verbally and in writing, citing the occupational Health and Safety Regulations as well as supported legislation.						2	2		2						
4	Discuss the role of health and safety in the workplace pertaining to the responsibilities of workers, managers, supervisors.	2						2	2						2	