K. S. SCHOOL OF ENGINEERING AND MANAGEMENT- 560 109

DEPARTMENT OF CIVIL ENGINEERING

Circular

Date: 29th JUNE 2019

All the faculty members are hereby informed to provide the subject preferences for semester July 2019- Nov 2019 in the attached sheet latest by 10th July 2019.

Syllabus of different schemes is attached for your information.

Head-Department

Professor & Head
Dept. of Civil Engineering
K.S. Group of Institutions
K.S. School of Engineering & Management
Bangalore-560 062

K. S. SCHOOL OF ENGINEERING AND MANAGEMENT- 560 109

DEPARTMENT OF CIVIL ENGINEERING (UG)

Session 2019-2020 (Odd semester: July-November 2019)

Preferences for Subjects

Sl. No.	Name of the Faculty	I Semester 2018	III Semester 2018	V Semester 2017	VII Semester 2015	Signature
1	Dr. Vijayalakshmi Akella			Design of RCC 17CV51		
2	Dr. Arekal Vijay	Elements of Civil 18CIV14	Basic Surv 18CV35	Applied Geotech 17CV53	DCBS 15CV743	
3	Prof. Veerendra Kumar M	Elements of Civil 18CIV14		Analysis of Indeterminate Struct 17CV52	DRCC&SS 15CV72	
4	Dr. Vyshali		Engineering Geology 18CV36	Remote Sensing and ATS 17CV563	Hydrology & Irrigation Engineering 15CV73	
5	Dr. Savitha B G	Elements of Civil Engg (18CIV14)	Basic Surv 18CV35	RHTA 17CV552	MIWME 15CV71	
6	Prof. Sushma M		Strength of Materials (18CV32)	Analysis of Indeterminate structures (17CV52)	Design of RCC & steel (15CV72)	
7	Prof. Naveena M P		Basic Surv (18CV35)	CAD LAB (17CVS2)	DRCC&SS (15CV72)	
8	Prof. Prashanth M	Elements of Civil 18CIV14	Streyth of material 18CV32		Computer Aided Buildi 15CVL75	
9	Prof. Manjunath B	Element SO CIVIL 18CIV14	BMCT 18CV34	computer Aid Drawing 17CV54		
10	Prof. Shashi Prasad N		CAD LAB	Analysis of Indeterminat Structure (17CV52)	Hydrology & Irr. Engg (15CV73)	
11	Prof. Sasha Rai P	Elements of Civil Engg (18CIV14)	MT Lab 18CVL38	Design of RC Structural Elem 17CV51(CORE)		
12	Prof. Varnitha M S	Elements of Civil engg 18CIV14		Traffic engg (17CV561)	DDRC 15CV72	
13	Prof. Vignesh Bhat	Elements of CE 18CV14	SOM 18CV32	Applied GT 17CV53	MIWME 15CV71	
14	Prof. Amrutha Dhiraj					

Head-Department

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K. S. SCHOOL OF ENGINEERING AND MANAGEMENT- 560 109

DEPARTMENT OF CIVIL ENGINEERING (PG)

Session 2019-2020 (Odd semester: August 2019 -January 2020)

Preferences for Subjects

Sl. No.	Name of the Faculty	I M.Tech Semester 2018 Scheme	III M.Tech Semester 2018 Scheme	Signature
1	Dr. Vijayalakshmi Akella	MDDB [18CSE13]		
2	Prof. Veerendra Kumar M		Design of Concrete Bridges 18CSE31	
3	Prof. Sushma M		Repair & Rehabilitation of Structures (18CV322)	
4	Prof. Naveena M P		Design of masonry 18CSE332	
5	Prof. Prashanth M	Special concrete 18CSE15		
6	Prof. Manjunath B	computational Structural mech 18CSE11		
7	Prof. Shashi Prasad N		Design of Masonry Structures [18CSE332]	
8	Prof. Sasha Rai P	CSM (18CSE11)		
9	Prof. Varnitha M S	Advanced RCC 18CSE12		
10	Prof. Amrutha Dhiraj	Advanced Rcc 18CSE12		

Head-Department

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B. E. CIVIL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

STRENGTH OF MATERIALS

Course Code	**18CV32**	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:2:0)	SEE Marks	60
Credits	04	Exam Hours	03

Course Learning Objectives: This course will enable students

1. To understand the basic concepts of the stresses and strains for different materials and strength of structural elements.
2. To know the development of internal forces and resistance mechanism for one dimensional and two-dimensional structural elements.
3. To analyse and understand different internal forces and stresses induced due to representative loads on structural elements.
4. To determine slope and deflections of beams.
5. To evaluate the behaviour of torsion members, columns and struts.

Module-1

Simple Stresses and Strain: Introduction, Definition and concept and of stress and strain. Hooke's law, Stress-Strain diagrams for ferrous and non-ferrous materials, factor of safety, Elongation of tapering bars of circular and rectangular cross sections, Elongation due to self-weight. Saint Venant's principle, Compound bars, Temperature stresses, Compound section subjected to temperature stresses, state of simple shear, Elastic constants and their relationship.

Module-2

Compound Stresses: Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses**.** Theory of failures: Max. Shear stress theory and Max. principal stress theory.

Thin and Thick Cylinders: Introduction, Thin cylinders subjected to internal pressure; Hoop stresses, Longitudinal stress and change in volume. Thick cylinders subjected to both internal and external pressure; Lame's equation, radial and hoop stress distribution.

Module-3

Shear Force and Bending Moment in Beams: Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, Sign conventions, relationship between load intensity, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to points load, uniformly distributed loads, uniformly varying loads, couple and their combinations.

Module-4

Bending and Shear Stresses in Beams: Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity. Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, 'I', and 'T' sections. Shear centre (only concept).

Torsion in Circular Shaft: Introduction, pure torsion, Assumptions, derivation of torsion equation for circular shafts, torsional rigidity and polar modulus Power transmitted by a shaft.

Module-5

Deflection of Beams: Definition of slope, Deflection and curvature, Sign conventions, Derivation of moment-curvature equation. Double integration method and Macaulay's method: Slope and deflection for standard loading cases and for determinate prismatic beams subjected to point loads, UDL, UVL and couple.

Columns and Struts: Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns.

Course outcomes: After studying this course, students will be able;

1. To evaluate the basic concepts of the stresses and strains for different materials and strength of structural elements.
2. To evaluate the development of internal forces and resistance mechanism for one dimensional and two dimensional structural elements.
3. To analyse different internal forces and stresses induced due to representative loads on structural elements.
4. To evaluate slope and deflections of beams.
5. To evaluate the behaviour of torsion members, columns and struts.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks:

1. B.S. Basavarajaiah, P. Mahadevappa "Strength of Materials" in SI Units, University Press (India) Pvt. Ltd., 3rd Edition,2010
2. Ferdinand P. Beer, E. Russell Johnston and Jr. John T. De Wolf "Mechanics of Materials", Tata McGraw-Hill, Third Edition, SI Units

Reference Books:

1. D.H. Young, S.P. Timoshenko "Elements of Strength of Materials" East West Press Pvt. Ltd., 5th Edition (Reprint2014).
2. R K Bansal, "A Textbook of Strength of Materials", 4th Edition, Laxmi Publications, 2010.
3. S.S. Rattan "Strength of Materials" McGraw Hill Education (India) Pvt. Ltd., 2nd Edition (Sixth reprint2013).
4. Vazirani, V N, Ratwani M M. and S K Duggal "Analysis of Structures Vol. I", 17th Edition, Khanna Publishers, New Delhi.

B. E. CIVIL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

FLUIDS MECHANICS

Course Code	**18CV33**	CIE Marks	40
Teaching Hours/Week(L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives: The objectives of this course is to make students to learn:

1. The Fundamental properties of fluids and its applications.
2. Hydrostatic laws and application to solve practical problem.
3. Principles of Kinematics and Hydrodynamics for practical applications.
4. Basic design of pipes and pipe networks considering flow, pressure and its losses.
5. The basic flow rate measurements.

Module-1

Fluids & Their Properties: Concept of fluid, Systems of units. Properties of fluid; Mass density, Specific weight, Specific gravity, Specific volume, Viscosity, Newton's law of viscosity (theory & problems), Cohesion, Adhesion, Surface tension, Pressure inside a water droplet, soap bubble and liquid jet. Numerical problems,& Capillarity. Capillary rise in a vertical tube and between two plane surfaces (theory & problems). Vapor pressure of liquid, compressibility and bulk modulus, Fluid as a continuum,

Fluid Pressure and Its Measurements: Definition of pressure, Pressure at a point, Pascal's law, Variation of pressure with depth. Types of pressure. Measurement of pressure using simple, differential & inclined manometers (theory & problems). Introduction to Mechanical and electronic pressure measuring devices**.**

Module-2

Hydrostatic forces on Surfaces: Definition, Total pressure, centre of pressure, total pressure on horizontal, vertical and inclined plane surface, total pressure on curved surfaces, water pressure on gravity dams, Lock gates. Numerical Problems.

Fundamentals of fluid flow (Kinematics): Introduction. Methods of describing fluid motion. Velocity and Total acceleration of a fluid particle. Types of fluid flow, Description of flow pattern. Basic principles of fluid flow, three- dimensional continuity equation in Cartesian coordinate system. Derivation for Rotational and irrational motion. Potential function, stream function, orthogonality of streamlines and equipotential lines. Numerical problems on Stream function and velocity potential. Introduction to flow net.

Module-3

Fluid Dynamics: Introduction. Forces acting on fluid in motion. Euler's equation of motion along a streamline and Bernoulli's equation. Assumptions and limitations of Bernoulli's equation. Modified Bernoulli's equation. Problems on applications of Bernoulli's equation (with and without losses).
Momentum equation problems on pipe bends.

Applications: Introduction. Venturi meter, Orifice meter, Pitot tube. Numerical Problems.

Module-4

Orifice and Mouth piece: Introduction, classification, flow through orifice, hydraulic coefficients and Numerical problems. Mouthpiece, classification, Borda's Mouthpiece (No problems).

Notches and Weirs: Introduction. Classification, discharge over rectangular, triangular, trapezoidal notches, Cippoletti notch, broad crested weirs. Numerical problems. Ventilation of weirs, submerged weirs.

Module-5

Flow through Pipes: Introduction. Major and minor losses in pipe flow. Darcy- Weis bach equation for head loss due to friction in a pipe. Pipes in series, pipes in parallel, equivalent pipe-problems. Minor losses in pipe flow, equation for head loss due to sudden expansion. Numerical problems. Hydraulic gradient line, energy gradient line. Numerical problems, .Pipe Networks, Hardy Cross method (No problems on pipe networks),

Surge Analysis in Pipes: Water hammer in pipes, equations for pressure rise due to gradual valve closure and sudden closure for rigid and elastic pipes. Problems.

Course outcomes: After successful completion of the course, the student will be able to:

1. Possess a sound knowledge of fundamental properties of fluids and fluid Continuum
2. Compute and solve problems on hydrostatics, including practical applications
3. Apply principles of mathematics to represent kinematic concepts related to fluid flow
4. Apply fundamental laws of fluid mechanics and the Bernoulli's principle for practical applications
5. Compute the discharge through pipes and over notches and weirs

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks:

1. P N Modi and S M Seth, "Hydraulics and Fluid Mechanics, including Hydraulic Machines", 20th edition, 2015, Standard Book House, New Delhi
2. R.K. Bansal, "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi
3. S K SOM and G Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill, New Delhi

Reference Books:

1. Victor L Streeter, Benjamin Wylie E and Keith W Bedford, "Fluid Mechanics", Tata McGraw Hill Publishing Co Ltd., New Delhi, 2008(Ed).
2. K Subramanya, "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Publishing Co. Ltd.
3. K Subramanya, "Fluid Mechanics and Hydraulic Machines-problems and solutions", Tata McGraw Hill Publishing Co. Ltd.
4. J. F. Douglas, J. M. Gasoriek, John Swaffield, Lynne Jack, "Fluid Mechanics", Pearson, Fifth Edition.
5. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press.

B. E. CIVIL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

BUILDING MATERIALS AND CONSTRUCTION

Course Code	**18CV34**	CIE Marks	40
Teaching Hours/Week(L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives: This course will develop a student;

1. To recognize good construction materials based on properties.
2. To investigate soil properties and design suitable foundation.
3. To understand the types and properties of masonry materials and supervise masonry construction.
4. To gain knowledge of structural components like lintels, arches, staircase and roofs.
5. To understand the finishes in construction like flooring, plastering, paining.

Module-1

Building Materials: Stone as building material; Requirement of good building stones, Dressing of stones, Deterioration and Preservation of stone work. Bricks; Classification, Manufacturing of clay bricks, Requirement of good bricks. Field and laboratory tests on bricks; compressive strength, water absorption, efflorescence, dimension and warpage.

Cement Concrete blocks, Autoclaved Aerated Concrete Blocks, Sizes, requirement of good blocks.

Timber as construction material.

Fine aggregate: Natural and manufactured: Sieve analysis, zoning, specify gravity, bulking, moisture content, deleterious materials.

Coarse aggregate: Natural and manufactured: Importance of size, shape and texture. Grading of aggregates, Sieve analysis, specific gravity, Flakiness and elongation index, crushing, impact and abrasion tests.

Module-2

Foundation: Preliminary investigation of soil, safe bearing capacity of soil, Function and requirements of good foundation , types of foundation , introduction to spread, combined , strap, mat and pile foundation

Masonry: Definition and terms used in masonry. Brick masonry, characteristics and requirements of good brick masonry, Bonds in brick work, Header, Stretcher, English, Flemish bond, Stone masonry, Requirements of good stone masonry, Classification, characteristics of different stone masonry, Joints in stone masonry. Types of walls; load bearing, partition walls, cavity walls.

Module-3

Lintels and Arches: Definition, function and classification of lintels, Balconies, chejja and canopy. Arches; Elements and Stability of an Arch.

Floors and roofs: Floors; Requirement of good floor, Components of ground floor, Selection of flooring material Procedure for laying of Concrete (VDF), Mosaic, Kota, Slate, Marble, Granite, Tile flooring, Cladding of tiles.

Roof: Requirement of good roof, Types of roof, Elements of a pitched roof, Trussed roof, King post Truss, Queen Post Truss, Steel Truss, Different roofing materials, R.C.C. Roof.

Module-4

Doors, Windows and Ventilators: Location of doors and windows, technical terms, Materials for doors and windows: PVC, CPVC and Aluminum. Types of Doors and Windows: Paneled, Flush, Collapsible, Rolling shutter, Paneled and glazed Window, Bay Window, French window. Steel windows, Ventilators. Sizes as per IS recommendations.

Stairs: Definitions, technical terms and types of stairs: Wood, RCC, Metal. Requirements of good stairs. Geometrical design of RCC doglegged and open-well stairs.

Formwork: Introduction to form work, scaffolding, shoring, under pinning.

Module-5

Plastering and Pointing: Mortar and its types. Purpose, materials and methods of plastering and pointing: Sand faced plastering, Stucco plastering, lathe plastering, defects in plastering . Water proofing with various thicknesses.

Damp proofing- causes, effects and methods.

Paints- Purpose, types, technical terms, ingredients and defects, Preparation and applications of paints to new and old plastered surfaces, wooden and steel surfaces.

Course outcomes: After a successful completion of the course, the student will be able to:

1. Select suitable materials for buildings and adopt suitable construction techniques.
2. Decide suitable type of foundation based on soil parameters
3. Supervise the construction of different building elements based on suitability
4. Exhibit the knowledge of building finishes and form work requirements

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.

Textbooks:

1. Sushil Kumar “Building Materials and construction”, 20th edition, reprint 2015,StandardPublishers
2. Dr. B. C. Punmia, Ashok kumar Jain, Arun Kumar Jain, “Building Construction, Laxmi Publications (P) ltd., New Delhi.
3. Rangawala S. C. “Engineering Materials”, Charter Publishing House, Anand, India.

Reference Books:

1. S. K. Duggal, “Building Materials”, (Fourth Edition)New Age International (P) Limited, 2016 National Building Code(NBC) of India
2. P C Vergese, “Building Materials”, PHI Learning Pvt.Ltd
3. Building Materials and Components, CBRI, 1990,India
4. Jagadish. K.S, “Alternative Building Materials Technology”, New Age International,2007.
5. M. S. Shetty, “Concrete Technology”, S. Chand & Co. New Delhi.

B. E. CIVIL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – III

BASIC SURVEYING

Course Code	**18CV35**	CIE Marks	40
Teaching Hours/Week(L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives: This course will enable students to;

1. Understand the basic principles of Surveying
2. Learn Linear and Angular measurements to arrive at solutions to basic surveying problems.
3. Employ conventional surveying data capturing techniques and process the data for computations.
4. Analyze the obtained spatial data to compute areas and volumes and draw contours to represent 3D data on plane figures.

Module-1

Introduction: Definition of surveying, Objectives and importance of surveying. Classification of surveys. Principles of surveying. Units of measurements, Surveying measurements and errors, types of errors, precision and accuracy. Classification of maps, map scale, conventional symbols, topographic maps, map layout, Survey of India Map numbering systems.

Measurement of Horizontal Distances: Measuring tape and types. Measurement using tapes, Taping on level ground and sloping ground. Errors and corrections in tape measurements, ranging of lines, direct and indirect methods of ranging, Electronic distance measurement, basic principle. Booking of tape survey work, Field book, entries, Conventional symbols, Obstacles in tape survey, Numerical problems.

Module-2

Measurement of Directions and Angles: Compass survey: Basic definitions; meridians, bearings, magnetic and True bearings. Prismatic and surveyor's compasses, temporary adjustments, declination. Quadrantal bearings, whole circle bearings, local attraction and related problems

Traversing: Traverse Survey and Computations: Latitudes and departures, rectangular coordinates, Traverse adjustments, Bowditch rule and transit rule, Numerical Problems.

Module-3

Leveling: Basic terms and definitions, Methods of leveling, Dumpy level, auto level, digital and laser levels. Curvature and refraction corrections. Booking and reduction of levels. Differential leveling, profile leveling, fly leveling, check leveling, reciprocal leveling.

Module-4

Plane Table Surveying: Plane table and accessories, Advantages and limitations of plane table survey, Orientation and methods of orientation, Methods of plotting – Radiation, Intersection, Traversing, Resection method, Two point and three point problems, Solution to two point problem by graphical method, Solution to three point problem Bessel's graphical method, Errors in plane table survey.

Module-5

Areas and Volumes: Measurement of area by dividing the area into geometrical figures, area from offsets, mid ordinate rule, trapezoidal and Simpson's one third rule, area from co-ordinates, introduction to planimeter, digital planimeter. Measurement of volumes- trapezoidal and prismoidal formula.

Contouring: Contours, Methods of contouring, Interpolation of contours, contour gradient, characteristics of contours and uses.

Course outcomes: After a successful completion of the course, the student will be able to:

1. Posses a sound knowledge of fundamental principles Geodetics
2. Measurement of vertical and horizontal plane, linear and angular dimensions to arrive at solutions to basic surveying problems.
3. Capture geodetic data to process and perform analysis for survey problems]
4. Analyse the obtained spatial data and compute areas and volumes. Represent 3D data on plane figures as contours

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks:

1. B.C. Punmia, "Surveying Vol.1", Laxmi Publications pvt. Ltd., New Delhi –2009.
2. Kanetkar T P and S V Kulkarni , Surveying and Leveling Part I, Pune VidyarthiGrihaPrakashan,1988

Reference Books:

1. S.K. Duggal, "Surveying Vol.1", Tata McGraw Hill Publishing Co. Ltd. New Delhi.2009.
2. K.R. Arora, "Surveying Vol. 1" Standard Book House, New Delhi. –2010
3. R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, NewDelhi
4. A. Bannister, S. Raymond , R. Baker, "Surveying", Pearson, 7th ed., NewDelhi

B. E. CIVIL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

ENGINEERING GEOLOGY

Course Code	**18CV36**	CIE Marks	40
Teaching Hours/Week(L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives: This course will enable students;

1. To inculcate the importance of earth's interior and application of Geology in civil engineering. Attempts are made to highlight the industrial applications of minerals.
2. To create awareness among Civil engineers regarding the use of rocks as building materials.
3. To provide knowledge on dynamic Geology and its importance in modifying the physical character of rocks which cause rocks suitable or unsuitable in different civil engineering projects such as Dams, bridges, tunnels and highways.
4. To educate the ground water management regarding diversified geological formations, climatologically dissimilarity which are prevailed in the country. To highlight the concept of rain water harvesting.
5. To understand the application of Remote Sensing and GIS, Natural disaster and management and environmental awareness.

Module-1

Introduction: Application of Geology in Civil Engineering Practices, Understanding the earth, internal structure and composition.

Mineralogy: Mineral properties, composition and their use in the manufacture of construction materials – Quartz Group (Glass); Feldspar Group (Ceramic wares and Flooring tiles); Kaolin (Paper, paint and textile); Asbestos (AC sheets); Carbonate Group (Cement) ; Gypsum (POP, gypsum sheets, cement); Mica Group (Electrical industries); Ore minerals - Iron ores (Steel); Chro mite (Alloy); Bauxite (aluminum); Chalcopyrite (copper).

Module-2

Petrology & Geomorphology: Formation, Classification and Engineering Properties of: **Igneous rocks**-Types of Granite, Dolerite, Basalt, Pumice, Granite Porphyry. **Sedimentary Rocks**- Sandstone, Limestone, Shale, Late rite, Conglomerate. **Metamorphic Rocks**- Gneiss, Slate, Muscovite & Biotite schist, Marble, Quartzite. Rock weathering: types and their effects on Civil Engineering Projects. Landforms, Drainage pattern and types. Soil formation and soil profile. The apprehension of Index properties of rocks: Porosity, Density, Permeability, and Durability. Selection of rocks as materials for construction, as a foundation, Decorative, Flooring, and Roofing, Concrete Aggregate, Road Metal, Railway Ballast with examples.

Module-3

Structural Geology & Rock Mechanics: Structural aspects of rocks like Outcrop, Dip and strike, Folds, Faults, Joints, Unconformities and their influence on Engineering Projects/structures like dam, tunnels, slope treatment; ground improvement, recognition of the structures in field and their types/classification. Rock Quality Determination (RQD) & Rock Structure Rating (RSR). Geological site characterization: Dam foundations and rock Foundation treatment for dams and Reservoirs heavy structures by grouting and rock reinforcement. Tunnels: Basic terminology and application, site investigations, Coastlines and their engineering considerations.

Module-4

Hydrogeology: Hydrological cycle, Vertical distribution of groundwater, artesian groundwater in soil and rock. Water Bearing Formations, Aquifer and its types – Aquitard, Aquifuge, and Aquiclude. Porosity, Specific yield and retention, Permeability, Transmissibility and Storage Coefficient. Determination of Quality - SAR, RSC and TH of Groundwater. Groundwater Exploration- Electrical Resistivity and Seismic methods, Artificial Recharge of Groundwater, Rain water harvesting and methods, Seawater intrusion in coastal areas and remedies. Groundwater Pollution. Floods and its control, Cyclone and its effects.

Module-5

Seismology and Geodesy: Earthquake - Causes and Effects, Seismic waves, engineering problems related to Earthquakes, Earthquake intensity, Richter scale, Seismograph, Seismic zones- World and India. Tsunami causes and effects, Volcanic Eruptions. Landslides (Mass movements) causes, types and remedial measures –stability assessment for soil and rock slopes. Study of Topographic maps and Contour maps; Remote Sensing – Concept, Application and its Limitations; Geographic Information System (GIS) and Global Positioning System (GPS) –

Concept and their use resource mapping. Aerial Photography, LANDSAT Imagery – Definition and its use. Impact of Mining, Quarrying and Reservoirs on Environment. Natural Disasters and their mitigation

Course outcomes: After a successful completion of the course, the student will be able to:

1. Apply geological knowledge in different civil engineering practice.
2. Students will acquire knowledge on durability and competence of foundation rocks, and confidence enough to use the best building materials.
3. Civil Engineers are competent enough for the safety, stability, economy and life of the structures that they construct.
4. Able to solve various issues related to ground water exploration, build up dams, bridges, tunnels which are often confronted with ground water problems.
5. Intelligent enough to apply GIS, GPS and remote sensing as a latest tool in different civil engineering construction.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks:

1. P.K. Mukerjee, “A Text Book of Geology”, World Press Pvt., Ltd.Kolkatta.
2. Parbin Singh, “Text Book of Engineering and General Geology”, Published by S.K.Kataria and Sons, New Dehli.

Reference Books:

1. Earthquake Tips - Learning Earthquake Design and Construction - C V R Murthy Published by National Information Centre of Earthquake Engineering, Indian Institute of Technology, Kanpur. Dimitri P Krynine and William R Judd, “Principles of Engineering Geology and Geotechnics”, CBS Publishers and Distributors, New Delhi.
2. K V G K Gokhale, “Principles of Engineering Geology”, B S Publications, Hyderabad.
3. M Anji Reddy, “Text book of Remote Sensing and Geographical Information System”, BS Publications, Hyderabad.
5. M Anji Reddy, “Text book of Remote Sensing and Geographical Information System”, BS Publications, Hyderabad.
6. Ground water Assessment, development and Management by K.R. Karanth, Tata Mc Graw Hills
7. K. Todd, “Groundwater Hydrology”, Tata Mac Grow Hill, NewDelhi.
8. D. Venkata Reddy, “Engineering Geology”, New Age International Publications, NewDelhi.
9. S.K Duggal, H.K Pandey and N Rawal, “Engineering Geology”, McGrawHill Education (India) Pvt, Ltd. Ne Delhi.
10. M.P Billings, “Structural Geology”, CBS Publishers and Distributors, New Delhi.
11. K. S. Valdiya, “Environmental Geology”,, Tata Mc Grew Hills.
12. M. B. Ramachandra Rao, “Outlines of Geophysical Prospecting- A Manual for Geologists”, Prasaranga, University of Mysore, Mysore

B. E. CIVIL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

COMPUTER AIDED BUILDING PLANNING AND DRAWING

Course Code	**18CVL37**	CIE Marks	40
Teaching Hours/Week(L:T:P)	(0:2:2)	SEE Marks	60
Total Number of Lecture/Practice Hours	02	Exam Hours	03

Course Learning Objectives: Provide students with a basic understanding

1. Achieve skill sets to prepare computer aided engineering drawings
2. Understand the details of construction of different building elements.
3. Visualize the completed form of the building and the intricacies of construction based on the engineering drawings.

Module:1

Drawing Basics: Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS: 962.

Simple engineering drawings with CAD drawing tools : Lines, Circle, Arc, Poly line, Multiline, Polygon, Rectangle, Spline, Ellipse, Modify tools: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet, Using Text: Single line text, Multiline text, Spelling, Edit text, Special Features: View tools, Layers concept, Dimension tools, Hatching, Customizing toolbars, Working with multiple drawings.

Module:2

Drawings Related to Different Building Elements:

Following drawings are to be prepared for the data given using CAD Software

a) Cross section of Foundation, masonry wall, RCC columns with isolated & combined footings.
b) Different types of bonds in brick masonry.
c) Different types of staircases – Dog legged, Open well.
d) Lintel and chajja.
e) RCC slabs and beams.
f) Cross section of a pavement.
g) Septic Tank and sedimentation Tank.
h) Layout plan of Rainwater recharging and harvesting system.
i) Cross sectional details of a road for a Residential area with provision for all services.
j) Steel truss (connections Bolted).

Note: Students should sketch to dimension the above in a sketch book before doing the computer drawing.

Module -3:

Building Drawings: Principles of planning, Planning regulations and building bye-laws, factors affecting site selection, Functional planning of residential and public buildings, design aspects for different public buildings. Recommendations of NBC.

Drawing of Plan, elevation and sectional elevation including electrical, plumbing and sanitary services using CAD software for:

1. Single and double story residential building.
2. Hostel building.
3. Hospital building.
4. School building.

Submission drawing (sanction drawing) of two storied residential building with access to terrace including all details and statements as per the local bye-laws

Note:

- Students should sketch to dimension the above in a sketch book before doing the computer drawing
- One compulsory field visit/exercise to be carried out.
- Single line diagrams to be given in the examination.

Course Outcomes: After studying this course, students will be able to

1. Prepare, read and interpret the drawings in a professional set up.
2. KnowtheproceduresofsubmissionofdrawingsandDevelopworkingandsubmissiondrawingsforbuilding.
3. Plananddesignaresidentialorpublicbuildingasperthegivenrequirements.

Question paper pattern:

- There will be four full questions with sub divisions if necessary from Module2 with each full question carrying twenty five marks. Students have to answer any two questions.
- There will be two full questions from Module 3 with each full question carrying fifty marks. Students have to answer any one question. The conduction of examination and question paper format of should be in lines of 1st year CAED drawing. It's a drawing paper but the exam will be conducted by batches in the computer labs. Question papers should be given in batches.

Textbook:

1. MG Shah, CM Kale, SY Patki, "Building drawing with an integrated approach to Built Environment Drawing" , Tata McGraw Hill Publishing co. Ltd., New Delhi
2. Gurucharan Singh, "Building Construction", Standard Publishers, & distributors, New Delhi.
3. Malik R S and Meo G S, "Civil Engineering Drawing", Asian Publishers/Computech Publications Pvt Ltd.

Reference Books:

1. Time Saver Standard by Dodge F. W., F. W. Dodge Corp.
2. IS: 962-1989 (Code of practice for architectural and building drawing).
3. National Building Code, BIS, New Delhi.

B. E. CIVIL ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III

BUILDING MATERIALS TESTING LABORATORY

Course Code	**18CVL38**	**CIE Marks**	**40**
Teaching Hours/Week(L:T:P)	**(0:2:2)**	**SEE Marks**	**60**
Credits	**02**	**Exam Hours**	**03**

Course Learning Objectives: The objectives of this course is to make students to learn:

1. Ability to apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials.
2. Ability to function on multi-disciplinary teams in the area of materials testing.
3. Ability to use the techniques, skills and modern engineering tools necessary for engineering.
4. Understanding of professional and ethical responsibility in the areas of material testing.
5. Ability to communicate effectively the mechanical properties of materials.

Experiments:

1. Tension test on mild steel and HYSD bars.
2. Compression test on mild steel, cast iron and wood.
3. Torsion test on mild steel circular sections.
4. Bending Test on Wood Under two point loading.
5. Shear Test on Mild steel- single and double shear.
6. Impact test on Mild Steel (Charpy & Izod).
7. Hardness tests on ferrous and non-ferrous metals- Brinell's, Rockwell and Vicker's.
8. Tests on Bricks, Tiles and Concrete Blocks.
9. Tests on Fine aggregates-Moisture content, Specific gravity, Bulk density, Sieve analysis and Bulking.
10. Tests on Coarse aggregates-Absorption, Moisture content, specific gravity, Bulk density and Sieve analysis.
11. Demonstration of Strain gauges and Strain indicators.

NOTE: All tests to be carried out as per relevant latest BIS Codes

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

1. Reproduce the basic knowledge of mathematics and engineering in finding the strength in tension, compression, shear and torsion.
2. Identify, formulate and solve engineering problems of structural elements subjected to flexure.
3. Evaluate the impact of engineering solutions on the society and also will be aware of contemporary issues regarding failure of structures due to unsuitable materials.

Question paper pattern:

- Group experiments - Tension test, compression test, torsion test and bending test.
- Individual Experiments – Remaining tests.
- Two questions are to be set - One from group experiments and the other as individual experiment.
- Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.
- All exercises are to be included for practical examination.

Reference Books:

1. Davis, Troxell and Hawk, “Testing of Engineering Materials”, International Student Edition – McGraw Hill Book Co. New Delhi.
2. M L Gambhir and Neha Jamwal, “Building and construction materials-Testing and quality control”, McGraw Hill education (India)Pvt. Ltd.,2014.
3. Fenner, “Mechanical Testing of Materials”, George Newnes Ltd. London.
4. Holes K A, “Experimental Strength of Materials”, English Universities Press Ltd. London.
5. Suryanarayana A K, “Testing of Metallic Materials”, Prentice Hall of India Pvt. Ltd. New Delhi.
6. Kukreja C B, Kishore K. and Ravi Chawla “Material Testing Laboratory Manual”, Standard Publishers & Distributors1996.
7. Relevant **latest IS Codes.**

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM
CHOICE BASED CREDIT SYSTEM (CBCS)
CIVIL ENGINEERING BOARD
BE-CBCS SYLLABUS 2017-18 Scheme

TITLE OF THE COURSE: DESIGN OF RC STRUCTURAL ELEMENTS
B.E., V Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17CV51**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course objectives: This course will enable students to

1. Identify, formulate and solve engineering problems of RC elements subjected to different kinds of loading.
2. Follow a procedural knowledge in designing various structural RC elements.
3. Impart the culture of following the codes for strength, serviceability and durability as an ethics.
4. Provide knowledge in analysis and design of RC elements for the success in competitive examinations.

Module-1

Introduction to Limit State Design and Serviceability: Introduction to working stress method, Difference between Working stress and Limit State Method of design, Modular Ratio and Factor of Safety.

Philosophy and principle of limit state design with assumptions. Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section.

Limiting deflection, short term deflection, long term deflection, Calculation of deflection of singly reinforced beam only. Cracking in reinforced concrete members, calculation of crack width of singly reinforced beam. Side face reinforcement, slender limits of beams for stability.

L1, L2

Module-2

Limit State Analysis of Beams:
Analysis of singly reinforced, doubly reinforced and flanged beams for flexure and shear

L2, L4

Module-3

Limit State Design of Beams: Design of singly and doubly reinforced beams, Design of flanged beams for shear, design for combined bending and torsion as per IS-456

L2, L4

Module-4

Limit State Design of Slabs and Stairs: Introduction to one way and two way slabs, Design of cantilever, simply supported and one way continuous slab. Design of two way slabs for different boundary conditions. Design of dog legged and open well staircases. Importance of bond, anchorage length and lap length.

L2, L4

Module-5

Limit State Deign of Columns and Footings: Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments, Design

concepts of the footings. Design of Rectangular and square column footings with axial load and also for axial load & moment

L2, L4

Course outcomes: After studying this course, students will be able to:

1. understand the design philosophy and principles
2. solve engineering problems of RC elements subjected to flexure, shear and torsion
3. demonstrate the procedural knowledge in designs of RC structural elements such as slabs, columns and footings
4. owns professional and ethical responsibility

- The designs are as per IS-456 and SP (16) relevant charts to be provided in the question paper

Text Books:

1. Unnikrishnan Pillai and Devdas Menon, " **Reinforced Concrete Design"** , McGraw Hill, New Delhi
2. Subramanian, " **Design of Concrete Structures"** , Oxford university Press
3. H J Shah, **"Reinforced Concrete Vol. 1 (Elementary Reinforced Concrete)"** , Charotar Publishing House Pvt. Ltd.

Reference Books:

1. P C Varghese, "Limit State design of reinforced concrete" , PHI, New Delhi
2. W H Mosley, R Husle, J H Bungey, "Reinforced Concrete Design", MacMillan Education, Palgrave publisher s
3. Kong and Evans, "Reinforced and Pre-Stressed Concrete", Springer Publications
4. A W Beeby and Narayan R S, "Introduction to Design for Civil Engineers", CRC Press
5. Robert Park and Thomas Paulay, "Reinforced Concrete Structures", John Wiley & Sons, Inc.

TITLE OF THE COURSE: ANALYSIS OF INDETERMINATE STRUCTURES
B.E., V Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17CV52**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course Objectives: This course will enable students to

1. Apply knowledge of mathematics and engineering in calculating slope, deflection, bending moment and shear force using slope deflection, moment distribution method and Kani's method.
2. Identify, formulate and solve problems in structural analysis.
3. Analyze structural system and interpret data.
4. use the techniques, such as stiffness and flexibility methods to solve engineering problems
5. communicate effectively in design of structural elements

Module-1

Slope Deflection Method: Introduction, sign convention, development of slope deflection equation, analysis of continuous beams including settlements, Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy≤3

L2, L4,L5

Module-2

Moment Distribution Method: Introduction, Definition of terms, Development of method, Analysis of continuous beams with support yielding, Analysis of 08 Hours orthogonal rigid plane frames including sway frames with kinematic indeterminacy ≤3

L2, L4,L5

Module-3

Kani's Method: Introduction, Concept, Relationships between bending moment and deformations, Analysis of continuous beams with and without settlements, Analysis of frames with and without sway

L2, L4,L5

Module-4

Matrix Method of Analysis (Flexibility Method) : Introduction, Axes and coordinates, Flexibility matrix, Analysis of continuous beams and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach with static indeterminacy ≤3

L2, L4,L5

Module-5

Matrix Method of Analysis (Stiffness Method): Introduction, Stiffness matrix, Analysis of continuous beams and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach with kinematic indeterminacy ≤3

L2, L4,L5

Course outcomes: After studying this course, students will be able to:

1. Determine the moment in indeterminate beams and frames having variable moment of inertia and subsidence using slope defection method
2. Determine the moment in indeterminate beams and frames of no sway and sway using moment distribution method.
3. Construct the bending moment diagram for beams and frames by Kani's method.
4. Construct the bending moment diagram for beams and frames using flexibility

method
5. Analyze the beams and indeterminate frames by system stiffness method.

Text Books:

1. Hibbeler R C, **" Structural Analysis",** Pearson Publication
2. L S Negi and R S Jangid, **"Structural Analysis",** Tata *McGraw-Hill* Publishing Company Ltd.
3. D S Prakash Rao, **"Structural Analysis: A Unified Approach"** , Universities Press
4. K.U. Muthu, H.Narendra etal, **"Indeterminate Structural Analysis",** IK International Publishing Pvt. Ltd.

Reference Books:

1. Reddy C S, **"Basic Structural Analysis",** *Tata McGraw-Hill* Publishing Company Ltd.
2. Gupta S P, G S Pundit and R Gupta, **"Theory of Structures"**, Vol II, Tata McGraw Hill Publications company Ltd.
3. V N Vazirani and M M Ratwani, **"Analysis Of Structures** ", Vol. 2, Khanna Publishers
4. Wang C K, **"Intermediate Structural Analysis",** McGraw Hill, International Students Edition.
5. S.Rajasekaran and G. Sankarasubramanian, **"Computational Structural Mechanics",** PHI Learning Pvt. Ltd.,

TITLE OF THE COURSE: APPLIED GEOTECHNICAL ENGINEERING
B.E., V Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17CV53**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

Credits – 04

Course objectives: This course will enable students to

1. Appreciate basic concepts of soil mechanics as an integral part in the knowledge of Civil Engineering. Also to become familiar with foundation engineering terminology and understand how the principles of Geotechnology are applied in the design of foundations
2. Learn introductory concepts of Geotechnical investigations required for civil engineering projects emphasizing in situ investigations
3. Conceptually learn various theories related to bearing capacity of soil and their application in the design of shallow foundations and estimation of load carrying capacity of pile foundation
4. Estimate internal stresses in the soil mass and application of this knowledge in proportioning of shallow and deep foundation fulfilling settlement criteria
5. Study about assessing stability of slopes and earth pressure on rigid retaining structures

Module-1

Soil Exploration: Introduction, Objectives and Importance, Stages and Methods of exploration- Test pits, Borings, Geophysical methods, stabilization of boreholes, Sampling techniques, Undisturbed, disturbed and representative samples, Geophysical exploration and Bore hole log. Drainage and Dewatering methods, estimation of depth of GWT (Hvorslev's method).

L1,L2,L3

Module-2

Stress in Soils: Introduction, Boussinesq's and Westergaard's theory concentrated load, circular and rectangular load, equivalent point load method, pressure distribution diagrams and contact pressure, Newmark's chart Foundation Settlement - Approximate method for stress distribution on a horizontal plane, Types of settlements and importance, Computation of immediate and consolidation settlement

L2,L3,L4

Module-3

Lateral Earth Pressure: Active, Passive and earth pressure at rest, Rankine's theory for cohesionless and cohesive soils, Coulomb's theory, Rebhann's and Culmann's graphical construction.

Stability of Slopes : Assumptions, infinite and finite slopes, factor of safety, use of Taylor's stability charts, Swedish slip circle method for C and C-ø (Method of slices) soils, Fellineous method for critical slip circle

L2,L4,L5

Module-4

Bearing Capacity of Shallow Foundation: Types of foundations, **10 Hours** determination of bearing capacity by Terzaghi's and BIS method (IS: 6403), Effect of water table and eccentricity, field methods - plate load test and SPT Proportioning of shallow foundations- isolated and combined footings (only two columns)

L2,L4,L5,L6

Module-5

Pile Foundations: Types and classification of piles, single loaded pile capacity in

cohesionless and cohesive soils by static formula, efficiency of file group, group capacity of piles in cohesionless and cohesive soils, negative skin friction, pile load tests, Settlement of piles, under reamed piles (only introductory concepts – no derivation)

L1, L2, L3 L4

Course outcomes: On the completion of this course students are expected to attain the following outcomes;

1. Ability to plan and execute geotechnical site investigation program for different civil engineering projects
2. Understanding of stress distribution and resulting settlement beneath the loaded footings on sand and clayey soils
3. Ability to estimate factor of safety against failure of slopes and to compute lateral pressure distribution behind earth retaining structures
4. Ability to determine bearing capacity of soil and achieve proficiency in proportioning shallow isolated and combined footings for uniform bearing pressure
5. Capable of estimating load carrying capacity of single and group of piles

Text Books:

1. Gopal Ranjan and Rao A.S.R., Basic and Applied Soil Mechanics, New Age International (P) Ltd., New Delhi.
2. Punmia B C, Soil Mechanics and Foundation Engineering, Laxmi Publications co., New Delhi.
3. Murthy V.N.S., Principles of Soil Mechanics and Foundation Engineering, UBS Publishers and Distributors, New Delhi.
4. Braja, M. Das, Geotechnical Engineering; Thomson Business Information India (P) Ltd., India

Reference Books:

1. T.W. Lambe and R.V. Whitman, Soil Mechanics-, John Wiley & Sons
2. Donald P Coduto, Geotechnical Engineering- Phi Learning Private Limited, New Delhi
3. Shashi K. Gulathi & Manoj Datta, Geotechnical Engineering-. , Tata McGraw Hill Publications
4. Debashis Moitra, “Geotechnical Engineering”, Universities Press.,
5. Malcolm D Bolton, “A Guide to soil mechanics”, Universities Press.,
6. Bowles J E , Foundation analysis and design, McGraw- Hill Publications

TITLE OF THE COURSE: COMPUTER AIDED BUILDING PLANNING AND DRAWING

B.E., V Semester, Civil Engineering

[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17CV54**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50**	**Exam Hours**	**03**

Credits – 04

Course Objectives: Provide students with a basic understanding

1. Achieve skill sets to prepare computer aided engineering drawings
2. Understand the details of construction of different building elements.
3. Visualize the completed form of the building and the intricacies of construction based on the engineering drawings.

Module-1

Drawing Basics: Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS: 962
Simple engineering drawings with CAD drawing tools : Lines, Circle,Arc, Polyline, Multiline, Polygon, Rectangle, Spline, Ellipse, Modify tools: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet, Using Text: Single line text, Multiline text, Spelling, Edit text, Special Features: View tools, Layers concept, Dimension tools, Hatching, Customising toolbars, Working with multiple drawings

12 Hours L1,L2

Module-2

Drawings Related to Different Building Elements:
Following drawings are to be prepared for the data given using CAD Software

a. Cross section of Foundation, masonry wall, RCC columns with isolated & combined footings.
b. Different types of bonds in brick masonry
c. Different types of staircases – Dog legged, Open well
d. Lintel and chajja
e. RCC slabs and beams
f. Cross section of a pavement
g. Septic Tank and sedimentation Tank
h. Layout plan of Rainwater recharging and harvesting system
i. Cross sectional details of a road for a Residential area with provision for all services
j. Steel truss (connections Bolted)

Note: Students should sketch to dimension the above in a sketch book before doing the computer drawing

12 Hours L2,L3,L4,L5,L6

Module-3

Building Drawings: Principles of planning, Planning regulations and building bye-laws, factors affecting site selection, Functional planning of residential and public buildings, design aspects for different public buildings. Recommendations of NBC.

Drawing of Plan, elevation and sectional elevation including electrical, plumbing and sanitary services *using CAD software* for:

1. Single and Double story residential building
2. Hostel building
3. Hospital building
4. School building
5. Submission drawing (sanction drawing) of two storied residential building with access to terrace including all details and statements as per the local bye-laws

Note:

- *Students should sketch to dimension the above in a sketch book before doing the computer drawing*
- *One compulsory field visit/exercise to be carried out.*
- *Single line diagrams to be given in the examination*

26 Hours L2,L3, L4, L5, L6

Course outcomes: After studying this course, students will be able to

1. Gain a broad understanding of planning and designing of buildings
2. Prepare, read and interpret the drawings in a professional set up.
3. Know the procedures of submission of drawings and Develop working and submission drawings for building
4. Plan and design a residential or public building as per the given requirements

Question paper pattern:

- There will be two full questions with sub divisions if necessary from Module 2 with each full question carrying ***thirty*** marks. Students have to answer one question.
- There will be two full questions from Module 3 with each full question carrying ***fifty*** marks. Students have to answer one question.
- The conduction of examination and question paper format of should be in lines of 1st year CAED drawing. It's a drawing paper but the exam will be conducted by batches in the computer labs. question papers should be given in batches

Text Books:

1. MG Shah, CM Kale, SY Patki, **"Building drawing with an integrated approach to Built Environment Drawing"** , Tata Mc Graw Hill Publishing co. Ltd., New Delhi
2. Gurucharan Singh, **"Building Construction",** Standard Publishers, & distributors, New Delhi.
3. Malik R S and Meo G S, **"Civil Engineering Drawing"** , Asian Publishers/Computech Publications Pvt Ltd.

Reference Books:

1. Time Saver Standard by Dodge F. W., F. W. Dodge Corp.,
2. IS: 962-1989 (Code of practice for architectural and building drawing)
3. **National Building Code**, BIS, New Delhi.

TITLE OF THE COURSE: AIR POLLUTION AND CONTROL
B.E., V Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17CV551**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours per Module)**	**Exam Hours**	**03**

Credits – 03

Course Objectives: This course will enable students to

1. Study the sources and effects of air pollution
2. Learn the meteorological factors influencing air pollution.
3. Analyze air pollutant dispersion models
4. Illustrate particular and gaseous pollution control methods.

Module-1

Introduction: Definition, Sources, classification and characterization of air pollutants. Effects of air pollution on health, vegetation & materials. Types of inversion, photochemical smog.

L1,L2

Module-2

Meteorology: Temperature lapse rate & stability, wind velocity & turbulence, plume behavior, measurement of meteorological variables, wind rose diagrams, Plume Rise, estimation of effective stack height and mixing depths. Development of air quality models-Gaussian dispersion model

L1,L2,L3

Module-3

Sampling: Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants (PM2.5, PM10, SOX, NOX, CO, NH3)

L2,L3,L4

Module-4

Control Techniques: Particulate matter and gaseous pollutants- settling chambers, cyclone separators, scrubbers, filters & ESP.

L3,L4

Module-5

Air pollution due to automobiles, standards and control methods. Noise pollution causes, effects and control, noise standards. Environmental issues, global episodes, laws, acts, protocols

L3,L4,L5,L6

Course outcomes: After studying this course, students will be able to:

1. Identify the major sources of air pollution and understand their effects on health and environment.
2. Evaluate the dispersion of air pollutants in the atmosphere and to develop air quality models.
3. Ascertain and evaluate sampling techniques for atmospheric and stack pollutants.
4. Choose and design control techniques for particulate and gaseous emissions.

Text Books:

1. M. N. Rao and H V N Rao, “Air pollution”, Tata Mc-G raw Hill Publication.
2. H. C. Perkins, “Air pollution”. Tata McGraw Hill Publication
3. Mackenzie Davis and David Cornwell, “Introduction t o Environmental Engineering” McGraw-Hill Co.

Reference Books:

1. Noel De Nevers, “Air Pollution Control Engineering” , Waveland Pr Inc.
2. Anjaneyulu Y, “Text book of Air Pollution and Contr ol Technologies”, Allied Publishers

TITLE OF THE COURSE: RAILWAYS, HARBOUR, TUNNELING AND AIRPORTS
B.E., V Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17 CV552**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours per Module)**	**Exam Hours**	**03**

Credits – 03

Course Objectives: This course will enable students to

1. Understand the history and development, role of railways, railway planning and development based on essential criteria's.
2. Learn different types of structural components, engineering properties of the materials, to calculate the material quantities required for construction
3. Understand various aspects of geometric elements, points and crossings, significance of maintenance of tracks.
4. Design and plan airport layout, design facilities required for runway, taxiway and impart knowledge about visual aids
5. Apply design features of tunnels, harbours, dock and necessary navigational aids; also expose them to various methods of tunneling and tunnel accessories.

Module-1

Railway Planning: Significance of Road, Rail, Air and Water transports – Coordination of all modes to achieve sustainability – Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, – Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods- – Soil suitability analysis – Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings.

L1,L2

Module-2

Railway Construction and Maintenance: Earthwork – Stabilization of track on poor soil, Calculation of Materials required for track laying – Construction and maintenance of tracks – Modern methods of construct ion & maintenance – Railway stations and yards and passenger amenities- Urban rail – Infrastructure for Metro, Mono and underground railways.

L1,L2,L3

Module-3

Harbour and Tunnel Engineering: Definition of Basic Terms: Planning and Design of Harbours: Requirements, Classification, Location and Design Principles – Harbour Layout and Terminal Facilities , Coastal Structures, Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works.

Tunneling: Introduction, size and shape of the tunnel, tunneling methods in soils, tunnel lining, tunnel drainage and ventilation.

L2,L3,L4

Module-4

Airport Planning: Air transport characteristics, airport classification, air port planning: objectives, components, layout characteristics, and socio-economic characteristics of the catchment area, criteria for airport site selection and ICAO stipulations, typical airport layouts, Parking and circulation area.

L3,L4

Module-5

Airport Design: Runway Design: Orientation, Wind Rose Diagram, Runway length, Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles, Elements of Taxiway Design, Airport Zones, Passenger Facilities and Services, Runway and Taxiway Markings and lighting.

L3,L4,L5,L6

Course outcomes: After studying this course, students will be able to:

1. Acquires capability of choosing alignment and also design geometric aspects of railway system, runway and taxiway.
2. Suggest and estimate the material quantity required for laying a railway track and also will be able to determine the hauling capacity of a locomotive.
3. Develop layout plan of airport, harbor, dock and will be able relate the gained knowledge to identify required type of visual and/or navigational aids for the same.
4. Apply the knowledge gained to conduct surveying, understand the tunneling activities.

Text Books:

1. Saxena Subhash C and Satyapal Arora, "A Course in Railway Engineering", Dhanpat Rai and Sons, Delhi.
2. Satish Chandra and Agarwal M.M, "Railway Engineering", 2nd Edition, Oxford University Press, New Delhi.
3. Khanna S K, Arora M G and Jain S S, "Airport Planni ng and Design", Nemchand and Brothers, Roorkee,
4. C Venkatramaiah, " Transportation Engineering", Volume II: Railways, Airports, Docks and Harbours, Bridges and Tunnels, Universities Press
5. Bindra S P, "A Course in Docks and Harbour Engineering", Dhanpat Rai and Sons, New Delhi

Reference Books:

1. Oza.H.P. and Oza.G.H., "A course in Docks & Harbour Engineering". Charotar Publishing Co.,
2. Mundrey J.S. "A course in Railway Track Engineering". Tata McGraw Hill
3. Srinivasan R. Harbour, "Dock and Tunnel Engineering ", 26th Edition 2013

TITLE OF THE COURSE: MASONRY STRUCTURES
B.E., V Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17 CV553**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours per Module)**	**Exam Hours**	**03**

Credits – 03

Course Objectives: This course will enable students to

1. Understand properties of masonry units, strength and factors affecting strength.
2. Understand design criteria of various types of wall subjected to different load system.
3. Impart the culture of following the codes for strength, serviceability and durability as an ethics.
4. Provide knowledge in analysis and design of masonry elements for the success in competitive examinations.

Module-1

Masonry Units, Materials, types and masonry construction: Bricks, Stone and Block masonry units- strength, modulus of elasticity and water absorption of masonry materials – classification and properties o f mortars. Defects and Errors in masonry construction – cracks in masonry, types, reason for cracking, methods of avoiding cracks.

Strength and Stability: Strength and stability of axially loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship. Compressive strength formulae based on elastic theory and empirical formulae.

L1,L2,L3

Module-2

Permissible stresses: Types of walls, permissible compressive stress, stress reduction and shape modification factors, increase in permissible stresses for eccentric vertical and lateral load, permissible tensile stress and shear stresses.

Design Considerations: Effective height of walls and columns, openings in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action in lintels. Problems on design considerations for solid walls, cavity walls, wall with pillars.

L1,L2,L3

Module-3

Load considerations and design of Masonry subjected to axial loads: Design criteria, design examples of walls under UDL, solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers.

L1,L2,L3

Module-4

Design of walls subjected to concentrated axial loads: Solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers, design of wall with openings.

Design of walls subjected to eccentric loads: Design criteria – stress distribution under eccentric loads – problems on eccentrically loaded solid walls, cavity walls, walls with piers.

L2,L3,L4,L5

Module-5

Design of Laterally and transversely loaded walls: Design criteria, design of solid wall under wind loading, design of shear wall – design of compound walls. Introduction to reinforced brick masonry, lintels and slabs.
In-filled frames: Types – modes of failures – design criteria of masonry retaining walls.

L2,L3,L4,L5

Course outcomes: After studying this course, students will be able to:

1. Explain engineering properties and uses of masonry units, defects and crack in masonry and its remedial measures.
2. Summarize various formulae's for finding compressive strength of masonry units.
3. Explain permissible stresses and design criteria as per IS: 1905 and SP-20.
4. Design different types of masonry walls for different load considerations.

Text Books:

1. Henry, A.W., "Structural Masonry", Macmillan Education Ltd., 1990.
2. Dayaratnam P, "Brick and Reinforced Brick Structures", Oxford & IBH, 1987.
3. M. L. Gambhir, "Building and Construction Materials", Mc Graw Hill education Pvt. Ltd.

Reference Books:

1. IS 1905–1987 "Code of practice for structural use o f un-reinforced masonry- (3rd revision) BIS, New Delhi.
2. SP 20 (S&T) – 1991, "Hand book on masonry design and construction (1^{st} revision) BIS, New Delhi.

TITLE OF THE COURSE: THEORY OF ELASTICITY
B.E., V Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17CV554**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours per Module)**	**Exam Hours**	**03**

Credits-03

Course Objectives: This course will enable students to

1. This course advances students from the one-dimensional and linear problems conventionally treated in courses of strength of materials into more general, two and three-dimensional problems.

2. The student will be introduced to rectangular and polar coordinate systems to describe stress and strain of a continuous body.

3. Introduction to the stress – strain relationship, basic principles and mathematical expressions involved in continuum mechanics. also solution of problems in 2- dimensional linear elasticity

Module-1

Concepts of continuum, Stress at a point, Components of stress, Differential equations of equilibrium, Stress transformation, Principal stresses, Maximum shear stress, Stress invariants.

Strain at a point, Infinitesimal strain, Strain-displacement relations, Components of strain, Compatibility Equations, Strain transformation, Principal strains, Strain invariants, Measurement of surface strains, strain rosettes

L1,L2,L3

Module-2

Generalized Hooke's Law, Stress-strain relationships, Equilibrium equations in terms of displacements and Compatibility equations in terms of stresses, Plane stress and plane strain problems, St. Venant's principle, Principle of superposition, Uniqueness theorem, Airy's stress function, Stress polynomials (Two Dimensional cases only).

L1,L2,L3

Module-3

Two-dimensional problems in rectangular coordinates, bending of a cantilever beam subjected to concentrated load at free end, effect of shear deformation in beams, Simply supported beam subjected to Uniformly distributed load.

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

L3, L4

Module-4

Axisymmetric stress distribution - Rotating discs, Lame's equation for thick cylinder, Effect of circular hole on stress distribution in plates subjected to tension, compression and shear, stress concentration factor.

L3,L4

Module-5

Torsion: Inverse and Semi-inverse methods, stress function, torsion of circular, elliptical, triangular sections

L3,L4

Course outcomes: After studying this course, students will be able to:

1. Ability to apply knowledge of mechanics and mathematics to model elastic bodies as continuum
2. Ability to formulate boundary value problems; and calculate stresses and strains
3. Ability to comprehend constitutive relations for elastic solids and compatibility constraints;
4. Ability to solve two-dimensional problems (plane stress and plane strain) using the concept of stress function.

Text Books:

1. S P Timoshenko and J N Goodier, "Theory of Elasticity", McGraw-Hill International Edition, 1970.
2. Sadhu Singh, "Theory of Elasticity", Khanna Publish ers, 2012
3. S Valliappan, "Continuum Mechanics - Fundamentals", Oxford & IBH Pub. Co. Ltd., 1981.
4. L S Srinath, "Advanced Mechanics of Solids", Tata - McGraw-Hill Pub., New Delhi, 2003.

Reference Books:

1. C. T. Wang, "Applied Elasticity", Mc-Graw Hill Book Company, New York, 1953

2. G. W. Housner and T. Vreeland, Jr., "The Analysis o f Stress and Deformation", California Institute of Tech., CA, 2012. [Download as per user policy from http://resolver.caltech.edu/CaltechBOOK:1965.001]

3. A. C. Ugural and Saul K. Fenster, "Advanced Strength and Applied Elasticity", Prentice Hall, 2003.

4. Abdel-Rahman Ragab and Salah EldininBayoumi, "Engineering Solid Mechanics: Fundamentals and Applications", CRC Press,1998

TITLE OF THE COURSE: TAFFIC ENGINEERING
B.E., V Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17 CV561**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours per Module)**	**Exam Hours**	**03**

Credits – 03

Course Objectives: This course will enable students to

1. Understand fundamental knowledge of traffic engineering, scope and its importance.
2. Describe basic techniques for collecting and analysing traffic data, diagnosing problems, designing appropriate remedial treatment, and assessing its effectiveness.
3. Apply probabilistic and queuing theory techniques for the analysis of traffic flow situations and emphasis the interaction of flow efficiency and traffic safety.
4. Understand and analyse traffic issues including safety, planning, design, operation and control.
5. Apply intelligent transport system and its applications in the present traffic scenario.

Module-1

Traffic Planning and Characteristics: Road Characteristics-Road user characteristics, PIEV theory, Vehicle Performance characteristics, Fundamentals of Traffic Flow, Urban Traffic problems in India, Integrated planning of town, country, regional and all urban infrastructures, Sustainable approach- land use & transport and modal integration.

L1,L2,L3

Module-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, Statistical applications in traffic studies and traffic forecasting, Level of service- Concept, applications and significance.

L1,L2,L3,L4,L5

Module-3

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

L1,L2,L3,L4

Module-4

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

L1,L2,L3

Module-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, Congestion and parking pricing, All segregation methods- Coordination among different agencies, Intelligent Transport System for traffic management, enforcement and education.

L1,L2,L3,L4

Course outcomes: After studying this course, students will be able to:

1. Understand the human factors and vehicular factors in traffic engineering design.
2. Conduct different types of traffic surveys and analysis of collected data using statistical concepts.
3. Use an appropriate traffic flow theory and to comprehend the capacity & signalized intersection analysis.
4. Understand the basic knowledge of Intelligent Transportation System.

Text Books:

1. Kadiyali.L.R. "Traffic Engineering and Transport Planning ", Khanna Publishers, Delhi, 2013
2. S K Khanna and CEG Justo and A Veeraragavan, "Highway Engineering", Nem Chand and Bros.
3. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management
4. Salter. R.I and Hounsell N.B, "Highway Traffic Analysis and design", Macmillan Press Ltd.1996.

Reference Books:

1. Fred L. Mannering, Scott S. Washburn and Walter P. Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt. Ltd., New Delhi, 2011
2. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010
3. SP:43-1994, IRC Specification, "Guidelines on Low-cost Traffic Management Techniques" for Urban Areas, 1994
4. John E Tyworth, "Traffic Management Planning, Operations and control", Addison Wesly Publishing Company, 1996
5. Hobbs.F.D. "Traffic Planning and Engineering", University of Brimingham, Peragamon Press Ltd, 2005

TITLE OF THE COURSE: SUSTAINABILITY CONCEPTS IN ENGINEERING
B.E., V Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17 CV562**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours per Module)**	**Exam Hours**	**03**

Credits – 03

Course Objectives: This course will enable students to

1. Learn about the principles, indicators and general concept of sustainability.
2. Apprehend the local, regional and global impacts of unsustainable designs, products and processes.
3. Student shall be able to apply the sustainability concepts in engineering
4. Know built environment frameworks and their use
5. Understand how building and design is judged and valued by clients and stakeholders and how to implement sustainability.

Module-1

Introduction: Sustainability - Introduction, Need and concept of sustainability, Social-environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Environmental legislations in India - Water Act, Air Act

L1,L2,L3

Module-2

Global Environmental Issue: Resource degradation, Climate change, Regional and Local Environmental Issues. Carbon credits and carbon trading, carbon foot print Carbon sequestration – Carbon capture and storage (CCS). Environmental management standards, ISO 14000 series, Life Cycle Analysis (LCA) - Scope and Goal, Bio-mimicking

L1,L2,L3

Module-3

Sustainable Design: Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification- GRIHA & IGBC Certification for buildings, Energy efficient building design- Passive solar design technique, Thermal storage, Cooling strategies, high performance insulation. Sustainable cities, Sustainable transport.

L1,L2,L3,L4

Module-4

Clean Technology and Energy: Energy sources: Basic concepts-Conventional and non-conventional, solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans, Geothermal energy. Rainwater harvesting.

L1,L2,L3

Module-5

Green Engineering: Green Engineering concepts, Sustainable Urbanization, industrialization and poverty reduction; Social and technological change, Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Industrial symbiosis

L1,L2,L3

Course outcomes: After studying this course, students will be able to:

1. Learn the sustainability concepts; understand the role and responsibility of engineers in sustainable development.
2. Quantify sustainability, and resource availability, Rationalize the sustainability based on scientific merits.
3. Understand and apply sustainability concepts in construction practices, designs, product developments and processes across various engineering disciplines.
5. Make a decision in applying green engineering concepts and become a lifelong advocate of sustainability in society.

Text Books:

1. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
2. Bradley. A.S; Adebayo,A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning

Reference Books:

1. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication
2. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System
3. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
4. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).
5. Malcolm Dowden, Climate Change and Sustainable Development: Law, Policy and Practice
6. Daniel A. Vallero and Chris Brasier, " Sustainable Design: The Science of Sustainability and Green Engineering", Wiley-Blackwell
7. Sustainable Engineering Practice: An Introduction, Committee on Sustainability, American Society of Civil Engineers

TITLE OF THE COURSE: REMOTE SENSING AND GIS
B.E., V Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17CV563**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours per Module)**	**Exam Hours**	**03**

Credits – 03

Course Objectives: This course will enable students to

1. Understand the basic concepts of remote sensing.
2. Analyze satellite imagery and extract the required units.
3. Extract the GIS data and prepare the thematic maps.
4. Use the thematic maps for various applications.

Module-1

Remote Sensing: Basic concept of Remote sensing, Data and Information, Remote sensing data collection, Remote sensing advantages & Limitations, Remote Sensing process. Electromagnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, and vegetation), Resolution, image registration and Image and False color composite, elements of visual interpretation techniques.

L1,L2,L3

Module-2

Remote Sensing Platforms and Sensors: Indian Satellites and Sensors characteristics, Remote Sensing Platforms, Sensors and Properties of Digital Data, Data Formats: Introduction, platforms- IRS, Landsat, SPOT, Cartosat, Ikonos, Envisat etc. sensors, sensor resolutions (spatial, spectral, radiometric and temporal). Basics of digital image processing- introduction to digital data, systematic errors(Scan Skew, Mirror-Scan Velocity, Panoramic Distortion, Platform Velocity , Earth Rotation) and non-systematic [random] errors(Altitude, Attitude), Image enhancements(Gray Level Thresholding, level slicing, contrast stretching),image filtering.

L2,L3,L4

Module-3

Geographic Information System: Introduction to GIS; components of a GIS; Geographically Referenced Data, Spatial Data- Attribute data-Joining Spatial and attribute data, GIS Operations: Spatial Data Input – Attribute data Management, Geographic coordinate System, Datum; Map Projections: Types of Map Projections, Projected coordinate Systems. UTM Zones.

L2,L3,L4

Module-4

Data Models: Vector data model: Representation of simple features – Topology and its importance; coverage and its data structure, Shape file; Relational Database, Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data conversion.

L3,L4,L5

Module-5

Integrated Applications of Remote sensing and GIS: Applications in land use land cover analysis, change detection, water resources, urban planning, environmental planning, Natural resource management and Traffic management. Location Based

Services And Its Applications.

L3,L4,L5,L6

Course outcomes: After studying this course, students will be able to:

1. Collect data and delineate various elements from the satellite imagery using their spectral signature.
2. Analyze different features of ground information to create raster or vector data.
3. Perform digital classification and create different thematic maps for solving specific problems
4. Make decision based on the GIS analysis on thematic maps.

Text Books:

1. Narayan Panigrahi, "Geographical Information Science", and ISBN 10: 8173716285 / ISBN 13: 9788173716287, University Press 2008.
2. Basudeb Bhatta, "Remote sensing and GIS" , ISBN:9780198072393, Oxford University Press 2011
3. Kang – Tsurg Chang, "Introduction to Geographic Information System". Tata McGraw Hill Education Private Limited 2015.

   Lillesand, Kiefer, Chipman, "Remote Sensing and Image Interpretation", Wiley 2011.

Reference Books:

1. Chor Pang Lo and Albert K.W Yeung, "Concepts & Techniques of GIS", PHI, 2006
2. John R. Jensen, "Remote sensing of the environment", An earth resources perspective – 2nd edition – by Pearson Education 2007.
3. Anji Reddy M., "Remote sensing and Geograperhical information system", B.S. Publications 2008.
4. Peter A. Burrough, Rachael A. McDonnell, and Christopher D. Lloyd, "Principals of Geo physical Information system", Oxford Publications 2004.
5. S Kumar, "Basics of remote sensing & GIS", Laxmi publications 2005.

TITLE OF THE COURSE: OCCUPATIONAL HEALTH AND SAFETY
B.E., V Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17CV564**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours per Module)**	**Exam Hours**	**03**

Credits – 03

Course Objectives: This course will enable students 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

Module-1

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, Methods of acquiring accident facts, Supervisory role in accident investigation

L1,L2,L3

Module-2

Ergonomics at Work Place: Ergonomics Task analysis, Preventing Ergonomic Hazards, Work space Envelops, Visual Ergonomics, Ergonomic Standards, Ergonomic Programs. Hazard cognition and Analysis, Human Error Analysis – Fault Tree Analysis – Emergency Response - Decision for action – purpose and considerations

L2,L3,L4,L5

Module-3

Fire Prevention and Protection: Fire Triangle, Fire Development and its severity, Effect of Enclosures, early detection of Fire, Classification of fire and Fire Extinguishers.
Electrical Safety, Product Safety: Technical Requirements of Product safety.

L2,L3,L4,L5

Module-4

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. Environment management plans (EMP) for safety and sustainability

L2,L3,L4,L5

Module-5

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. Policies, roles and responsibilities of workers, managers and supervisors

L3,L4,L5,L6

Course outcomes: After studying this course, students will be 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.
5. Identify the decisions required to maintain protection of the environment, workplace as well as personal health and safety.

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.

TITLE OF THE COURSE: GEOTECHNICAL ENGINEERING LAB

B.E., V Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17CVL57**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03=(1 Hour Instruction + 2 Hours Laboratory)**	**SEE Marks**	**60**
Total Number of Hours	**40**	**Exam Hours**	**03**

RBT LEVEL L1,L2

Credits – 02

Course Objectives: This course will enable students to;

1. To carry out laboratory tests and to identify soil as per IS codal procedures
2. To perform laboratory tests to determine index properties of soil
3. To perform tests to determine shear strength and consolidation characteristics of soils

Modules

1. Visual soil classification. Water content determination by oven drying method and infrared moisture method. Specific gravity test (pycnometer and density bottle method).
2. Grain size analysis
   i. Sieve analysis
   ii. Hydrometer analysis
3. In-situ density tests
   i. Core-cutter method
   ii. Sand replacement method
4. Consistency limits
   i. Liquid limit test (by Casagrande's and cone penetration method)
   ii. Plastic limit test
   iii. Shrinkage limit test
5. Standard compaction test (light and heavy compaction)
6. Co-efficient of permeability test
   i. Constant head test
   ii. Variable head test
7. Shear strength tests
   i. Unconfined compression test
   ii. Direct shear test
   iii. Triaxial test (undrained unconsolidated)
8. Consolidation test : Determination of compression index and co- efficient of consolidation
9. Laboratory vane shear test
10. Demonstration of Swell pressure test, Standard penetration test and boring equipment

Course outcomes: Students will be able to conduct appropriate laboratory/field experiments and interpret the results to determine

1. Physical and index properties of the soil
2. Classify based on index properties and field identification
3. To determine OMC and MDD, plan and assess field compaction program
4. Shear strength and consolidation parameters to assess strength and deformation characteristics
5. In-situ shear strength characteristics (SPT- Demonstration)

Question paper pattern:

- All experiments are to be included in the examination except demonstration exercises.
- Candidate to perform experiment assigned to him
- Marks are to be allotted as per the split up of marks shown on the cover page of answer script

Reference Books:

1. Punmia B C, Soil Mechanics and Foundation Engineering- (2017), 16th Edition, Laxmi Publications co., New Delhi.
2. Lambe T.W., "Soil Testing for Engineers", Wiley Eastern Ltd., New Delhi.
3. Head K.H., "Manual of Soil Laboratory Testing" Vol. I, II, III, Princeton Press
4. Bowles J.E., "Engineering Properties of Soil and Their Measurements",- McGraw Hill Book Co. New York.
5. Relevant BIS Codes of Practice: 2720(Part-3/Sec. 1) – 1987; IS 2720 (Part – 2)- 1973; IS 2720 (Part – 4) – 1985; IS 2720 (Part – 5) – 1985; IS 2720 (Part – 6) – 1972; IS 2720 (Part – 7) – 1980; IS 2720 (Part – 8) – 1983; IS 2720 (Part – 17) – 1986; IS 2720 (Part - 1 0) – 1973; IS 2720 (Part – 13) – 1986; IS2720 (Part 11) – 1971; IS2720 (Part 15) – 1986; IS 2720 (Part 30) – 1987; IS 2720 (Part 14) – 1977; IS 2720 (Part – 14) – 1983; IS 2720 (Part – 28) – 1974; IS 2720 (Part – 29) – 1 966, IS 2720 (Part-60) 1965.

TITLE OF THE COURSE: CONCRETE AND HIGHWAY MATERIALS LABORATORY
B.E., V Semester, Civil Engineering
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**17CVL58**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03=(1 Hour Instruction + 2 Hours Laboratory)**	**SEE Marks**	**60**
Total Number of Hours	**40**	**Exam Hours**	**03**
RBT Levels	**L1, L2, L3,**		

Credits – 02

Course objectives: This course will enable students

1. To learn the principles and procedures of testing Concrete and Highway materials and to get hands on experience by conducting the tests and evolving inferences.

Modules

Part A: Concrete Lab

1. Tests on Cement:
   a. Normal Consistency
   b. setting time
   c. compressive strength
   d. fineness by air permeability test
   e. specific gravity

2. Tests on Concrete:
   a. Design of concrete mix as per IS-10262
   b. Tests on fresh concrete:
      i. slump,
      ii. compaction factor and
      iii. Vee Bee test
   c. Tests on hardened concrete:
      i. compressive strength test,
      ii. split tensile strength test,
      iii. flexural strength test
   d. NDT tests by rebound hammer and pulse velocity test.

3. Tests on Self Compacting Concrete:
   a. Design of self compacting concrete,
   b. slump flow test,
   c. V-funnel test,
   d. J-Ring test,
   e. U Box test and
   f. L Box test

Part B: High way materials Lab

1. Tests on Aggregates
   a. Aggregate Crushing value
   b. Los Angeles abrasion test
   c. Aggregate impact test
   d. Aggregate shape tests (combined index and angularity number)

2. Tests on Bituminous Materials
   a. Penetration test
   b. Ductility test
   c. Softening point test
   d. Specific gravity test
   e. Viscosity test by tar viscometer
   f. Bituminous Mix Design by Marshall Method (Demonstration only)

3. Tests on Soil
    a. Wet sieve analysis
    b. CBR test

Course outcomes: During this course, students will develop expertise in;

1. 1. Conduct appropriate laboratory experiments and interpret the results
2. Determine the quality and suitability of cement
3. Design appropriate concrete mix
4. Determine strength and quality of concrete
5. Test the road aggregates and bitumen for their suitability as road material.
6. Test the soil for its suitability as sub grade soil for pavements.

Question paper pattern:

- All are individual experiments
- Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.
- All exercises are to be included for practical examination.

Reference Books:

1. 1. M.L.Gambir, "Concrete Manual", Danpat Rai and sons, New Delhi
2. Shetty M.S, "Concrete Technology", S. Chand & Co. Ltd, New Delhi.
3. Mehta P.K, "Properties of Concrete", Tata McGraw Hill Publications, New Delhi.
4. Neville AM, "Properties of Concrete", ELBS Publications, London.
5. Relevant BIS codes.
6. S K Khanna, C E G Justo and A Veeraragavan, "Highway Materials Testing Laboratory Manual ", Nem Chand Bros, Roorkee
7. L R Kadiyali, "Highway Engineering ", Khanna Publishers, New Delhi

Course Title: Municipal and Industrial Waste Water Engineering

As per Choice Based Credit System (CBCS) scheme]

SEMESTER:VII

Subject Code	15CV71	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS –04		**Total Marks- 100**	

Course objectives: This course will enable students to;

1. Understand sewerage network and influencing parameters.
2. Understand and design different unit operations involved in conventional and biological treatment process.
3. Apply the principles of Industrial effluent treatment process for different industrial wastes.
4. Evaluate self purification of streams depending on hydraulic and organic loading of sewage into receiving waters.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Introduction, need for sanitation, methods of sewage disposal, types of sewerage systems, dry weather flow, wet weather flow, factors effecting dry and wet weather flow on design of sewerage system, estimation of storm flow, time of concentration flow, material of sewers, shape of sewers, laying and testing of sewers, ventilation of sewers. low-cost waste treatment; oxidation pond, septic tank, Sewer appurtenances, manholes, catch basins, basic principles of house drainage, typical layout plan showing house drainage connections,	10 hours	L1,L2
Module -2		
Design of sewers, hydraulic formula for velocity, effects of variation on velocity, regime velocity, design of hydraulic elements for circular sewers for full flow and partial flow conditions, disposal of effluents by dilution, self purification phenomenon, oxygen sag curve, zones of purification, sewage farming, sewage sickness, numerical problems on disposal of effluents, Streeter-Phelps equation	10 Hours	L2,L3
Module -3		
Waste water characteristics, sampling, significance and techniques, physical, chemical and biological characteristics, flow diagram for municipal waste water treatment, unit operations; screens, grit chambers, skimming tanks, equalization tanks Suspended growth and fixed film bio process, design of trickling filters, activated sludge process, sequential batch reactors, moving bed bio reactors, sludge digesters,	10 Hours	L1,L2,L3
Module -4		
Difference between domestic and industrial waste water, effect of effluent discharge on streams, methods of industrial waste water treatment; volume reduction, strength reduction, neutralization, equalisation and proportioning. Removal of organic, inorganic and colloidal solids, combined treatment methods; merits, demerits and feasibility, principles of discharge of raw, partially treated and completely treated wastes in to streams	10 Hours	L1,L2
Module -5		
Process flow chart, sources and characteristics of industrial waste water, treatment methods, reuse and recovery and disposal; cotton and textile industry, tanning industry, cane sugar and distilleries, dairy industry, steel and cement industry, paper and pulp industry, pharmaceutical and food processing industry.	10 Hours	L1,L2,L3

Course outcomes: After studying this course, students will be able to:

1. Acquires capability to design sewer and Sewerage treatment plant.
2. Evaluate degree of treatment and type of treatment for disposal, reuse and recycle.
3. Identify waste streams and design the industrial waste water treatment plant.
4. Manage sewage and industrial effluent issues.

Program Objectives:

Engineering knowledge
Problem analysis
Interpretation of data

Question paper pattern:

The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
Each full question shall cover the topics as a module

The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Metcalf and Eddy, "Wastewater Engineering - Collection, Treatment, Disposal and Reuse", McGraw Hill Pub.Co., 2009.
2. Nelson Leonard Nemerow, "Industrial Waste Treatment", Butterworth-Heinemann, 2007.
3. Patwardhan A.D, "Industrial Waste Water Treatment", PHI Learning Private Limited-New Delhi
4. Hammer, M.J. and Hammer, M.J., "Water and Wastewater Technology", 7th Ed., Prentice Hall of India

Reference Books:

1. Manual on Waste Water Treatment : CPHEEO, Ministry of Urban Development, New Delhi.
2. Fair, Geyer and Okun , "Water and Wastewater Engineering" Vol-II, John Willey Publishers, New York.

Course Title: Design of RCC and Steel Structures
As per Choice Based Credit System (CBCS) scheme]
SEMESTER:VII

Subject Code	15CV72	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS –04		**Total Marks- 100**	

Course objectives: This course will enable students to

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

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Footings: Design of rectangular slab type combined footing. Retaining Walls: Design of cantilever Retaining wall and counter fort retaining wall. Water Tanks: Design of circular water tanks resting on ground (Rigid and Flexible base). Design of rectangular water tanks resting on ground. **As per IS: 3370 (Part IV)** Design of portal frames with fixed and hinged based supports.	25 hours	L1,L2,L3
Module -2		
Roof Truss: Design of roof truss for different cases of loading, forces in members to given. Plate Girder: Design of welded plate girder with intermediate stiffener, bearing stiffener and necessary checks Gantry Girder: Design of gantry girder with all necessary checks	25 Hours	L1,L2,L3

Course Outcomes: After studying this course, students will be able to:

Students will acquire the basic knowledge in design of RCC and Steel Structures.

Students will have the ability to follow design procedures as per codal provisions and skills to arrive at structurally safe RC and Steel members.

Program Objectives:

Engineering knowledge

Problem analysis

Interpretation of data

Question Paper Pattern:

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

One full question should be answered from each module.

Each question carries 40 marks.

Code books – IS 456, IS 800, IS 3370 (Part IV), SP (6) – Steel Tables, shall be referred for designing

The above charts shall be provided during examinations

Text Books:

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

Reference Books:

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

Course Title: Hydrology and Irrigation Engineering

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER:VII

Subject Code	15CV73	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03
	CREDITS – 04	**Total Marks-100**	

Course Objectives: This course will enable students to;

1. Understand the concept of hydrology and components of hydrologic cycle such as pricipitation, infiltration, evaporation and transpiration.
2. Quantify runoff and use concept of unit hydrograph.
3. Demonstrate different methods of irrigation, methods of application of water and irrigation procedure.
4. Design canals and canal network based on the water requirement of various crops.
5. Determine the reservoir capacity.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1		
Hydrology: Introduction, Importance of hydrology, Global and Indian water availability, Practical application of hydrology, Hydrologic cycle (Horton's) qualitative and engineering representation. **Precipitation:** Definition, Forms and types of precipitation, measurement of rain fall using Symon's and Syphon type of rain gauges, optimum number of rain gauge stations, consistency of rainfall data (double mass curve method), computation of mean rainfall, estimation of missing data, presentation of precipitation data, moving average curve, mass curve, rainfall hyetographs.	10 hours	L2, L3
Module -2		
Losses: Evaporation: Introduction, Process, factors affecting evaporation, measurement using IS class-A Pan, estimation using empirical formulae (Meyer's and Rohwer's equations) Reservoir evaporation and control **Evapo-transpiration:** Introduction, Consumptive use, AET, PET, Factors affecting, Measurement, Estimation by Blaney-Criddle equation, **Infiltration:** Introduction, factors affecting infiltration capacity, measurement by double ring infiltrometer, Horton's infiltration equation, infiltration indices.	10 Hours	L2, L3
Module -3		
Runoff: Definition, concept of catchment, factors affecting runoff, rainfall – runoff relationship using regression analysis. **Hydrographs:** Definition, components of hydrograph, base flow separation, unit hydrograph, assumption, application and limitations, derivation from simple storm hydrographs, S curve and its computations, Conversion of UH of different durations	10 Hours	L2, L4

Module -4		
Irrigation: Definition. Benefits and ill effects of irrigation. System of irrigation: surface and ground water, flow irrigation, lift irrigation, Bandhara irrigation. **Water Requirements of Crops:** Duty, delta and base period, relationship between them, factors affecting duty of water crops and crop seasons in India, irrigation efficiency, frequency of irrigation.	10 Hours	L2, L4
Module -5		
Canals: Types of canals. Alignment of canals. Definition of gross command area, cultural command area, intensity of irrigation, time factor, crop factor. Unlined and lined canals. Standard sections. Design of canals by Lacey's and Kennedy's method. **Reservoirs:** Definition, investigation for reservoir site, storage zones determination of storage capacity using mass curves, economical height of dam.	10 Hours	L2, L4

Course outcomes: After studying this course, students will be able to:

1. Understand the importance of hydrology and its components.
2. Measure precipitation and analyze the data and analyze the losses in precipitation.
3. Estimate runoff and develop unit hydrographs.
4. Find the benefits and ill-effects of irrigation.
5. Find the quantity of irrigation water and frequency of irrigation for various crops.
6. Find the canal capacity, design the canal and compute the reservoir capacity.

Program Objectives:

Engineering knowledge

Problem analysis

Interpretation of data

Question paper pattern:

The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks

There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.

Each full question shall cover the topics as a module

The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1) K. Subramanya, “Engineering Hydrology”, Tata McGraw Hill Publishers, New Delhi.

2) Jayarami Reddy, “A Text Book of Hydrology”, Lakshmi Publications, New Delhi.

3) Punmia and LalPandey, “Irrigation and Water Power Engineering” Lakshmi Publications, New Delhi.

Reference Books:

1) H.M. Raghunath, “Hydrology”, Wiley Eastern Publication, New Delhi.

2) Sharma R.K., “Irrigation Engineering and Hydraulics”, Oxford & IBH Publishing Co., New Delhi.

3) VenTe Chow, “Applied Hydrology”, Tata McGraw Hill Publishers, New Delhi.

4) Modi P.N “Water Resources and Water Power Engineering”-. Standard book house, Delhi.

3) Garg S.K, “Irrigation Engineering and Hydraulic Structures” Khanna publications, New Delhi.

Course Title: Design of Bridges

As per Choice Based Credit System (CBCS) scheme]

SEMESTER:VII

Subject Code	15CV741	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
	CREDITS –03	**Total Marks- 100**	

Course objectives: This course will enable students to understand the analysis and design of concrete Bridges.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Introduction to bridges, classification, computation of discharge, linear waterway, economic span, afflux, scour depth Design loads for bridges, introduction to I.R.C. loading standards, Load Distribution Theory, Bridge slabs, Effective width, Introduction to methods as per I.R.C.	8 hours	L1,L2
Module -2		
Design of Slab Bridges: Straight and skew slab bridges	8 Hours	L2,L3
Module -3		
Design of T beam bridges(up to three girder only) 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 of main girder.	8 Hours	L2,L3,L4
Module -4		
Other Bridges: Design of Box culvert (Single vent only) Design of Pipe culverts	8 Hours	L2,L3,L4
Module -5		
Substructures - Design of Piers and abutments, Introduction to Bridge bearings, Hinges and Expansion joints.(No design)	8 Hours	L2,L2,L3,L4

Course outcomes: After studying this course, students will be able to:

1. Understand the load distribution and IRC standards.
2. Design the slab and T beam bridges.
3. Design Box culvert, pipe culvert
4. Use bearings, hinges and expansion joints and
5. Design Piers and abutments.

Program Objectives:

Engineering knowledge
Problem analysis
Interpretation of data

Question paper pattern:

The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
Each full question shall cover the topics as a module

The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Johnson Victor. D, "Essentials of Bridge Engineering", Oxford Publishing Company.
2. N Krishna Raju, "Design of Bridges, Oxford and IBH publishing company
3. T R Jagadeesh and M A Jayaram, "Design of bridge structures", Prentice Hall of India

Reference Books:

1. Jain and Jaikrishna, “Plain and Reinforced Concrete”, Vol.2., Nem Chand Brothers.
2. Standard specifications and code of practice for road bridges, IRC section I,II, III and IV.
3. “Concrete Bridges”, The Concrete Association of India

Course Title: Ground Water & Hydraulics

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER:VII

Subject Code	15CV742	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
	CREDITS – 03	**Total Marks-100**	

Course objectives: This course will enable students

1. To characterize the properties of ground water and aquifers.
2. To quantify the ground water flow.
3. To locate occurrence of ground water and augment ground water resources.
4. To synthesize ground water development methods.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1		
Introduction: Importance, vertical distribution of subsurface water, occurrence in different types of rocks and soils, definitions-aquifers, aquifuge, aquitard, aquiclude, confined and Unconfined aquifers.	7 hours	L_1, L_2
Module -2		
Fundamentals of Ground Water Flow: Aquifer parameters, specific yield and specific retention, porosity, storage coefficient, derivation of the expression, Darcy's law, hydraulic conductivity, coefficient of permeability and intrinsic permeability, transmissibility, permeability in isotropic, unisotropic layered soils, steady one dimensional flow: cases with recharge.	8 Hours	L_2, L_3
Module -3		
Well Hydraulics: Steady Flow, Radial flow in confined and unconfined aquifers, pumping test Unsteady Flow, General equation, derivation; thesis method, Cooper and Jacob method, Chow's method, solution of unsteady flow equations, leaky aquifers (only introduction), interference of well, image well theory.	10 Hours	L_2, L_3, L_4
Module -4		
Ground Water Exploration: Seismic method, electrical resistively method, Geo-physical techniques, electrical logging, radioactive logging, induction logging, sonic and fluid logging.	7 Hours	L_2, L_3
Module -5		
Ground Water Development: Types of wells, methods of construction, tube well design, dug wells, pumps for lifting water, working principles, power requirement, Conjunctive use, necessity, techniques and economics. **Ground Water Recharge:** Artificial recharge, groundwater runoff	8 Hours	L_2, L_3

Course outcomes: After studying this course, students will be able to:

1. find the characteristics of aquifers.
2. estimate the quantity of ground water by various methods.
3. locate the zones of ground water resources.
4. select particular type of well and augment the ground water storage.

Program Objectives:

Engineering knowledge

Problem analysis

Interpretation of data

Question paper pattern:

The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks

There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.

Each full question shall cover the topics as a module

The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. H.M. Raghunath, "Ground Water", Wiley Eastern Publication, New Delhi.
2. K. Todd, "Ground Water Hydrology", Wiley and Sons, New Delhi.
3. Bower. H., "Ground Water Hydrology" McGraw Hill, New Delhi.

Reference Books:

1. Garg Satya Prakash, "Ground Water and Tube Wells", Oxford and IBH, New Delhi.
2. W. C. Walton, "Ground Water Resources and Evaluation" McGraw Hill, Delhi.
3. Michel, D. M., Khepar, S. D., Sondhi, S. K., "Water Wells and Pumps" McGraw Hill, Delhi.

Course Title: Design Concept of Building Services
As per Choice Based Credit System (CBCS) scheme]
SEMESTER:VII

Subject Code	15CV743	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
	CREDITS –03	**Total Marks- 100**	

Course Objectives: This course will enable students to
1. learn the importance of sanitation, domestic water supply, plumbing and fire services
2. Understand the concepts of heat, ventilation and air conditioning
3. Develop technical and practical knowledge in Building Services.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Water Supply, Drainage and Solid Waste Disposal: Water requirements for different types of buildings, simple method of removal of impurities, water saving practices and their potential Service connection from mains, sump and storage tank, types and sizes of pipes, special installation in multistoried buildings. Material, types of fixtures and fitting for a contemporary bathroom– taps –quarter turn, half turn, ceramic, foam flow etc, hot water mixer, hand shower Rainwater harvesting to include roof top harvesting, type of spouts, sizes of rainwater pipes and typical detail of a water harvesting pit Principles of drainage, surface drainage, shape and sizes of drains and sewers, storm water over flow chambers, methods of laying and construction of sewers Approaches for solid waste management, Solid wastes collection and removal from buildings. On-site processing and disposal methods	8 hours	L1,L2
Module -2		
Heat Ventilation and Air Conditioning (HVAC): Behaviour of heat propagation, thermal insulating materials and their co-efficient of thermal conductivity. General methods of thermal insulation: Thermal insulation of roofs, exposed walls. Ventilation: Definition and necessity, system of ventilation. Principles of air conditioning, Air cooling, Different systems of ducting and distribution, Essentials of air-conditioning system.	8 Hours	L1,L2
Module -3		
Electrical and Fire Fighting Services: Electrical systems, Basics of electricity, single/Three phase supply, protective devices in electrical installation, Earthing for safety, Types of earthing, ISI Specifications. Electrical installations in buildings, Types of wires, Wiring systems and their choice , planning electrical wiring for building, Main and distribution boards, Principles of illumination, Classification of buildings based on occupancy, causes of fire and spread of fire, Standard fire, Fire fighting, protection and fire resistance, Firefighting equipment and different methods of fighting fire., means of escape, alarms, etc., Combustibility of materials, Structural elements and fire resistance, Fire escape routes and elements, planning and design. Wet risers, dry risers, sprinklers, heat detector, smoke detectors, fire dampers, fire doors, etc. Provisions of NBC.	8 Hours	L1,L2,L3
Module -4		
Plumbing and Fire Fighting Layout of Simple Buildings: Application of above studies in preparing layout and details - Plumbing layout of residential and public buildings, Fire fighting layout, Reflected ceiling plan of smoke detectors / sprinklers, etc.	8 Hours	L2,L3

Module -5		
Engineering Services: engineering services in a building as a system, Lifts, escalators, cold and hot water systems, waste water systems and electrical systems. Pumps and Machineries: Reciprocating, Centrifugal, Deep well, Submersible, Automatic pumps, Sewerage pumps, Compressors, Vacuum pump – their selection, installation and maintenance – Hot water boilers – Classification and types of lifts, lift codes, rules structural provision: escalators, their uses, types and sizes, safety norms to be adopted – Social features required for physically handicapped and elderly, DC/AC motors, Generators, **Building Maintenance**: Preventive and protective maintenance, Scheduled and contingency maintenance planning, M.I.S. for building maintenance. Maintenance standards. Economic maintenance decisions.	8 Hours	L1,L2,L3

Course Outcomes: After studying this course, students will be able to:

1. Describe the basics of house plumbing and waste water collection and disposal.
2. Discuss the safety and guidelines with respect to fire safety.
3. Describe the issues with respect to quantity of water, rain water harvesting and roof top harvesting.
4. Understand and implement the requirements of thermal comfort in buildings

Program Objectives:

Engineering knowledge
Problem analysis
Interpretation of data

Question paper pattern:

The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
Each full question shall cover the topics as a module

The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

REFERENCE BOOKS

1. National Building Code
2. Charangith shah, Water supply and sanitary engineering, Galgotia publishers.
3. Kamala & DL Kanth Rao, Environmental Engineering, Tata McGraw Hill publishing co. Ltd.
4. Technical teachers Training Institute (Madras), Environmental Engineering, Tata McGraw Hill publishing Co. Ltd.
5. M.David Egan, Concepts in Building Fire Safety.
6. O.H.Koenigsberger, “Manual of Tropical Housing and Building”, Longman Group United Kingdom
7. V.K.Jain, Fire Safety In Building 2edition, New Age International Publishers
8. E.G.Butcher, Smoke control in Fire-safety Design.
9. E.R.Ambrose, Heat pumps and Electric Heating, John and Wiley and Sons Inc, New York
10. Handbook for Building Engineers in Metric systems, NBC, New Delhi

Course Title: Structural Dynamics

As per Choice Based Credit System (CBCS) scheme]

SEMESTER:VII

Subject Code	15CV744	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS –03		**Total Marks- 100**	

Course Objectives: This course will enable students to;

1. Understand the behaviour of structure especially building to various dynamic loads: such as wind, earthquake, machine vibration and ambient vibration
2. Basic understanding of structural analysis and knowledge of engineering mathematics.
3. Understand response of a single degree of freedom system to dynamic excitation and Vibration Control Techniques.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Introduction: Introduction to structural dynamics, brief history of vibration, Basic definitions, vibration of SDOF (Single Degree of Freedom) systems, undamped, Damped, Free vibrations, equivalent viscous damping, Logarithmic decrement	08 hours	L1,L2
Module -2		
Forced vibrations of SDOF system, Response of undamped and damped system subjected to harmonic loading, response to SDOF subject to harmonic base excitation, Duhamel's integral, response to general system of loading, dynamic load factor, response spectrum.	08 Hours	L1,L2,L3
Module -3		
Free vibration of MDOF (Multi Degree Freedom System), Natural frequencies, Normal modes, Orthogonality of normal modes, Eigen Values Shear buildings modeled as MDOF systems. Free vibrations, Natural frequencies,	08 Hours	L1,L2,L3
Module -4		
Forced vibrations, Motion of shear buildings, Model Superposition Method, Response to shear buildings, Base motion, Harmonic fixed excitation. Damped motion of shear buildings, Equations for damped shear buildings, uncoupled damped equations, Conditions for damping uncoupled.	08 Hours	L1,L2,L3
Module -5		
Dynamic analysis of base stuffiness matrices, Lumped mass and consistent mass formulation, Equations of motion.	08 Hours	L1,L2,L3

Course outcomes: After studying this course, students will be able to:

1. Apply knowledge of mathematics, science, and engineering by developing the equations of motion for vibratory systems and solving for the free and forced response.
2. Basic understanding of fundamental analysis methods for dynamic systems
   Interpret dynamic analysis results for design, analysis and research purposes
3. Apply structural dynamics theory to earthquake analysis, response, and design of structures

Program Objectives:

Engineering knowledge

Problem analysis

Interpretation of data

Question paper pattern:

The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks

There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.

Each full question shall cover the topics as a module

The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Anil K Chopra, **"Structural Dynamics"**, PHI Publications
2. Mukobadhyay, **"Vibrations, Structural Dynamics",** Oxford IBH Publications
3. Vinod Husur, **"Earth Quake resistant design of building structures**", WILE EASTERN India Publications

Reference Books:

1. V K Mac Subramanian, "Elementary structural dynamics", Danpatra Publications
2. Mario Poz, "Structural Dynamics", CBS publications.
3. Manik A Selvam, "Structural Dynamics", Danpatra publications

Course Title: Urban Transportation and Planning
As per Choice Based Credit System (CBCS) scheme]
SEMESTER:VII

Subject Code	15CV751	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS –04		**Total Marks- 100**	

Course Objectives: This course will enable students to;

1. Understand and apply basic concepts and methods of urban transportation planning.
2. Apprise about the methods of designing, conducting and administering surveys to provide the data required for transportation planning.
3. Understand the process of developing an organized mathematical modelling approach to solve select urban transportation planning problem.
4. Excel in use of various types of models used for travel forecasting, prediction of future travel patterns.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Urban transport planning: Urbanization, urban class groups, transportation problems and identification, impacts of transportation, urban transport system planning process, modeling techniques in planning. Urban mass transportation systems: urban transit problems, travel demand, types of transit systems, public, private, para-transit transport, mass and rapid transit systems, BRTS and Metro rails, capacity, merits and comparison of systems, coordination, types of coordination.	08 hours	L1,L2,L3
Module -2		
Data Collection And Inventories: Collection of data – Organisation of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.	08 Hours	L1,L2,l3
Module -3		
Trip Generation & Distribution: UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution by Growth Factor Methods. **Problems on above**	08 Hours	L3,L4
Module -4		
Trip Distribution: Gravity Models, Opportunity Models, Time Function Iteration Models. Travel demand modeling: gravity model, opportunity models, Desire line diagram. Modal split analysis. **Problems on above**	08 Hours	L2,L3,L4,L5
Module -5		
Traffic Assignment: Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment. Introduction to land use planning models, land use and transportation interaction.	08 Hours	L2,L3,L4,L5

Course outcomes: After studying this course, students will be able to:

1. Design, conduct and administer surveys to provide the data required for transportation planning.
2. Supervise the process of data collection about travel behavior and analyze the data for use in transport planning.
3. Develop and calibrate modal split, trip generation rates for specific types of land use developments.
4. Adopt the steps that are necessary to complete a long-term transportation plan.

Program Objectives:

Engineering knowledge
Problem analysis
Interpretation of data

Question paper pattern:

The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks

There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.

Each full question shall cover the topics as a module

The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Kadiyali.L.R., 'Traffic Engineering and Transportation Planning', Khanna Publishers, New Delhi.
2. Hutchinson, B.G, 'Introduction to Urban System Planning', McGraw Hill.
3. Khisty C.J., 'Transportation Engineering – An Introduction' Prentice Hall.
4. Papacostas,'Fundamentals of Transportation Planning', Tata McGraw Hill.

Reference Books:

1. Mayer M and Miller E, 'Urban Transportation Planning: A decision oriented Approach', McGraw Hill.
2. Bruton M.J., 'Introduction to Transportation Planning', Hutchinson of London.
3. Dicky, J.W., 'Metropolitan Transportation Planning', Tata McGraw Hill.

Course Title: Prefabricated Structures
As per Choice Based Credit System (CBCS) scheme]
SEMESTER:VII

Subject Code	15CV752	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS –03		**Total Marks- 100**	

Course objectives: This course will enable students to
1. Understand modular construction, industrialised construction
2. Design prefabricated elements
3. Understand construction methods.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
INTRODUCTION Need for prefabrication–Principles–Materials–Modular coordination–Standarization–Systems–Production–Transportation–Erection.	08 hours	L1,L2
Module -2		
PREFABRICATED COMPONENTS Behaviour of structural components–Large panel constructions–Construction of roof and floor slabs–Wall panels –Columns–Shear walls	08 Hours	L1,L2
Module -3		
DESIGN PRINCIPLES Disuniting of structures-Design of cross section based on efficiency of material used–Problems in design because of joint flexibility –Allowance for joint deformation.	08 Hours	L2,L3
Module -4		
JOINT IN STRUCTURAL MEMBERS Joints for different structural connections–Dimensions and detailing–Design of expansion joints	08 Hours	L1,L2,L3
Module -5		
DESIGN FOR ABNORMAL LOADS Progressive collapse–Code provisions–Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc.,-Importance of avoidance of progressive collapse.	10 Hours	L2,L3

Course Outcomes: After studying this course, students will be able to:
1. Use modular construction, industrialised construction
2. Design prefabricated elements
3. Design some of the prefabricated elements
4. Use the knowledge of the construction methods and prefabricated elements in buildings

Program Objectives:
Engineering knowledge
Problem analysis
Interpretation of data

Question paper pattern:
The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
Each full question shall cover the topics as a module
The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R.," Knowledge based process planning for construction and manufacturing", Academic Press Inc., 1994

Reference Books:

1. Koncz T.,"Manual of precast concrete construction", Vol.I, II and III, Bauverlag, GMBH,1976.
2. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009

Course Title: Rehabilitation and Retrofitting of Structures
As per Choice Based Credit System (CBCS) scheme]
SEMESTER:VII

Subject Code	15CV753	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS –03		**Total Marks- 100**	

Course Objectives: This course will enable students to;
1. Investigate the cause of deterioration of concrete structures.
2. Strategise different repair and rehabilitation of structures.
3. Evaluate the performance of the materials for repair

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
General: Introduction and Definition for Repair, Retrofitting, Strengthening and rehabilitation. Physical and Chemical Causes of deterioration of concrete structures, Evaluation of structural damages to the concrete structural elements due to earthquake.	08 hours	L1,L2
Module -2		
Damage Assessment: Purpose of assessment, Rapid assessment, Investigation of damage, Evaluation of surface and structural cracks, Damage assessment procedure, destructive, non-destructive and semi destructive testing systems	08 Hours	L1,L2
Module -3		
Influence on Serviceability and Durability: Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, and cathodic protection.	08 Hours	L1,L2,L3
Module -4		
Maintenance and Retrofitting Techniques: Definitions: Maintenance, Facts of Maintenance and importance of Maintenance Need for retrofitting, retrofitting of structural members i.e., column and beams by Jacketing technique, Externally bonding(ERB) technique, near surface mounted (NSM) technique, External post-tensioning, Section enlargement and guidelines for seismic rehabilitation of existing building	08 Hours	L1,L2,L3
Module -5		
Materials for Repair and Retrofitting: Artificial fibre reinforced polymer like CFRP, GFRP, AFRP and natural fiber like Sisal and Jute. Adhesive like, Epoxy Resin, Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Techniques for Repair: Rust eliminators and polymers coating for rebar during repair foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shot Crete Epoxy injection, Mortar repair for cracks, shoring and underpinning	08 Hours	L1,L2,L3

Course outcomes: After studying this course, students will be able to:
1. Understand the cause of deterioration of concrete structures.
2. Able to assess the damage for different type of structures
3. Summarize the principles of repair and rehabilitation of structures
4. Recognize ideal material for different repair and retrofitting technique

Program Objectives:
Engineering knowledge
Problem analysis
Interpretation of data

Question paper pattern:
The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
Each full question shall cover the topics as a module
The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Sidney, M. Johnson, "Deterioration, Maintenance and Repair of Structures"
2. Denison Campbell, Allen & Harold Roper, "Concrete Structures – Materials, Maintenance and Repair"- Longman Scientific and Technical.

Reference Books:

3. R.T.Allen and S.C. Edwards, "Repair of Concrete Structures"-Blakie and Sons

Raiker R.N., "Learning for failure from Deficiencies in Design, Construction and Service"- R&D Center (SDCPL).

Course Title: Reinforced Earth Structures
As per Choice Based Credit System (CBCS) scheme]
SEMESTER:VII

Subject Code	15CV754	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS –03		**Total Marks- 100**	

Course Objectives: This course will enable students to;

1. Create an understanding of the latest technique such as reinforcing the soil;
2. Analyze the concept of RE so as to ascertain stability of RE structures;
3. Understand the different reinforcing materials that can be used efficiently in soils.
4. Understand design concepts of different RE structures including introductory concepts of Foundations resting of RE soil bed.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		
Basics of Reinforced Earth Construction: Definition, Historical Background, Components, Mechanism and Concept, Advantages and Disadvantage of reinforced earth Construction, Sandwich technique for clayey soil. **Geosynthetics and Their Functions:** Historical developments, Recent developments, manufacturing processwoven &non-woven, Raw materials – Classification based on materials type – Metallic and Non-metallic, Natural and Man-made, Geosynthetics **Properties and Tests on Materials** Properties – Physical, Chemical, Mechanical, Hydraulic, Endurance and Degradation requirements, Testing & Evaluation of properties	08 hours	L1,L2,L3
Module -2		
Design of Reinforced Earth Retaining Walls: Concept of Reinforced earth retaining wall, Internal and external stability, Selection of materials, Typical design problems **Soil Nailing Techniques:** Concept, Advantages & limitations of soil nailing techniques, comparison of soil nailing with reinforced soil, methods of soil nailing, Construction sequence, Components of system, Design aspects and precautions to be taken	08 Hours	L1,L2,L3,L4
Module -3		
Design of Reinforced Earth Foundations: Modes of failure of foundation, Determination of force induced in reinforcement ties – Location of failure surface, tension failure and pull out resistance, length of tie and its curtailment, Bearing capacity improvement in soft soils, General guidelines.	08 Hours	L2,L3,L4
Module -4		
Geosynthetics for Roads and Slopes: Roads - Applications to Temporary and Permanent roads, Role of Geosynthetic in enhancing properties of road, control of mud pumping, Enhancing properties of subgrade, Design requirements Slopes – Causes for slope failure, Improvement of slope stability with Geosynthetic, Drainage requirements, Construction technique. Simple Numerical Stability Checking Problems on Reinforced Slopes	08 Hours	L2,L3,L4
Module -5		
GEOSYNTHETICS - FILTER, DRAIN AND LANDFILLS: Filter & Drain – Conventional granular filter design criteria, Geosyntheticfilter design requirements, Drain and filter properties, Design criteria – soilretention, Geosynthetic permeability, anticlogging, survivability and durability (No Numerical Problems) Landfills – Typical design of Landfills – Landfill liner & cover, EPA Guidelines, Barrier walls for existing landfills and abandoned dumps (No Numerical Problems)	08 Hours	L2,L3,L4

Course outcomes: After studying this course, students will be able to:

1. identify, formulate reinforced earth techniques that are suitable for different soils and in different structures;
2. understand the laboratory testing concepts of Geosynthetics
3. design RE retaining structures and Soil Nailing concepts
4. Determine the load carrying capacity of Foundations resting on RE soil bed.
5. asses the use of Geosynthetics in drainage requirements and landfill designs

Program Objectives:

Engineering knowledge
Problem analysis
Interpretation of data

Question paper pattern:

The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
Each full question shall cover the topics as a module

The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Koerner. R.M, "Design with Geosynthetics", Prince Hall Publications
2. Koerner. R.M. &Wesh, J.P, "Construction and Geotechnical Engineering using synthetic fabrics", Wiley Inter Science, NewYork,.
3. SivakumarBabu G. L., "An introduction to Soil Reinforcement and Geosynthetics", Universities Press, Hyderabad
4. Swami Saran, "Reinforced Soil and its Engineering Applications", I. K. International Pvt. Ltd, New Delhi
5. Venkattappa Rao, G., & Suryanarayana Raju., G. V.S, "Engineering with Geosynthetics", Tata McGraw Hill publishing Company Limited., New Delhi.

Reference Books:

1. Jones, "Earth reinforcement and Soil structure", CJEP Butterworths, London
2. Ingold, T.S. & Millar, K.S, "Geotextile Hand Book", Thomas, Telford, London.
3. Hidetoshi Octial, Shigenori Hayshi& Jen Otani, "Earth Reinforcement Practices",Vol. I, A.A. Balkema, Rotterdam
4. Bell F.G, "Ground Engineer's reference Book", Butterworths, London
5. Ingold, T.S, "Reinforced Earth", Thomas, Telford, London.
6. Sarsby R W- Editor, "Geosynthetics in Civil Engineering", Woodhead Publishing Ltd & CRC Press, 2007

Course Title: Environmental Engineering Laboratory
As per Choice Based Credit System (CBCS) scheme
SEMESTER:VII

Subject Code	15CVL76	IA Marks	20
Number of Lecture Hours/Week	1I+2P	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
	CREDITS –02	**Total Marks- 100**	

Course objectives: This course will enable students,
1. To learn different methods of water & waste water quality
2. To conduct experiments to determine the concentrations of water and waste water
3. To determine the degree and type of treatment
4. To understand the environmental significance and application in environmental engineering practice

Experiments	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
1. Determination of pH, Acidity and Alkalinity	02 Class	L1,L2,L3
2. Determination of Calcium, Magnesium and Total Hardness.	02 Class	L1,L2,L3
3. Determination of Dissolved Oxygen. 4. Determination of BOD.	02 Class	L1,L2,L3
5. Determination of Chlorides	01 Class	L1,L2,L3
6. Determination of percentage of available chlorine in bleaching powder, Determination of Residual Chlorine	01 Class	L1,L2,L3
7. Determination of Solids in Sewage: I) Total Solids, II) Suspended Solids, III) Dissolved Solids, IV) Volatile Solids, Fixed Solids, V) Settle able Solids. 8. Determination of Turbidity by Nephelometer 9. Determination of Optimum Dosage of Alum using Jar test apparatus.	02 Class	L1,L2,L3
10. Determination of sodium and potassium using flame photometer.	01 Class	L1,L2,L3
11. Determination Nitrates by spectrophotometer. 12. Determination of Iron & Manganese.	01 Class	L1,L2,L3
13. Determination of COD.	Demonstration	L1,L2,L3
14. Air Quality Monitoring (Ambient, stack monitoring , Indoor air pollution)	Demonstration	L1,L2,L3
15. Determination of Sound by Sound level meter at different location	Demonstration	L1,L2,L3

Course Outcomes: After studying this course, students will be able to:
1. Acquire capability to conduct experiments and estimate the concentration of different parameters.
2. Compare the result with standards and discuss based on the purpose of analysis.
3. Determine type of treatment, degree of treatment for water and waste water.
4. Identify the parameter to be analyzed for the student project work in environmental stream.

Program Objectives:
1. Evaluation of the test results and assesses the impact on water and waste water treatment.
2. Train student to undertake student project work in 8^{th} semester in the field of environmental engineering.

Question paper pattern:
Two experiments shall be asked from the above set
One experiment to be conducted and for the other student should write detailed procedure.

Reference Books:

1. Lab Manual, ISO 14001 Environmental Management, Regulatory Standards for Drinking Water and Sewage disposal
2. Clair Sawyer and Perry McCarty and Gene Parkin, "Chemistry for Environmental Engineering and Science" , McGraw-Hill Series in Civil and Environmental Engineering

Course Title: Computer Aided Detailing of Structures
As per Choice Based Credit System (CBCS) scheme]
SEMESTER:VII

Subject Code	15CVL77	IA Marks	20
Number of Lecture Hours/Week	03 (1I+2D)	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
	CREDITS –02	**Total Marks- 100**	

Course 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.

Modules	**Teaching Hours**	**Revised Bloom's Taxonomy (RBT) Level**
Module -1 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. Cantilever Retaining wall 5. Counter Fort Retaining wall 6. Circular Water Tank, Rectangular Water Tank.	20 hours	L1,L2,L3
Module -2 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. 4. Roof Truss – Welded and Bolted 5. Beams with Bolted and Welded 6. Gantry Girder	20 Hours	L1,L2,L3

Course outcomes: After studying this course, students will be able to:
Prepare detailed working drawings

Program Objectives:
Engineering knowledge
Problem analysis
Interpretation of data

Question paper pattern:
Two questions shall be asked from each Module.
One full question should be answered from each Module.
Each question carries 40 marks.

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