SYLLABUS

AUTONOMOUS SYSTEM

For B.E. III and IV Semester

Civil Engineering

With effect from the Academic Year 2016-17



Hyderabad Karnataka Education Society's

Poojya Doddappa Appa College of Engineering, Kalaburagi

A Govt. Aided Autonomous College, Affiliated to VTU Belagavi, and Approved by AICTE, New Delhi

AUGUST 2016

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IV - SEN	AESTER - B.E.					CIVII	L ENGIN	EERING
Code			Hours	/Week		Max	iimum Ma	rks
No.	20000	Lecture	Tutorial	Practical	Credits	CIE	SEE	Total
		F	НЕОКУ					
15MA41	Engineering Mathematics-IV	4	T	0	4	50	50	100
15CV42	Structural Analysis-I	4	T	0	4	50	50	100
15CV43	Fluid Mechanics-II	3	2	0	4	50	50	100
15CV44	Surveying-II	4	I	0	4	50	50	100
15CV45	Engineering Geology	З	I	0	с	50	50	100
15CV46	Concrete Technology	3	I	0	3	50	50	100
		РК	ACTICAL					
15CV47	Engineering Geology Lab	0	0	2	1	50	50	100
15CV48	Surveying Lab-II	0	0	2	1	50	50	100
15CV49	Fluid Mechanics Lab	0	0	2	-	50	50	100
	TOTAL	19	08	4	25	400	400	800

THIRD SEMESTER ENGINEERING MATHEMATICS - III

Subject code: 15MA31	Credit : 04	
CIE : 50 Marks	SEE : 50 Marks	SEE : 03hours
Hours/Week : 4 hours. (L	ecture)	Total Hours : 52

Prerequisite: Engineering Mathematics - (15MA11)

Engineering Mathematics- (15MA21)

Course objectives:

To enable the students to obtain the knowledge of Engineering Mathematics in the following topics:

- 1. Numerical methods to solve algebraic and Transcedental equations and Eigen values and Eigen vectors
- 2. Interpolation methods and Numerical integration
- 3. Fourier Series and Fourier transformation and Z transformation and its application in engineering fields
- 4. Partial Differential equations and its applications

MODULE-I

Numerical Methods-I:

Introduction, numerical solutions of algebraic and Transcendental equations, Newton's Raphson and Regula falsi methods. Solution of linear simultaneous equations by Jacobi's iteration method and Gauss - Seidel iterative methods. Eigen values and eigen vectors.Computation of largest eigen value and the corresponding eigen vector by Rayleigh's power method. Problems.

MODULE-II

Numerical Methods-II:

Finite differences of various orders. Interpolation, Newton's Forward and Backward formulae. Langrange's interpolation and inverse interpolation formulae. Numerical differentiation using Newton's forward and Backward interpolation formulae. Problems.

10 hours

10 hours

Numerical integration : Trapezoidal rule , Simpsons $1/3^{rd}$ and $3/8^{th}$ rule, Weddle's rule (all formulae and rules without proof) . Problems.

MODULE-III

Difference equations and Z-Transforms:10 hoursDifference equations –Basic definitions, Z-Transform-Definitions ,standardz-transform, linearity property , damping rule, shifting rule , initial valuetheorem, final value theorem . Inverse Z-Transform. Problems.

Calculus of variations : Variation of functional, extremal of functional, variational problems, Euler's equations, standard variational problems including geodesics , minimal surface of revolution. Problems.

MODULE-IV

Fourier series:

Periodic functions , Fourier series with periods $(0,2 \pi)$, $(-\pi, \pi)$, $(0,2\ell)$ and $(-\ell,\ell)$. Half range fourier series. Practical harmonic analysis . Problems.

Fourier Transform :

Finite and Infinite fourier transforms. Fourier sine and cosine transforms, properties. Inverse transform. Problems.

MODULE-V

Partial differential equations (PDE): 11 hours Formation of PDE by eliminating arbitrary constants and arbitrary functions. Solution of non-homogeneous PDE by direct integration method.Solution of homogeneous PDE involving derivative with respective one independent variable only.Method of separation of variables. (First and second order equations).Solution of Langrange's linear PDE of the type Pp+Qq=R. Problems.

Applications of PDE: Derivation of one dimensional wave and heat equations. Various possible solutions of of wave equation, heat equation and Laplace equation by the method of separation of variables with given conditions. Problems.

Course Outcomes:

On completion of this course, student are able to :

CO1: Solve the numerical problems in algebraic, transcendental equations, Eigen values and Eigen vectors. Computation of interpolation polynomials and numerical integration (C3)

11 hours

- CO2: Analyze discrete type system using convolution and the Z-transform (C4)
- CO3: Determine Fourier transform for continuous time signals and systems (C4)
- CO4: Construction of Fourier series for periodic signals and Fourier series to analyze circuits (C3)
- CO5: Determine solution of wave, heat and Laplace equations (C4)

Text Books:

Higher Engineering Mathematics by B.S.Grewal, Khanna publishers; 42nd the Edition. 2007

Reference Books:

- Advanced Engineering Mathematics by E. Kreyszig, John Willey & sons 8th Edn.
- 2. A short course in differential equations Rainvile E.D.9th Edition.
- Advanced Engineering Mathematics by R.K.Jain & S.R.K Iyengar; Narosa publishing House.
- 4. Introductory methods of numerical analysis by S.S.Sastry

Question Paper Pattern :

- Question paper will have TEN questions.
- Each full question consisting of 20 marks
- There will be TWO full questions (with maximum of four subquestions) covering the entire entire topic under module.

The student shall answer FIVE full questions, selecting one full question from each module.

BUILDING PLANNING AND DRAWING

Subject/Course Code: 15CV32	Credits: 04	
CIE: 50 Marks	SEE: 50 Marks	Total Marks: 100
Hours/Week: 2hrs. (Theory) + 4	hrs. (Tutorial)	Total Hours: 52

Prerequisite: Building Materials & Construction (11CV36)

Course Objectives:

To enable the Student to acquire the knowledge in the following topics

- 1 Working drawing for components of the building.
- 2 Functional design of residential and public building.
- 3 Functional design of residential and public building USING BUBBLE DIAGRAM.
- 4 Preparation of line diagram for water supply, sanitary, electrical layout and rain water harvesting.
- 5 Preparation of building plan, elevation and sectional by solid edge software.
- 6 Development of plan, elevation, section and schedule of opening for a residential building.

PART-I

To prepare working drawing of component of buildings i) Steppedwall footing and isolated RCC column footing, ii) Fully paneled andflush doors, iii) Half panelled and half-glazed window. 3 Hours

Functional design of building (Residential, Public and Industrial), positioning of various components of buildings, orientation of buildings, building standards, bye laws, set back distances and calculation of carpet area, plinth area and floor area ratio. 4 Hours

Functional design of building using inter connectivity diagrams (bubble diagram), development of line diagram only for following building :

i) Primary health centre, ii) Primary school building iii) Residential building 6 Hours

For a given single line diagram, preparation of water supply, Sanitaryand electrical layouts. Rain water harvesting elements4 Hours

Solid edge: preparation of building plan, elevation and typical sections by solid edge of single storied two bed room residential building 01 Hours

PART-II

Development of plan, elevation, section and schedule of openingsfrom the given line diagram of residential buildings, i) Two bed room Residential building, ii) Two storied building. 10 Hours

Course Outcomes:

At the end of the course, the student will be able to:

- CO1 Possess knowledge in principles of building planning and Drawing.(C1)
- CO2 Understand and interpret working drawings of building foundations, building Components and building drawings.(C2)
- CO3 Prepare, Compute, Design and develop plans, elevation and sections of residential and public buildings as per building bye laws.(C3)

REFERENCE BOOKS :

- 1. Shah M.H and Kale C.M **"Building Drawing"**, , Tata Mc Graw Hill Publishing co. Ltd., New Delhi.
- Gurucharan Singh "Building Construction", Standard Publishers & distributors, New Delhi.
- 3 National Building Code , BIS, New Delhi.

TERM WORKS DETAILS:

Sheet No: 1 to 2 from foundation & Doors

- Sheet No: 3 to 5 from bubble diagram of Primary health centre, Primary school building & Residential building
- Sheet No: 6 to 8 from Water supply, Sanitation, Electrical layout & Rain water harvesting elements.
- Sheet No: 9 &10 from section-II plan, elevation, sectional elevation & schedule of openings from given line diagram of single and double storey residential building

Sheet No: 11 plan, elevation, sectional elevation & schedule of openings from given line diagram of single storey residential building by using solid edge software.

CIE MARKS:	Sheets -11nos	-	25 marks
	Single major test	-	20 marks
	Assignment	-	05 marks

Pattern of Question Paper:

SEE: Four question of 20 marks each to be set in PART-I and two questions to be answered.

One compulsory question of 60 marks to be set in PART -II on development of plan, elevation, sectional elevation & schedule of openings from a given line diagram of single storey residential building.

Subject/Course Code: 15CV33	Credits: 04			
CIE: 50 Marks	SEE: 50 Marks	Total Marks: 100		
Hours/Week: 3hrs. (Theory) + 2	hrs. (Tutorial)	Total Hours: 52		

STRENGTH OF MATERIALS

Prerequisite: Civil Engineering Science (15CV15/15CV25)

COURSE OBJECTIVE:

To enable the Student to acquire the knowledge in the following topics

- 1 Understand the concepts of simple stresses and strain due to various loadings, including temperature stresses for ferrous and non ferrous, simple and compound bars with elastic constants.
- 2 Understand the complex stress with analytical and graphical methods. Find stresses in thin and thick cylinders.
- 3 Draw shear force diagram and bending moment diagram for determinate beams for different loads.
- 4 Draw bending stress and shear stress diagram across the beam section with elastic stability of columns.
- 5 Find the torsion in circular shafts and to determine the slope and deflection beams.

MODULE-I

SIMPLE STRESSES AND STRAINS: Introduction to various strengths of material, concept and definition of stress and strain, types of stresses and strains, Assumptions in strength of materials, stress-strain diagrams for mild steel, ferrous and non-ferrous materials, St Venant's Principle, Hook's Law, Modulus of Elasticity, Poission's ratio, Deformation of bars of uniform cross section, varying cross section. Elongation due to self weight. Compound bars, Temperature stresses, Elastic constants and their relationship, volumetric strain, application problems. 12 hours

MODULE-II

COMPOUND STRESSES: Determination of stresses on oblique/inclined plane due to uniaxial, biaxial and general 2D stresses, (Analytical and Mohr's circle method), Determination of Principal Planes and Principal Stresses, Maximum Shear Stress and their plane (Analytical and Mohr's circle method)

THIN AND THICK CYLINDERS: THIN CYLINDERS: Determination of Longitudinal and Circumferential/Hoop's stress, change in dimensions and volume

THICK CYINDERS: Assumptions, Lami's equation derivation and problems, radial pressure and hoop stress distribution diagrams.

10 hours

MODULE-III

SHEAR FORCE AND BENDING MOMENT IN BEAMS: Intorduction to types of loads, beams and support with reaction. Defination of Shear force and bending moment, sign conventions. Relationship between load intensity, bending moment and shear force. Shear force diagram (SFD) and Bending moment diagram (BMD) for simply supported beams (both without overhang and with overhangs) and cantilever beams, beams subjected to point loads, UDL, UVL, Couples and their combinations.

10 hours

MODULE-IV

BENDING STRESSES AND SHEAR STRESSES IN BEAMS. BENDING STRESSES: Assumptions, Bernoulli's theory of Pure Bending, relationship between bending moment, bending stress and radius of curvature, Moment of Resistance, Section Modulus, flexural rigidity, Modulus of rupture. Bending stress diagram for rectangular, circular, I', 'T' and 'L' sections (simple problems)

SHEAR STRESS: Expression for transverse shear stress in beams, Shear stress diagram for rectangular, circular, 'I', 'T' and 'L' sections.

ELASTIC STABILITY OF COLUMNS AND STRUTS : Introduction to short and long columns. Defination of effective length, slenderness ratio, radius of gyration, buckling/critical load. Assumption and derivation of Euler's Buckling load for different end conditions. Problems and limitations of "Euler's theory. Rankine's theory, numerical problems. 10 hours

MODULE-V

TORSION OF CIRCULAR SHAFTS: Equation for theory of pure Torsion, Assumptions, Torsion equation for circular shaft, Strength and stiffness, torsional rigidity, polar modulus, strengths of solid and hollow shafts, power transmitted by solid and hollow shafts.

DEFLECTION OF BEAMS: Defination of stiffness, elastic curve, deflection in simple bending, relation between curvature, slope and deflection. Double Integration method for cantilever and simply supported beams for point load, UDL, UVL and couple, Macaulay's method, numerical problems. 10 hours

COURSE OUTCOME:

At the end of the course, the student will be able to:

- CO1 Understand the strength of materials for different structural elements under various stresses and strains like tensile and compressive. (C2)
- CO2 Construct Mohr's circle diagram for complex stresses with radial and hoop stress diagrams for the cylinders. (C2)
- CO3 Construct the shear force diagram and bending moment diagrm for determinate beams along with bending and shear stress diagram. (C2)
- CO4 Determine the load carrying capacity of columns. (C4)

Extent of Teaching: This is clearly defined in the syllabus.

CIE covers 2 Major tests, Assignments/ Class Seminar, Quizzes/class or slip test.

Pattern of Question Paper: Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.

Text Books:

- 1. S.S.Bhavikatti "Strength of Materials", New age Publications
- B.S. Basavarajaiah, P Mahadevappa "Strength of Materials" in SI Units, University Press (India) Pvt. Ltd., 3rd Edition (2010)
- 3. Shesha Prakash MN and Suresh GS, Mechanics of Materials, Prentice Hall, New Delhi, 2011
- R.Subramanian "Strength of Materials" Oxford University Press. 3rd Edition (2016)

Reference Books:

- D.H. Young, S.P. Timoshenko " Elements of Strength of Materials" East West Press Pvt. Ltd., 5th Edition (Reprint 2014)
- S.S. Rattan "Strength of Materials" McGraw Hill Education (India) Pvt. Ltd., 2nd Edition (Sixth reprint 2013). for a residential building.

Subject/Course Code: 15CV34	Credits: 04		
CIE: 50 Marks	SEE: 50 Marks	Total Marks: 100	
Hours/Week: 3hrs. (Theory) + 2	hrs. (Tutorial)	Total Hours: 52	

FLUID MECHANICS-I

Prerequisite: Engineering Mathematics III (15MA11) Engineering Mathematics II (15MA21) Civil Engineering Science 15CV15/15CV25

COURSE OBJECTIVE:

To enable the Student to acquire the knowledge in the following topics

- 1 Distinction between solid, fluid, liquid and gas. Classify the fluids and measurements of pressure by various types of manometers.
- 2 Hydrostatic forces on vertical, inclined and curved surfaces.
- 3 Dynamics of fluid flow.
- 4 Types of flows in pipes and head loss in pipe due to friction and bends.

5 Measurement of flow through orifice, notches and weirs.

MODULE - I

Scope and importance of the subject. Definition of fluid, distinction between a solid and a fluid, distinction between a liquid and a gas, Fluid continuum. Fluid properties and classification of Fluids: Mass density, specific volume, specific weight, relative density, viscosity, Newton's Law, compressibility, vapour pressure, surface tension and capillarity and their units (SI systems)

classification of fluids – Ideal and real fluids, Newtonian and Non-Newtonian fluids compressible and incompressible fluids. Problems on above fluid properties. Pressure at a point in a static fluid – Pascal's law – Hydrostatic Pressure law, Atmospheric pressure, Absolute, gauge, and vacuum pressure, Simple U-tube manometer, U-tube Differential manometers, inverted U-tube monometer. 12Hours

MODULE - II

Hydrostatics: Hydrostatics Forces on vertical & inclined plane surfaces, (rectangular, square, triangular ,trapezoidal, circular plane surfaces) Hydrostatic forces on curved surfaces and centre of pressure, pressure diagrams. Applications of total pressure and center of pressure on Dams, Roller gates, Tainter gates, sector gates, Sluice gates and pressure diagrams. 10 Hours

MODULE - III

Dynamics of Fluid Flow: Euler's equation of motion in one dimension – Integration of Euler's equation, Bernoulli's equation, Limitations and modifications of Bernoulli's equation – Applications of Bernoulli's equation Pitot tubes, Venturimeter – Momentum equation & its application on pipe bend. 10 Hours.

MODULE - IV

Flow Through pipes: Types of flows in pipes, Reynolds's experiments – Reynold's number Laminar & turbulent flows, fluid friction in pipes – Head loss due to friction (Darcy Weisbach equation) Friction factors for commercial pipes, Minor losses in pipes – pipes in series, equivalent pipe and pipes in parallel. 10 Hours.

MODULE - V

Flow measurements: Flow through a small orifice. Hydraulic coefficients 14 and experimental methods of determination. Flow through large rectangular orifices, submerged orifices. Flow through mouth pieces, external cylindrical mouth piece, hydraulic co-efficient, flow through internal or re-entrant Borda's mouth piece. Classification of Notches & weirs, Flow over rectangular Notch, Triangular Notch or weir Trapezoidal Notch, stepped Notch, Velocity of approach, Francis formula Flow Cippoletti weir or Notch, Broad crested, ogee weir submerged weir effect on discharge over a rectangular weir due to error in the measurement of head. 10 Hours

Course Outcomes:

At the end of the course, the student will be able to:

- CO1 Identify basic properties of Fluids.(C1)
- CO2 Application of fluid flow phenomena in flow through pipe, flow measurement through orifices, mouth pieces, notches and weirs.(C3)
- CO3 Analyze the flow problems by solving different examples on flow measuring devices in pipes and open channels. (C4)

Extent of Teaching: This is clearly defined in the syllabus.

CIE covers 2 Major tests, Assignments/ Class Seminar, Quizzes/class or slip test.

Pattern of Question Paper: Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.

Text Books:

- 1. Modi & Seth, Hydraulics & Fluid Mechanics standard book publishers, New Delhi.
- Arora, K.R., 'Fluid Mechanics & Hydraulics' Standard book publishers, New Delhi.
- Bansal, R.K., 'Fluid Mechanics; & Hydraulics' Laxmi Publication, New Delhi.
- 4. Jain, A.K. 'Fluid Mechanics' Khanna publishers, New Delhi.

Reference Books

1. Streeter – Mc Graw Hill Book Company.

SURVEYING – I

Subject/Course Code: 15CV35	Credits: 04	
CIE: 50 Marks	SEE: 50 Marks	Total Marks: 100
Hours/Week: 4hrs. (Th	eory)	Total Hours: 52

Prerequisite: Elementary Mathematics

COURSE OBJECTIVE:

To enable the Student to acquire the knowledge in the following topics

- 1 Introduction to Surveying and measurement of horizontal distances.
- 2 Chain surveying and compass surveying.
- 3 Principles of leveling.
- 4 Different types of leveling and contouring.

MODULE-I

Introduction : Definition of Surveying, Classification of Surveys, Uses of Surveying, Units of Measurements, Map & Classification, Survey of India topographical Maps and their numbering. Basic principles of Surveying, Errors, Classification, Precision and accuracy.

Measurement of horizontal distances : Chain and types, Tape and types, EDM devices, Ranging of lines Direct and Indirect, Measurement of distances over sloping grounds, Chain and Tape corrections - Numerical problems. 10 Hours

MODULE-II

Chain Surveying: Accessories required, Selection of stations and lines, Offsets and types, Setting out of right angles, Working principle and use of optical square, prism square, cross staff., Linear methods of setting out right angles, Booking of chain survey work, Field book, entries, conventional symbols, Obstacles in chain survey, Numerical problems, Errors in chain survey and precautions to be taken.

Compass Surveying-I: Meridians and bearings, Principle, working and use of - Prismatic compass, Surveyor's compass, Magnetic bearing, true bearings, WCB and Reduced bearing., Dip and Declination 10 Hours

MODULE-III

Compass Surveying-II : Accessories required for compass surveying, Traverse - closed and open traverse , Computation of bearings of legs of closed traverse given the bearing of one of the legs, Computation of included angles given the bearings of legs of a closed traverse.

Local attraction, determination and corrections. Bowditch's graphical method of adjustment of closed traverse, Bowditch rule & transit rule, Omitted measurements (only length & corresponding bearing of one line). 10Hours

MODULE-IV

Levelling-I : Principles and basic definitions, Fundamental axes and part of a dumpy level, Types of adjustments and objectives, Temporary adjustments of a dumpy level, Sensitiveness of bubble tube.

Inter relationship between fundamental axes for instrument to be in adjustment problems on two peg method for calibration of dumpy level. 11 Hours

MODULE-V

LEVELLING-II : Curvature and refraction correction, Type of leveling, Simple leveling, Reciprocal leveling, Profile leveling, Cross sectioning, Fly leveling

Reduction of Levelling : Booking of levels, Rise and fall method and Height of instrument method , comparison and arithmetic checks ,Fly back leveling., Errors and precautions.

Contouring : Contours and their characteristics, Methods of contouring, direct and indirect methods, Interpolation techniques, Uses of contours Numerical problems on determining intervisibility, Grade contours and uses. 11 Hours

Course Outcomes:

At the end of the course, the student will be able to:

- CO1 Possess a sound knowledge of principles of Surveying, measurements and surveying methodologies.(C1)
- CO2 Describe the technique for solutions in measurements, compass surveying and leveling.(C1)
- CO3 Calculate and design surveying applications in field.(C3)

Extent of Teaching: This is clearly defined in the syllabus.

CIE covers 2 Major tests, Assignments/ Class Seminar, Quizzes/class or slip test.

Pattern of Question Paper:

Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.

TEXT BOOKS:

- 1. B.C. Punmia 'Surveying' Vol–1 –, Laxmi Publications, New Delhi.
- 2. A.M. Chandra 'Plane Surveying' Vol-1-, Newage International ® Ltd.
- 3. ALAK 'Plane Surveying' –, S. Chand and Company Ltd., New Delhi.
- Kanetkar T P and S V kulkarni, Surveying and leveling volume 2, Pune Vidyarthi Griha Prakashan, 1988

REFERENCE BOOKS:

- 1. Milton O. Schimidt Wong, Fundamentals of Surveying -, Thomson Learning.
- 2. S.K. Roy, Fundamentals of Surveying -- Prentice Hall of India.
- S.K. Duggal, Surveying Vol. I, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
- * Survey of India Publication on maps.

BUILDING MATERIALS AND CONSTRUCTION

Subject/Course Code: 15CV36	Credits: 03	
CIE: 50 Marks	SEE: 50 Marks	Total Marks: 100
Hours/Week: 3hrs. (Th	eory)	Total Hours: 42

Pre Requisites: None

COURSE OBJECTIVE:

To enable the Student to acquire the knowledge in the following topics

- 1 Properties and preservation for stone and timber.
- 2 Properties of bricks and bonds in brickwork
- 3 Types of stone masonry, materials and methods of damp proofing courses.
- 4 Types of stairs and design of doglegged stair.
- 5 Roof, insulating materials and types of plastering.
- 6 Types of doors, windows, flooring and paints,.

MODULE-I

Building Stones: Common building stones and their uses, quarrying of stones, qualities of good building stones, deterioration of stones, Preservation of stones, dressing of stones, tests on building stones.

Timber: Important varieties and uses, defects in timber, tests for goodtimber, seasoning of timber, ply wood and its uses.8 Hours

MODULE-II

Bricks: Classification and composition of bricks, qualities of good bricks, tests on bricks.

Brick Masonry: Definition of terms used in masonry, bonds in brick work, English bond, Flemish bond, Reinforced brick work, Sand lime brick 7 Hours

Module-III

Stone Masonry: Rubble Masonry, Coursed and Un-coursed rubble masonry, Ashlar masonry, Shoring, Under Pinning and Scaffolding.

5 Hours

Damp Proof Course: Materials used for damp proof course, D.P.C Treatment in building methods of treatment to foundations, treatment to floors, walls and slabs, Concrete paver blocks. 3 Hours

MODULE-IV

Stairs: Types (classifications) and technical terms in stairs, requirements of a good stair, geometric design of R.C.C dog legged and open well stairs (Plan and Sectional elevation of stairs). 3 Hours

Roofs & Miscellaneous Materials: Sloped roof (R.C.C and tile roof), Requirements of good roofs, Adhesives, Aesbestos, Thermocol, Fibres, Heat insulating materials, Sound insulating materials, Geosynthetics..

3 Hours

Plastering: Purpose of plastering, materials of plastering, lime mortar,cement mortar, masonry mortar, methods of plastering, Stucco plastering,Lath plastering.3 Hours

MODULE-V

Doors: Types, Paneled doors, glazed doors, flush doors.

Windows: Types, Paneled Window, glazed Window. 3 Hours

Floors: Types of flooring (materials and methods of laying), Grannolithic, mosaic, ceramic, marble and polished granite, Linoleum. 3 Hours

Painting: Purpose of painting, types of paints, application of paints tonew and old surfaces, distemper, plastic emulsion, enamel, polishing ofwood surface.4 Hours

Course Outcomes:

At the end of the course, the student will be able to:

- CO1 Identify the various types of materials and their quality. (C1)
- CO2 Describe the components of Buildings. (C1)
- CO3 Choose the material, method of construction and sequence of construction. (C2)

Extent of teaching: This is clearly defined in the syllabus.

CIE covers 2 Major tests, Assignments/ Class Seminar, Quizzes/class or slip test.

Pattern of Question Paper:

Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.

TEXT BOOKS:

- 1. B.C.PUNMIA "Building Construction", Lakshmi Publications, New Delhi.
- 2. SUSHIL KUMAR "Building Construction", Standard Publication and Distributors, New Delhi.
- 3. S.C.RANGWALA" Building Construction", Charoter Publishing House, Anand, India.
- 4. Sushil Kumar "Engineering Materials", Standard Publication and Distributors, New Delhi.
- 5. S.C.Rangwala "Engineering Materials", Charoter Publishing House, Anand, India.
- P.G.Verghese" A Text Book of Building Materials", prentice-Hall of IndiaPvt Ltd, Publication.
- 7. R.K.rajpal" Engineering Materials", S.Chand and Company, New Delhi.

REFERENCE BOOKS:

- 1. Mohan rai and M.P.Jai Singh "Advanced Building Materials and Construction" CBRI Publication Roorkee.
- 2. Parbin Sing "Civil Engineering Materials ", S.K.Kataria and Sons Publications, New Delhi.
- 3. K.S.Manjunath "Materials of Construction", Sanguine Technical Publishers, Bangalore.

STRENGTH OF MATERIALS LAB

Subject/Course Code: 15CV37	Credits: 01	
CIE: 50 Marks	SEE: 50 Marks	Total Marks: 100
Hours/Week: 2hrs. (Pra	ctical)	Total Hours: 28

Prerequisite: Strength of Materials (15CV33)

COURSE OBJECTIVE:

To enable the Student to acquire the knowledge in the following topics

- 1 Determine tensile, compressive, torsional, shear and Impact strength of steel samples and interpret the results.
- 2 Determine compressive strength and bending strength of wood samples and interpret the results
- 3 Determine strength properties of brick and tile and interpret the results.

1.	Tension test on Mild Steel and HYSD bars.	04 Hours
2.	Compression test of Mild Steel, Cast iron and Wood.	02 Hours
3.	Torsion test on Mild Steel circular sections.	02 Hours
4.	Bending test on Wood under two point loading.	02 Hours
5.	Shear Test on Mild Steel.	02 Hours

- 6. Impact test on Mild steel (charpy & Izod) 02 Hours
- 7. Hardness test on ferrous and non-ferrous metals-Brinell's Rockwell and Vickers's methods. 06 Hours
- 8. Test on Bricks: Compressive strength, Water absorption and Effloroscence. 04 Hours
- 9. Test on Tiles: Flexural strength, abrasion resistance. 02 Hours
- 10. Demonstration of Strain gauges and Strain indicators. 02 Hours

Course Outcomes:

At the end of the course, the student will be able to:

CO1 Demonstrate the important concepts from the strength of materials theory course through a series of experiments.(A2)

- CO2 Determination of tensile strength, compressive strength, torsional strength and impact strength of steel samples and determination of compressive strength and bending strength of wood samples, strength properties of brick and tiles.(C4)
- CO3 Share responsibilities in small teams of 4-5 members for operating equipments and collecting data.(P6)

Reference Books:

- 1. Davis, Troxell and Hawk, Testing of Engineering Materials, International Student edition-Mcgraw Hill Book Co. New Delhi.
- 2. Fenner, George Newness, Mechanical Testing of Materials Ltd., London.
- 3. Holes K.A, Experimental Strength of Materials, English Universities Press Ltd. London.

Subject/Course Code: 15CV38	Credits: 01	
CIE: 50 Marks	SEE: 50 Marks	Total Marks: 100
Hours/Week: 2hrs. (Pra	ctical)	Total Hours: 28

SURVEYING LAB-I

Prerequisite: Surveying - I (15CV35)

COURSE OBJECTIVE:

To enable the Student to acquire the knowledge in the following topics

- 1 Measurements of distances by ranging.
- 2 Setout perpendiculars and regular figures by using Chain, tape and Compass.
- 3 Determine distance between inaccessible points and closed traverse of small area using chain, tape and compass.\
- 4 Determine difference in elevation between points including Chajja and recip[rocal leveling.
- 5 Conduct profile leveling and draw the L/S and C/S.
- 6 Demonstration of minor instruments.

EXERCISE - I

- a) To measure distance between two points by direct ranging.
- b) To set out perpendiculars at various points on given line using cross staff, optical square & tape. 2 hours

EXERCISE-II

Setting out of Rectangle, Pentagon Hexagon using tape/chain and other accessories.

Building plan mark out as per the plan.

4 hours

EXERCISE-III

To set out Rectangle, Pentagon, Hexagon, using tape/chain and compass. 4 hours

EXERCISE-IV

Closed traverse of a small area using chain and compass & adjustment of closing error by Bowdich's method. 4 hours

EXERCISE-V

To determine the distance between two inaccessible points using chain, tape & compass. 2 hours

EXERCISE-VI

To determine difference in elevation between two points using fly leveling technique & to conduct fly back leveling. Booking of levels using both HI & Rise & fall methods. 2 hours

EXERCISE-VII

To find the reduced level of different points including chajja by simple leveling. 2 hours

EXERCISE-VIII

To determine difference in elevation between two points using reciprocal leveling & to determine the collimation error. 2 hours

EXERCISE-IX

To conduct profile leveling for water supply/sewage line & to draw the longitudinal section to determine the depth of cut and depth of filling for a given formation level. 2 hours

EXERCISE-X

Demonstration : Minor instrument – clinometer, Ceylon ghat tracer, auto level, hand level, box sextant, digital planimeter & pantagraph.

2 hours

EXERCISE-XI

Use of pentagraph to enlarge the irregular boundary. 2 hours

Course Outcomes:

At the end of the course, the student will be able to:

- CO₁ Demonstrate the important concepts from Surveying–I Theory course through series of experiments (A2)
- CO₂ Determination of distances, perpendiculars, regular figures by chain and Compass and also determine the levels, profile leveling using Dumpty level (C4)
- CO₃ Share responsibility in small team of 4-5 members for operating instrument and collecting data (A4)

TEXT BOOKS:

- 1. B.C. Punmia , 'Surveying' Vol.–1, Laxmi Publications, New Delhi.
- A.M. Chandra , "Plane Surveying' Vol-1- New age International Ltd.
- ALAK , 'Plane Surveying ' –S. Chand and Company Ltd., New Delhi.

REFERENCE BOOKS :

- 1. S.K. Roy Fundamentals of Surveying -- Prentice Hall of India.
- 2. Milton O. Schimidt Wong, Fundamentals of Surveying -Thomson Learning.
- 3. S.K. Duggal, Surveying Vol. I,

FOURTH SEMESTER ENGINEERING MATHEMATICS - IV

Subject code: 15MA41	Credit : 04	
CIE : 50 Marks	SEE : 50 Marks	SEE : 03hours
Hours/Week : 4 hours. (Theory)		Total Hours : 52

Prerequisite: Engineering Mathematics - (15MA11)

Engineering Mathematics - (15MA21)

Engineering Mathematics - (15MA31)

Course objectives:

To enable the students to obtain the knowledge of Engineering Mathematics in the following topics:

- 1. Numerical methods to solve ordinary differential equations
- 2. Series solution by Frobenius method
- 3. Complex analysis and complex integration.
- 4. Probability distributions and sampling theory
- 5. Joint probability distribution and stochastic process

MODULE-I

Numerical Methods: Numerical solutions of first order and first degree ordinary differential equations—Taylors series method, modified Eulers method, Runge –Kutta method of fourth order, Adams-Bashforth predictor and corrector methods(All formulae without proof). problems.

Series solutions of ordinary differential equations and special functions : Series solution—Frobenius method, series solution of Bessel's differential equation leading to Bessel's function of first kind. Series solution of Legendre's differential equation leading to Legendre polynomials. Rodrigue's formula. problems. 10 hours

MODULE-II

Complex Variables: Function of a complex variable, limit, continuity, differentiability-Definitions. Analytic functions, Cauchy-Riemann equations in Cartesian and polar forms. Properties of analytic functions. Conformal transformation-Definition. Discussion of transformations: $W=z^2$, $W=e^z$. Bilinear transformations. problems.

Complex integration:Complex line integrals, Cauchy's theorem,Cauchy's integral formula.Taylor's and Laurent's series (Statements only).Singularities, poles, residues, Cauchy's residue theorem. (statement only).problems.11 hours

MODULE-III

Statistical Methods: Curve fitting by the method of least squares: y=ax+b, $y=a+bx+cx^2$, Correlation, Rank correlation, lines of regression and angle between two regression lines.

Probability: Addition rule, multiplication rule, conditional probability,Baye's theorem. Problems.11 hours

MODULE-IV

Random Variable: Random variable (Discrete and continous) p.d.f., c.d.f., Binomial distribution, Poisson distribution and Normal distribution. Problems.

Sampling theory : Sampling, sampling distribution, standard error. Testing of hypothesis for means. Cofidence limits for means, student's tdistribution, Chi-square distribution, test of goodness of fit. Problems.

10 hours

MODULE-V

Joint Probability Distributions and Markov Chains: Concept of joint probability distribution, discrete and continous random variables. Expectation, covariance, correlation coefficient. Probability vectors, stochastic matrices, fixed points, regular stochastic matrices. Markov chains and absorbing states. Problems. 10 hours

Course Outcomes:

On completion of this course, students are able to:

- CO1: Computation of numerical solutions to solve first and second order ordinary differential equations. (C3)
- CO2: Solve series solution of ordinary differential equations by Frobenius methods. (C3)
- CO3: Discuss complex functions.Solve bilinear transformation problems and evaluation of complex integration, compute residues and apply residue theorem to evaluate complex integrals. (C2)

CO4: Use of probability distributions and joint probability distributions .
Analyze, evaluate scientific hypothesis and theories using statistical methods. (C4)

Text Books:

- 1. Higher Engineering Mathematics by B.S.Grewal, 36th Edn.
- 2. Engineering Mathematics by N.P.Bali and Manish Goyal. Laxmi publications, latest edition.
- Higher Engineering Mathematics by H.K.Dass and Er. Rajnish Verma. S.Chand publishing 1st edition - 2011.

Reference Books:

- Advanced Engineering Mathematics by E. Kreyszig, John Willey & sons 8th Edn.
- 2. A short course in differential equations Rainvile E.D.9th Edition.
- Advanced Engineering Mathematics by R.K.Jain & S.R.K Iyengar; Narosa publishing House.
- 4. Introductory methods of numerical analysis by S.S.Sastry.

Question Paper Pattern :

- Question paper will have TEN questions.
- Each full question consisting of 20 marks
- There will be TWO full questions (with maximum of four subquestions) covering the entire entire topic under module.
- The student shall answer FIVE full questions, selecting one full question from each module.

STRUCTURAL ANALYSIS-1

Subject code: 15CV42	Credit : 04	
CIE : 50 Marks	SEE : 50 Marks	SEE : 03hours
Hours/Week : 4 hours. (Theory)		Total Hours : 52

Prerequisite: Civil Engineering Science (15CV15/15CV25) Strength of Materials (15CV33)

Course objectives:

To enable the Student to acquire the knowledge in the following topics

- 1 Determine the degree of freedom and degree of redundancy and analyse trusses.
- 2 Analysis of coplanar structures for displacements using strain energy methods.
- 3 Analysis for displacements by using classical methods and analyse the unknown reactions and internal forces in arches.
- 4 Analysis of cables and indeterminate arches, C-programming of trusses.
- 5 Analysis for moving loads.

MODULE - I

STRUCTURAL SYSTEMS: Forms of structures, conditions of equilibrium, degree of freedom, linear and non-linear structures, one, two, thoursee dimensional structural systems, determinate and indeterminate structures [static and kinematics], principle of superposition.

PLANE TRUSSES: Introduction, analysis by method of joints, analysis by method of sections. 10 hours

MODULE -II

STRAIN ENERGY: Strain energy and complimentary strain energy. Strain energy due to axial load, bending and shear, theorem of minimum potential energy, Law of conservation of energy, Principle of virtual work, the first and second theorem of Castigliano, betti's law, Clarke -Maxwell's theorem of reciprocal deflection. Numerical examples on beams, trusses, frames. 12 hours

MODULE -III

DEFLECTION OF BEAMS: Moment area method, Conjugate beam method.

ARCHES: Three hinged circular and parabolic arches with supports at same levels and different levels, Determination of thrust, shear and bending moment. 10 hours

MODULE - IV

ARCHES AND CABLES: Two hinged parabolic arch, Two hinged circular arch, Analysis of cables under point loads and UDL, length of cables (support at same levels and different levels).

DEVELOPMENT OF C-PROGRAMMING: For analysis of trusses by method of joints. 10 hours

MODULE – V

ROLLING LOADS: Rolling load analysis for a simply supported beam for several concentrated loads, Rolling load analysis for simply supported beam for fractional UDL, ILD for reaction, shear force, bending moment at a given section.

Derivation of condition for absolute bending moment under a chosen wheel load and for UDL moving on a span of a simply supported girder. Numericals on absolute maximum bending moment. 10 hours

Course Outcomes:

At the end of the course, the student will be able to:

- CO1: Describe different types of Structural systems and analyse plane trusses (C2, C3)
- CO2: Analyse, beam trusses and frames using energy principles (C4)
- CO3: Analyse, arches and cables for shear and bending moment (C4)
- CO4: Determine bending moment and shear force due to rolling loads (C3)

Extent of Teaching: Clearly mentioned in the syllabus.

CIE covers 2 Major tests, Assignments/ Class Seminar, Quizzes/class or slip test.

Pattern of Question Paper:

Two questions to be set from each module by inter-mixing the syllabus of respective module. Students have to answer any five full questions by selecting minimum one question from each module.

REFERENCE BOOKS:

- 1. K.U.Muthu atal, Basic Structural Analysis, I.K international publishing House, pvt.Ltd.
- S.S. Bhavikatti, Structural Analysis, vol-1; vikas publishing house, pvt.Ltd.
- 3. Norris and Willbur, "Elementary Structural Analysis" International student edition, McGraw Hill Co., New York.
- Reddy C.S., "Basic Structural Analysis" Tata Mcgraw Hill, New Delhi.
- 5. B.C Punmia ,R.K. Jain. "Strength of materials and theory of structures" Vol-I & II, Laxmi Publication, New Delhi.

Subject code: 15CV43	Credit : 04	
CIE : 50 Marks	SEE : 50 Marks	SEE : 03hours
Hours/Week : 3 Hrs. (Theory) + 2 Hrs. (Tutorial)		Total Hours : 52

FLUID MECHANICS-II

Prerequisite: Fluid Mechanics-I (11CV34)

Course objectives:

To enable the Student to acquire the knowledge in the following topics

- 1 Classify types of flow in open channels and design most economical sections.
- 2 Analysis of dimensions and model study by using different nondimensional numbers.
- 3 Impulse-momentum equation, its applications and force exerted by jet on various surfaces of vanes.
- 4 Types, design parameters and working principles of turbine.
- 5 Classify and describe the pumps.

MODULE-I

OPEN CHANNEL FLOW: Definition of open channels, classification, difference between pipe flow & open channel flow, types of flow, geometric properties of open channels, Uniform flow in open channels, Chezy's and Manning's formulae, Problems on uniform flow, Most economical section of open channel flow, Derivation of conditions for most economical rectangular, triangular and trapezoidal sections. Problems on most economical sections. Most economical circular channels derivations and problems, Specific energy, definitions, specific energy curve, conditions for minimum specific energy and maximum discharge, Critical flow in rectangular channels, problems Hydraulic jump in rectangular channels, derivations with Froude numbers concept. Problems of Hydraulic Jump, Venturi flume. 12 hours

MODULE-II

DIMENSIONAL ANALYSIS & MODEL SIMILITUDE: Introduction to Dimensional Analysis unit & dimensions, Table of Dimensions Dimensional Homogeneity, Methods of Analysis, Rayleigh's & Buckingham's method. Problems on Rayleigh's & Buckingham's methods, Model Studies, Introduction, Similitude, Dimensionless parameters. Types of models. Froude's models theory & problems. Reynolds models, Problems, Scale effects. 8 hours

MODULE-III

IMPACT OF JETS ON VANES: Introduction to Impulse – momentum equation and its applications, Force exerted by a jet on a fixed target, Derivations. Force exerted by a jet on a moving target, Derivations. Force exerted by a jet on a series of curved vanes. Force exerted on a by a jet on hinged plate. Concept of velocity triangles. Equation for work done & efficiency. Problems on above. 10 hours

MODULE-IV

HYDRAULIC TURBINES: Introduction, Types and classifications, Pelton Wheel, theory. Expression for work done and efficiency, design parameters. Problems on Pelton Wheel; Francis Turbine – Theory, equation for work done and efficiency, design parameters. Problems on Francis turbine, Problems on Kaplan turbine. 10 hours

MODULE - V

Draft tube theory and problems. Specific speed of a turbine, Equation for the specific speed, problems, Unit quantities of a turbine, definitions, equations and problems Characteristics curves of turbine, general layout of hydroelectric plants.

Definition of pump, difference between pump & a turbine, classification, Description & general principle of working, priming methods. Work done & efficiencies of a centrifugal pump. 12 hours

Course Outcomes:

At the end of the course, the student will be able to:

- CO1 Identify basic principles of flow through open channels and impact of jets on fluid machines.(C1)
- CO2 Analyze the flow problems by solving the examples of open channel flow and fluid machines.(C4)
- CO3 Organize computation design of conveyance system in open channels also design of fluid machines. (A4)

Extent of Teaching:

It is clearly defined in the content of the syllabus.

Pattern of Question Paper:

Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.

TEXT BOOKS:

- 1. MODI & SETH. "Hydraulics & Fluid Mechanics', Standard Book House, new Delhi.
- 2. BANSAL R.K. "Text Book on Fluid Mechanics & Hydraulic Machines" Laxmi publications.
- 3. K.R. Arora, 'Hydraulics & Fluid Mechanics', Standard Book House.

REFERENCE BOOKS

1. Streeter – Mc Graw Hill Book Company.

SURVEYING-II

Subject code: 15CV44	Credit : 04	
CIE : 50 Marks	SEE : 50 Marks	SEE : 03hours
Hours/Week : 4 Hrs. (Theory)		Total Hours : 52

Prerequisite: Surveying - I (15CV35)

Course objectives:

To enable the Student to acquire the knowledge in the following topics

- 1 Fundamental concept of Theodolite and total station with regard to measurement of angles and distances. Permanent adjustments of dumpy level and transit Theodolite.
- 2 Determine the heights and distances using principles of trigonometry and Tachometry.
- 3 Design and setout of different types of horizontal curves.
- 4 Design and setout of reverse curve, transition curve and simple types of vertical curves.
- 5 Calculation of closed traverse by Plannimeter, volume computations and capacity contours.
- 6 Introduction to Remote sensing and GIS.

MODULE-I

THEODOLITE SURVEY AND INTRODUCTION TO TOTAL STATION:

Theodolite and types, Fundamental axes of a transit theodolite, Uses of theodolite, Temporary adjustments of a transit theodolite, Measurement horizontal angles-Method of repetation and reiterations. Measurements vertical angles, Prolonging a straight line by a theodolite in adjustment and theodolite not in adjustment, Introduction to Total station, parts of total station Electronic Distance Measurement in total station and uses of total station in survey.

PERMANENT ADJUSTMENT OF DUMPY LEVEL AND TRANSIT THEODOLITE : Inter relationship between fundamental axes for instrument to be in adjustment problems on two peg method for calibration of dumpy level and step by step procedure of obtaining permanent adjustments in transit theodolite. 11 hours

MODULE-II

TRIGNOMETRIC LEVELLING: Determination of elevation of objects when the base accessible and inaccessible by single plane and double plane method, Distance and difference in elevation between two inaccessible objects by double plane method.

TACHEOMETRY : Basic principle, Types of Tachometric survey, Tacheometric equation for horizontal line of sight and inclined line of sight in fixed hair method, Application of Tacheometric methods for determing the elevation and distance of elevated objects by fixed stadia and tangential methods. Movable hair method, Subtense bar method and Beaman's stadia arc. 11 hours

MODULE-III

CURVE SETTING: Curves –Necessity-Types, Simple Curves-Elements-Designation of curves –Methods of setting out simple curves by linear methods and by using theodolite for setting out curve by Rankines deflection angle. Compound curves – elements – Design of compound curves–setting out of compound curves and problems. 11 hours

MODULE-IV

Reverse curve between two parallel straights – Equal radius – Unequal radius Transition curves – Characteristics – Length of transition curve – setting out cubic parabola and Bernoulli's Lemniscates. Vertical curves – Types – simple numerical problems. 11 hours

MODULE-V

AREAS AND VOLUMES: Calculations of area from cross staff surveying, calculations of area of a closed traverse by coordinate's method. Planimeter – principle of working and use of planimeter to measure areas, Computations of volumes by trapezoidal and prismoidal rule, Capacity contours

REMOTE SENSING AND GIS: Introduction to remote sensing – definition, classification, Idealized remote sensing system stages like Energy source, Propagation, Energy interaction, Space sensors, Transmission of data and multiple data users, Applications of remote sensing.

Introduction to GIS- definition, Objectives of GIS, Components of GIS, Application of GIS. 11 hours

Course Outcomes:

At the end of the course, the student will be able to:

- CO1 Possess a sound knowledge of all modern instruments, curves and remote sensing.(C1)
- CO2 Describe the technique for solutions in horizontal and vertical plane, curves and computation of areas and volumes.(C2)
- CO3 Calculate and design surveying applications in field. (A3)

Extent of teaching: This is clearly defined in the syllabus.

Pattern of Question paper: Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.

TEXT BOOKS:

- 1. 'Surveying' Vol 2 and Vol 3 B.C Punmia, Laxmi Publications
- 2. 'Plane surveying' S.M , Chandra New age international(p) Ltd.
- 3. 'Surveying' Vol 1 Dr K.R. ARORA Standard book house, Delhi.
- Kanetkar T P and S V kulkarni, Surveying and leveling volume 2, Pune Vidyarthi Griha Prakashan, 1988
ENGINEERING GEOLOGY

Subject code: 15CV45	Credit : 03		
CIE : 50 Marks	SEE : 50 Marks SEE : 03ho		
Hours/Week : 3 Hrs. (Th	Total Hours : 42		

Prerequisite: None

Course objectives:

To enable the Student to acquire the knowledge in the following topics

- 1 The scope of geology in terms of its academic significance..
- 2 Types of geological agents, and details of weathering of rocks.
- 3 Importance of rock forming minerals, advantage of the physical properties in identification.
- 4 Salient features of rocks.
- 5 Common types of structures such as folds, faults, joints and unconformities.
- 6 Relation between geology and geophysics.
- 7 Source of water to meet the increasing demand of water.

MODULE - I

INTRODUCTION : Definition and Branches of geology, Internal structure of the Earth and its composition. Importance of geology in civil engineering.

MINERALOGY : Definition of the mineral, difference between ore forming and rock forming minerals,. Important physical properties of the minerals, such as Colour, Streak, Lustre, Diaphaneity, Hardness, Specific gravity, Cleavage, Fracture, and Tenacity. Description of the following minerals, Quartz and its verities, Calcite, Talc, gypsum, Fluorite. Appatite. Corundum, Assebestose, Kainite, Beryl, Mica, Garnet, Barite, etc. Ore forming minerals like Hematite, Pyrolsite, Magnetite, Limonite magnsite, Gybbsite, Bauxite, Banded hematite quartzite etc. 8hours

MODULE - II

PETROLOGY: Defination of the Rocks, formation and general classification of the rocks. Igneous rocks, Sedimentary rocks & metamorphic rocks.

IGNEOUS ROCKS : Definition ,Forms, Texture, Structure, and Classification of the Igneous rocks. Description and physical properties of the following rocks. Granite, Syanite, Diorite. Dolerite, Basalt, Felsites, Pumice, Pegmatite, Trachite etc.

SEDIMENTARY ROCKS.: Definition, Structure, and Classification of the Sedimentary rocks. Description and Physical properties of the following rocks. Conglomerate, Breccias, sandstone, shale, Limestone, laterite, coal, etc.

METAMORPHIC ROCKS: Definition, Agents and kinds of metamorphic rocks . Description and physical properties of the following rocks. Gneiss, Marble, Schist, Quartzite, Slate , Charnokite , Phyllite etc. 8hours

MODULE -III

GEOMORPHOLOGY AND GEODYNAMICS: Hypo genetic and Epigenetic agents

WEATHERING: Definition, Deferent kinds of weathering with examples.

SOIL: Definition, Soil profile, Classification , Erosion, and Conservation of the Soil.

EARTHQUAKE: Causes, Effects, Classification, Concept of plate tectonics 5 hours

GEOMATICS AND ENVIRONMENTAL GEOLOGY : Application of Remote Sensing and GIS techniques in civil Engineering works. impacts of mining, Quarrying, dams reservoirs. 3 hours

MODULE - I V

STRUCTURAL GEOLOGY: Elements of structural geology, dip, strike, Clinometer compass. Description, Classification, and engineering importance of FOLDS, FAULTS, UNCONFORMITIES AND JOINTS.

5 hours

GROUNDWATER GEOLOGY: Hydrological cycle, water bearing properties of rocks .Aquifers, types of Aquifers Aquiclude, Aquitar etc. brief description about geological and geophysical methods of ground water investigation . detail study of electrical resistivity method.

5 hours

MODULE -V

GEOLOGICAL SITE INVESTIGATION: Geological consideration and brief description about Dams, Reservoirs, Tunnels, Highways, Bridges,. Rocks as materials for construction, Flooring, Foundation, Roofing Decoration, and road materials. 8 hours

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- CO1 Identify the different types of mineral Rocks. That is igneous, Sedimentary or metamorphic. (C2)
- CO2 Decide the suitable area for the particular construction with reference to their geological structures i.e folds, faults, and joints etc. (C6)
- CO3 Describe the applications of geological background to some civil engineering work, which required for the design of civil engineering work. (P2)

Text books:

- 1) Garg S.k " physical and engineering geology " Khanna publication new Delhi .
- 2) Parbin singh "Engineering and general geology" kaston publication house.
- 3) p. k. Mukharjee : a text book of geology.

Reference books :

- 1) Legeet, Geology of engineers McGraw hill company 1998
- 2) Blyth : geology of engineers ELBS 1995
- M. T. marutesh reddy " Elements of geology practical's ".new age international pvt ltd 2003
- H.H READ "rutleys Elements of mineralogy". CBS PUBLISHER 2003
- 5) Billings " Structural geology,
- 6) Pradeep kumar ghua ." Remote sensing for bingers " east west press ltd.

Pattern of the Question Papers.

Two questions to be set from each modules .students have to answer each question from every modules.

CONCRETE TECHNOLOGY

Subject code: 15CV46	Credit : 03		
CIE : 50 Marks	SEE : 50 Marks SEE : 03hou		
Hours/Week : 3 Hrs. (Th	Total Hours : 42		

Prerequisite: Engineering Chemistry 15CH12/15CH22 Building Materials & Construction (15CV36)

Course objectives:

To enable the Student to acquire the knowledge in the following topics

- 1 Hydration of cement and physical properties of cement and types of cement.
- 2 Physical properties of coarse and fine aggregate.
- 3 Design of concrete mix.
- 4 Fresh and hardened state property of concrete.
- 5 Destructive and Non-destructive testing of concrete.

MODULE-I

Cement: Manufacture of OPC by dry and wet process (Flow charts only). Oxide composition, compound composition of cement, hydration of cement, capillary pore, gel pore. Tests on cement- Fineness by sieve test and Blaine's air permeability test, normal consistency test, setting time, soundness, compressive strength of cement. Types of Cement.

07 Hours

MODULE-II

Aggregate: Coarse aggregate, importance of size, shape, texture, grading of aggregates-sieve analysis, specific gravity, moisture content, bulk density, bulking of fine aggregate, flakiness and elongation index, crushing, ten percent fine value test, impact and abrasion tests, deleterious materials. Grading requirements, practical grading, gap grading. 07 Hours

MODULE-III

Concrete Mix Design: Factors to be considered in mix design, different methods of mix design. Mix design by IS method and Current British method. 05 Hours

Fresh Concrete:Workability- factors affecting, measurement ofworkability-slump, compaction factor, Vee-bee consistometer, flow tests.Segregation and bleeding, mixing, placing and compaction.Curing andmethods of curing, accelerated curing.05 Hours

MODULE-IV

Fresh Concrete: Chemical admixture-plasticiser, superplasticiser, accelerators, retarders and air entraining agents. Mineral admixtures-fly ash and silica fume.

Hardened Concrete: Factors affecting strength- w/c, degree of compaction, age, agg/cement ratio, aggregate properties, maturity concept. Elasticity, factors affecting modulus of elasticity, relation between modulus of elasticity and Poisson's ratio.

Shrinkage-types of shoursinkage, factors affecting Shrinkage. Creepfactors affecting creep, effect of creep. Durability-importance, permeability, sulphate attack, chloride attack, carbonation, freezing and thawing. Factors contributing to cracks in concrete-plastic, Shrinkage, settlement cracks, construction joints. 10 hours

MODULE-V

Testing: Relation between tensile strength and compressive strength. Destructive testing-compressive strength, flexural strength, split tensile strength, factors influencing strength test results. Failure criteria, fracture mechanics. Non destructive testing-types, principles, application and limitations of rebound hammer and ultrasonic pulse velocity tests.

08 Hours

Course OutCome:

At the end of course student will be able to

- CO1 Identify good quality materials such as cement, fine aggregate and Coarse aggregate thoursough quality control tests for concrete.(c2)
- CO2 Identify good quality materials such as cement, fine aggregate and Coarse aggregate thoursough quality control tests for concrete.(c2)
- CO3 Understand the behavior of fresh concrete and Select proper method to produce good quality concreting work.(c3)

CO4 Understand the behavior of hardened concrete and durability requirements of concrete.(P1)

Extent of teaching: This is clearly defined in the syllabus.

CIE covers 2 Major tests, Assignments/ Class Seminar, Quizzes/class or slip test.

Pattern of Question Paper: Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.

Reference Books "

- 1. Neville A.M. and Brooks J.J. "Concrete Technology", ELBS edition, London.
- Neville A.M. "Properties of concrete", Darling Kinderslay (India) Pvt. Ltd.
- 3. Shetty M.S. "Concrete Technology theory and Practice", S. Chand and company, New Delhi, 2002.
- 4. Gambir M.L. "Concrete Technology", Dhanapat Rai and Sons, New delhi.

ENGINEERING GEOLOGY LAB

Subject code: 15CV47	Credit : 01		
CIE : 50 Marks	SEE : 50 Marks SEE : 03h		
Hours/Week : 2 Hrs. (Pra	Total Hours : 28		

Prerequisite: Engineering Geology (15CV45)

Course objectives:

To enable the Student to acquire the knowledge in the

- 1 Various types, of minerals with their physical properties..
- 2 Various types of Rocks, and their Physical properties.
- 3 Dip and strike of various structural features..
- 4 Drawing the geological section maps.
- 1) HARDNESS TEST

03 Hours

2) DETAIL STUDY AND THE PHYSICAL PROPERTIES OF THE FOLLOWING MINERALS .

Rock forming minerals Quartz and its verities, Feldspar and its verities, Gypsum, Calcite, Flourit, Apatite, Topaz, Corundum, Beryl, Asbestoses, Kyanite, Biotite, Muscovite, Talc, Kaolin, Garnet,

Ore forming minerals, such as Hematite, Magnetite, Magnasite, Limonite, Gibbsite, Chalcopyrit, Pyrite, Chromites, Pyrolsite, Psyllomelane, Bauxite, Banded hematite quartzite, Graphite.

6 Hours

3) DETAIL STUDY AND THE PHYSICAL PROPERTIES OF THE FOLLOWING ROCKS IN HAND SPECIMENS .

IGNEOUS ROCKS: Description and engineering uses of the following rock. Granite, Syanite, Dolerite, Diorite, Felsite, Trachyte, Pumice, Basalt, Pegmatite, Ryolite . etc 03 Hours

SEDIMENTARY ROCKS : Description and engineering uses of the following rock. Limestone, Sandsone, Laterate, Shale, conglomerate, Breccias etc. 03 Hours

METAMORPHIC ROCKS : Description and engineering uses of the following rocks . Marble, Schist, Quartzite, Slate, Genesis, Phyllite, Charnokite etc. 03 Hours

- 4) DIP AND STIKE PROBLEMS. 06 Hours
- 5) THICKNESS PROBLEMS.
- 6) THREE POINT BHOREHOLE PROBLEMS. 06 Hours
- 7) GEOLOGICAL SECTION MAP DRAWING 09 Hours

Course Outcomes:

At the end of the course, the student will be able to:

- CO₁ Demonstrate the important concepts from Engineering Geology Theory course through series of experiments (A2)
- CO2 Determination of Physical properties of Rock forming minerals, Ore forming minerals, Igneous Rocks, Sedimenatary Rocks and Metamorphic Rocks
- CO₃ Share responsibility in small team of 4-5 members for operating instrument and collecting data (A4)

SURVEYING PRACTICE – II LABORATORY

Subject code: 15CV48	Credit : 1.0		
CIE : 50 Marks	SEE : 50 Marks SEE : 03hou		
Hours/Week : 2 Hrs. (Pra	Total Hours : 28		

Prerequisite: Surveying - II (15CV35)

Course objectives:

To enable the student to acquire the knowledge in the following topics.

- 1 Measurement of horizontal and vertical angles using Theodolite
- 2 Determine the elevation of object
- 3 Determine constants of tachometer, horizontal and vertical distance using Tachometer
- 4 Setout of simple circular curve using different methods and setout of compound curve using Theodolite
- 5 Introduction to Total Station, measurement of distance and elevation of given point
- 6 Demonstration of finding RDM, REM and traversing using Total station

03 Hours

7 Determine area of irregular figure using digital plannimeter and demonstration of GPS instrument.

EXERCISE-I

- a) Measurement of horizontal angles with method of repetition & reiteration using theodolite.
- b) Measurement of vertical angles using theodolite. 02 hours

EXERCISE-II

To determine the elevation of an object using single plane method when base is inaccessible. 02 hours

EXERCISE-III

To determine the elevation of an object using double plane method when base is inaccessible. 02 hours

EXERCISE-IV

To determine the tachometric constants using horizontal & inclined line of sight. 02 hours

EXERCISE-V

Determine the horizontal & vertical distance by stadia principle of tacheometer. 02 hours

EXERCISE-VI

To set out simple curves using linear methods by

- 1. Perpendicular offsets from long chord & 02 hours
- 2. Offsets from chords produced.

EXERCISE-VII

To set out simple curves using Rankine's deflection angle methods.

02 hours

02 hours

EXERCISE-VIII

To set out compound curve by angular method using theodolite only. 02 hours

EXERCISE-IX

Introduction to total station- centering, levelling, various functions & part of the instrument-Demonstration. 02 hours

EXERCISE-X

Demonstration of finding the 1) distance of a given point 2) elevation of a given point. 02 hours

EXERCISE-XI

Demonstration of finding the

1) Distance between 2 inaccessible points using RDM in total station

 Finding the height of a given inaccessible point using R.E.M by total station.
 02 hours

DEMONSTRATION-XII

Exposure of use of total station for traversing & using relevant software for preparation of the contour drawings. 02 hours

EXERCISE-XIII

Determine the area of irregular figure by using Digital planimeter. 02 hours

EXERCISE-XIV

Demonstration of GPS instrument.

Course Outcomes:

At the end of the course, the student will be able to:

- CO₁ Demonstrate the important concepts from Surveying-II Theory course through series of experiments (A2)
- CO₂ Determination of horizontal and vertical distances, setting out horizontal curves by Theodolite and Total station (C4)
- CO₃ Share responsibility in small team of 4-5 members for operating instrument and collecting data (A4)

TEXT BOOKS:

- 1. C. Punmia , 'Surveying' Vol.-1& II, BLaxmi Publications, New Delhi.
- A.M. Chandra "Plane Surveying' Vol-1-, New age International ®Ltd.
- 3. ALAK , 'Plane Surveying ' –S. Chand and Company Ltd., New Delhi.

REFERENCE BOOKS :

- 1. S.K. Roy **Fundamentals of Surveying** -- Prentice Hall of India.
- Milton O. Schimidt Fundamentals of Surveying --Wong, Thomson Learning.
- 3. S.K. Duggal Surveying Vol. I & II,

02 hours

FLUID MECHANICS LAB

Subject code: 15CV49	Credit : 1		
CIE : 50 Marks	SEE : 50 Marks SEE : 03hou		
Hours/Week : 2 Hrs. (Pra	Total Hours : 28		

Prerequisite: Fluid Mechanics - I (11CV34)

Fluid Mechanics - II (15CV43)

COURSE OBJECTIVES

To enable the student to acquire the knowledge in the following topics.

- 1 Calibration of various Notches
- 2 Calibration of plug sluice4. Broad crested and Ogee weir
- 3 Determination of constants of Parshall flume, minor losses through pipes and friction through pipes
- 4 Determination of hydraulic coefficients of small circular orifice and external cylindrical mouth piece.
- 5 Determination of coefficient of discharge of venturimeter and study of performance of centrifugal pump.

EXERCISE-I

1.	Calibration of rectangular notch.	2 hours
	EXERCISE-II	
2.	Calibration of triangular notch	2 hours
3.	EXERCISE-III Calibration of Cippoletti notch	2 hours
	EXERCISE-IV	
4.	Calibration of broad crested weir	2 hours
	EXERCISE-V	
5.	Calibration of ogee weir	2 hours
	EXERCISE-VI	
6.	Calibration of plug sluice	2 hours
	EXERCISE-VII	
7.	Determination of constants of Parshall Flume	2 hours

	EXERCISE-VIII	
8.	Determination of minor losses through pipes	2 hours.
	EXERCISE-IX	
9.	Determination of hydraulic coefficients of small circular	orifice 2 hours
	EXERCISE-X	
10.	Determination of Friction has through pipes	2 hours
	EXERCISE-XI	
11.	Determination of hydraulic coefficients of external cylindri	cal mouth
	piece.	2 hours
	EXERCISE-XII	
12.	Determination of coefficient of discharge of Venturimet	er.2 hours
	EXERCISE-XIII	
13.	Study of performance of centrifugal pump.	2 hours
	EXERCISE-XIV	
14.	Study of performance of Francis Turbine.	2 hours
	or	
15.	Study of performance of Pelton Wheel Turbine	2 hours
	EXERCISE-XV	
16.	Demonstration of open channel flow	2 hours
Cour	se Outcomes:	

At the end of the course, the student will be able to:

- CO₁ Demonstrate the important concepts of Fluid Mechanics-I and Fluid Mechanics-II theory course through series of experiments (A2)
- CO₂ Determination of coefficient of discharge 'C' of rectangular notch /weir, triangular notch, Cippolletti notch, Ogeeweir, plugsluice, Constants of parshall flume, venturimeter, mouthpiece, losses through pipes, performance test on pump and turbine
- CO₃ Share responsibility in small team of 4-5 members for operating instrument and collecting data (A4)

CURRICULUM

FOR THE ACADEMIC YEAR 2018-19

DEPARTMENT OF CIVIL ENGINEERING

V AND VI SEMESTER B.E.



H. K. E SOCIETY'S

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING (An autonomous college under VTU) KALABURAGI

About the institution

Poojya Doddappa Appa College of Engineering was the first institution established by the Hyderabad Karnataka Education Society in 1958 by Sri. Mahadevappa Rampure, with an aim to impart quality education to the youth of Hyderabad Karnataka region. The college is spread over 71 acres of land and has sprawling complex housing student activity center, 1000 seat capacity auditorium and gardens and greenery around.

At present the total intake of the Institute stands at 980 in 11 UG programmes, 193 in10 PG programmes and 197 Research Scholars pursuing their Ph.D. in 12 Research centres. UGC has approved the academic Autonomy from 2009-10 to 2014-15 and extended up-to 2018-19. College has been declared fit under section 2(f) and 12 (B) of UGC Act1956. The Institute has been awarded with Bharatiya Vidya Bhavan National Award for an Engineering College having Best Overall Performance for the year 2017 by ISTE (Indian Society for Technical Education).

The College receives grant in aid funds from State Government for five departments. A number of research projects have been funded by MHRD/AICTE which includes also funds for modernization of laboratories. The institute is one among nine Institutions identified by Ministry of ITBT, Govt. of Karnataka for setting-up Incubation Centre. Innovative ideas of the students are encouraged to be translated into commercial products for the benefit of society. A fund of Rs.3 Lakh per project is being financed by Ministry of ITBT, Govt. of Karnataka. The institute is declared as the best NAIN Centre for submitting ten innovative projects for 2016. Several UG student projects are funded by Karnataka State Council for Science and Technology every year.

The college has got a central library facility which houses also a separate digital library with 40PCs. The library has got large collection of books along with e-journals which is upgraded every year by allocation of necessary funds. Training & Placement Computer Centre with 120 Core i5 systems with LCD Screen has been setup to provide facility for conducting Training, Workshops, Seminars, Conferences, Online examination etc. Separate hostel facility is provided for boys and girls. An exclusive Examination Centre housing state of the art facilities has been constructed. 100Mbps internet facility and wi fi facility are provided for the students. The student activity center houses sports facilities, canteen facility and three seminar halls.

The college has acquired autonomous status for both UG and PG programs since 2007-08 and is one among six colleges in Karnataka State to acquire the autonomous status for both UG and PG programs. The college is one among 14 colleges selected under TEQIP scheme, sponsored by World Bank. The college is selected for TEQIP-III as Mentoring Institution for BIET, Jhansi, UP by NPIU New Delhi.

The Institute, taking the advantage of academic autonomy, believes in preparing the students through OBE adopting Choice Based Credit System (CBCS) and Continuous Assessment and Grading Pattern of examination. Also a one year diploma course in Interior design has been started by the Architecture department. The curriculum is framed with wide interaction with alumni and Industry resource persons so as to impart necessary updated skills in the students.

Highly qualified and dedicated human resource, state of the art facilities, effective institute-alumni and industry-institute interaction make the learning process a unique and satisfying experience at Poojya Doddappa Appa College of Engineering.

About the department

Our College has started with Civil Engineering branch 58 years old branch.Department started with a intake of 60 in the year 1958, enhanced to 90 in the year 1994 and further enhanced to 180 in the year 2014.Department has also started Post graduates courses in Environmental Engineering and structural Engineering in the year 1985 and 1992 respectively with intake of 18 each.

Civil Engineering branch consists of faculty with various specilisations (such as Structural Engineering, Environmental Engineering, Water resource Engineering, Geotechnical Engineering, Transpotation Engineering, and Concrete and Material).

Many of our faculty obtained their Master's and Ph.D degree from reputed institutes such as NIT, IIT etc. Average experience of the faculty is 25 years. With the continuous support and encouragement of our management Civil Engineering Department laboratories are well equipped with latest equipments and necessary software's.

Because of this Civil Engineering Department is identified as Research Centre by VTU Belgaum in the year 2002. Six research scholars completed their Ph.D from Civil Engineering Department and 30 research scholars are pursuing their Ph.D.Faculty members have published papers in reputed national and international Journals and also presented papers abroad.

Civil Engineering Department is regularly organizing workshop and short term courses and conferences for engineers and faculty members from engineering colleges topic related to latest development in the field of civil engineering. Civil Engineering Department has procured research grants from AICTE, VGST and KSCST. Some of our UG projects are identified as good projects and selected for state level presentation by IISC expert committee.

Most of our aluminees have occupied higher positions in government and private sector within the country and abroad.

Apart from regular academic work, to strengthen industry and institute interaction and also to contribute to social cause, Civil Engineering department is doing consultancy work such as Material testing Soil, Cement, Aggregate, Steel, Water, Sewage, Mix design of Concrete, Pavement design, structural design for Government and Private works.

Department is conducting NDT tests and issue of Stability certificate for private and Government works since from past 25 years. Because of the lab facilities and availability of expertise service, our department is identified as nodal centre for PMGSY Project in northern part of Karnataka.

Vision of the institution

To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels

Mission of the institution

- By creating an engineering workforce with an enduring commitment towards technical, ethical and ecological values.
- By promoting scientific and technical temperament in the institute.
- By inculcating innovative teaching-learning process to meet the academic, industrial and entrepreneurial needs.
- By engaging in collaborative work with industries and premier institutions resulting in technology-exchange, research, consultancy and community service.
- By enriching the relationship with alumni for overall development of the institute.

Vision of the department

To impart technical knowledge and skills in the civil engineering field to meet social, industrial, environmental and research needs at local and global level

Mission of the department

- By providing technical education to meet challenges in the profession through a well structured curriculum.
- By inculcating innovative and research ideas for sustainable development with ethical background.
- By imparting effective communication and entrepreneurial skills.
- By enhancing industry institute and alumni interaction at local and global levels

Program Educational Objectives (PEOs)

- **PEO1**: Provide good foundation in mathematics, scientific and engineering fundamentals required to solve civil engineering problems.
- **PEO2:** Enable graduates to exhibit their knowledge and skills of recent practices in civil engineering disciplines.
- **PEO3:** Graduates are able to conduct and interpret results in basic sciences, technical & engineering related laboratories / experiments.
- **PEO4:** Enable the graduate for higher education, successful career and lifelong learning.
- **PEO5:** Enable graduates to have good communication, entrepreneurial skills, work in teamunderstanding the values of professional ethics.
- **PEO6:** Enable graduates identify and solve engineering problems using modern techniques for employability.

PROGRAM OUTCOMES(POs):

- 1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write

effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

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

PROGRAM SPECIFIC OUTCOMES

- Graduates of this programme will demonstrate good knowledge in civil engineering field such as structural engineering, Water resource engineering, environmental engineering, transportation engineering, laboratory investigations along with good foundation in basic science.
- Graduates will plan ,conduct survey produce drawing and prepare estimate along with construction aspects of civil engineering infrastructure.
- Graduates will execute the project economically, communicate effectively with client and use modern tools in the infrastructural work.

Code No.	Course	Hours/Week				Maximum Marks		n Marks
		Lecture	Tutorial	Practical	Credits	CIE	SEE	Total
		THEORY						
16HU51	INTELLECTUAL PROPERTY RIGHTS	2		0	2	50	50	100
16CV52	STRUCTURAL ANALYSIS – II	3	2	0	4	50	50	100
16CV53	GEOTECHNICAL ENGG – I	3	2	0	4	50	50	100
16CV54	DESIGN OF R.C.C STRUCTURES	3	2	0	4	50	50	100
16CV55	ENVIRONMENTAL ENGG – I	3		0	3	50	50	100
16CV564	MECANIZATION IN CONSTRUCTION	3		0	3	50	50	100
16HU01	APTITUDE TRAINING-I	1		0	1	50	50	100
		PRACTICAL	-					
16CV57	GEOTECHNICAL ENGINEERING LAB	0	0	2	1	50	50	100
16CV58	CONCRETE LAB	0	0	2	1	50	50	100
16CV59	ENVIRONMENTAL ENGG LAB	0	0	2	1	50	50	100
	TOTAL	18	06	06	24	450	450	900

SEMESTER V

16CV564 - MECANIZATION IN CONSTRUCTION

16CV561 – ECOLOGY AND ENVIRONMENT 16CV562 – ADVANCED SURVEYING 16CV563 – ALTERNATIVE BUILDING MATERIALS

SEMESTER VI

Code	Course	Hours/Week				Maximum Marks		m Marks
No.		Lecture	Tutorial	Practical	Credits	CIE	SEE	Total
		THEORY						
16CV61	ENVIRONMENTAL ENGG – II	3		0	3	50	50	100
16CV62	TRANSPORTATION ENGG – I	3		0	3	50	50	100
16CV63	GEOTECHNICAL ENGG – II	3	2	0	4	50	50	100
16CV64	WATER RESOURCES ENGG.	4		0	4	50	50	100
16CV654	ELECTIVE – II	3		0	3	50	50	100
16CV66x	ELECTIVE – III	3		0	3	50	50	100
16HU02	APTITUDE TRAINING-II	1		0	1	50	50	100
PRACTICAL								
16CV67	EXTENSIVE SURVEY PROJECT*	2	4	0	4	50	50	100
16CV68	HIGHWAY MATERIAL TESTING LAB	0	0	2	1	50	50	100
	TOTAL	22	02	06	26	450	450	900

* THIS HAS TO BE CONDUCTED DURING VACATION BETWEEN $\mathbf{5}^{\text{TH}}$ & $\mathbf{6}^{\text{TH}}$ semester

16CV65x -ELECTIVE – II

16CV651 – MATRIX METHODS OF STRUCTURAL ANALYSIS 16CV652 – DESIGN OF MASONRY STRUCTURES 16CV653 – RURAL WATER SUPPLY AND SANITATION 16CV654 – REMOTE SENSING & GIS

16CV66x -ELECTIVE –III

16CV661 – DESIGN OF PRESTRESSED CONCRETE STRUCTURES

16CV662 – THEORY OF ELASTICITY

16CV663 – PAVEMENT MATERIALS AND CONSTRUTION

Course Title: INTELLECTUAL PROPERTY RIGHTS					
Subject Code	16HU51	CIE: 50			
Number of Lecture Hours/Week	2 (Theory)	SEE: 50			
Total Number of Lecture Hours	28	SEE Hours: 03			
Prerequisite: None					
To enable the students to Managerial Accounting i 1. Meaning, Types, s Management of 2. Meaning, essentia of Industrial Des 3. Introduction, Ne of Cyber Crime a Secrets and Trac	 Course objectives: To enable the students to obtain the basic knowledge about Entrepreneurship and Managerial Accounting in the following topics:- Meaning, Types, surrender, revocation, restoration, Infringement, Management of a Patent and Procedure for obtaining Patent. Meaning, essential requirements, procedure for registration and Infringement of Industrial Designs, Copyright, Trademark and Geographical Indications Introduction, Need, importance, Provision of Cyber law. Meaning, Types of Cyber Crime and Computer related crimes. Introduction to Trade 				
M	Modules Teaching Hours				
MODULE - I Introduction: Basic Conce Classification of IP, Need f Iaw, WIPO- Objectives an Development in IP.	05 Hours				
MC Patents: Meaning of a Patentable Invention. Type Procedure for obtaining revocation & restoration Patents and related Management	05 Hours				
MO	DULE - III				
Industrial Design and Copy	/ Right:				
Introduction to Industrial	06 Hours				

entitled to seek Registration, Procedure for Registration of	
Designs,	
Meaning of Copy Right. Characteristics of Copyright. Who is Author, various rights of owner of Copyright. Procedure for registration. Publication and term of copyright. Infringement of Copyright. Software Copyright	
MODULE – IV	
Trade Marks and Geographical Indications: Definition of	06 Hours
Trade Mark. Characteristics of Trade Mark, Essential for a	
good Trade Mark, Functions of Trade Mark. Term of Trade	
Mark. Service Marks, Collective Marks, Certification Trade	
Marks, Well known Trade Marks and Internet Domain	
Name, Trade Dress. Rights of Trade Marks Holder.	
Infringement of Registered Trademark.	
Geographical Indications (GI)- Characteristics of Geographical Indications, Indian Geographical Indications, Difference between GI & Trade Mark. Registration of Geographical Indications	
MODULE – V	
Cyber law and other forms of IP :Cyber law introduction, Definition of Cyber Crime, Cyber Crime Types- Credit & Debit Cards fraud, Theft of FTP Passwords, Web Jacking etc. Hacking, Ethical Hacking. Need and Importance for Cyber law, Cyber law Provision in India, Computer related crimes covered under Indian Penal Code and Special laws, Cyber law and Information Technology Act 2000.Introduction to Trade Secrets and Traditional Knowledge	06 Hours
Question paper pattern: i) Two questions are to be	set from each module.
ii) Total five questions are to be answered by selecting minimeach module	num one question from
Text books: 1. Dr. M.K. Bhandari" Law relating	to Intellectual property".
2. Dr. R Radha Krishna and Dr. S Balasul	oramanain "Text book of
Intellectual Property Right".	
3. P Narayan "Text book of Intellectual Property	y Right".

1. **Reference Books:** Dr. Anant D Chinchure " Cyberspace Cyber law & Cyber Security"

www.wipo.int

www.ipindia.nic.in

E books and online course materials: www.civilenggbooks.com

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Explains the basic concept, classification,	
		History about IPR and their Protection C 2	C2
	CO2	Describe about Patent with regard to	C3
		Concepts types, registration, surrender,	
		revocation, restoration,	
		Infringement, Management C 2	
	CO3	Describe aboutIndustrial Designs and	C3
		Copyrightwith regard toMeaning, essential	
		requirements, procedure for registration	
		and Infringement C 2	
	CO4	Describe aboutTrademark and	C3
		Geographical Indicationswith regard to	
		Meaning, essential requirements,	
		procedure for registration	
		andInfringement. C 2	
	CO5	Explains the basic concept,Need,	
		importance, Provision of Cyber law. Explain	C2
		the Meaning and Types of Cyber Crime,	04
		Computer related crimes, Trade Secrets	
		and Traditional Knowledge.	

Course Title: STRUCTURAL ANALYSIS – II				
Course Code		16CV52	CIE: 50	
Number of Lecture Hours/Week		3hrs. (Theory) + 2hrs. (Tutorial)	SEE: 50	
Total N Lectu	Number of re Hours	42	SEE Hours: 03	
Prerequisi	te: Elements of	erials & Structural analysis- I		
 To enable the student to acquire the knowledge in the following topics. 1. Analysis of continuous beams and portal frames by slope def moment distribution, Kani's and Matrix methods of Analysis. 2. Analysis of pin jointed redundant frames. 3. Basics of structural dynamics and SDOF vibration. 				
Modules			Teaching Hours	
	M			
Slope Deflection method:				
1.1	Introduction			
1.2	Sign convention	on		
1.3	Development	of slope deflection equations	8 hours	
1.4	Analysis of without trans	continuous beams (with and atory motion of joints)	o nours	
1.5	Analysis of p frames with a column heads	oortal frames (Only orthogonal nd without translatory motion of)		
Moment Distribution Method				
2.1 Introduction				
2.2	Definition of t	erms	8 hours	
2.3	Development	of the method		
2.4	Analysis of co	ntinuous beams (with & without		
	translatory mo	otion of joints)		
2.5	Analysis of no	n sway type of frames		
Analysis of	sway type of or	thogonal portal frames		

Modula III	
Kani's Method of analysis	
3.1 Introduction	
3.2 Development of the method	
3.3 Analysis of continuous beams (with & without	- 1
translatory motion of joints)	8 hours
3.4 Analysis of non sway portal frames	
3.5 Simplified analysis of symmetrical portal &	
multistoried frames (only upto two stories)	
without lateral sway	
Analysis of portal frames with lateral sway (due to	
unsymmetrical vertical loading only)	
Module IV	
Introduction To Matrix Methods	
Structure Stiffness Method	
4.1 Fundamentals of the Stiffness Method	
4.2 Equivalent joint loads	
4.3 Displacement, Transformation matrix	
4.4 Member Stiffness matrix, Total stiffness or System	
stiffness matrix.	
4.5 Concept of Direct stiffness method and application	8 hours
to continuous beam (D.O.F.d" 3)	
Structure Flexibility Method	
4.6 Fundamentals of Flexibility Method	
4.7 Element Flexibility matrix	
4.8 Principle of contragradience, and force	
Transformation Matrix,	
4.9 Member flexibility Matrix.	
4.10Application to continuous beam (Static Indeterminacy d" 3)	
Module V	
Structural Dynamics	
5.1Introduction,	
5.2Brief History of structural Dynamics	8 hours
5.3Some Basic Definitions	
5.4Vibration of Single degree of Freedom system,	
Undamped, Damped, Free Vibrations	

5.5	Logarthmatic [Decrement.			
R	Redundant Frames:				
5.6	5.6 Introduction				
5.7 deg	5.7 Analysis of Trusses (Redundant upto second				
5.8 Stre	sses due to error	in length (Up to two members)			
Questi	on paper pattern	:			
i) Two (ii) Total	questions are to be five questions are	set from each module. to be answered by selecting mi	nimum one question from		
each mo	odule				
Text be	ooks: None				
1. 2.	 Reference Books: 1. Strength of materials Vol-II – B.C.Punmia 2. Advanced structural analysis – Ashok K Jain 				
3.	Theory of structure	s – S. Ramamrutham			
4.	Intermediate structural analysis – C. K. Wang.				
5.	Matrix methods of Structural Analysis — Pandit and Gupta				
6.	Vibrations, Dynamics and Structural Systems – Madhujit Mukhopadyaya.				
7.	7. Structural Dynamics – Mario Paz, CBS Publishers New Delhi.				
8.	Basic structural ana	ilysis – C.S. Reddy			
E book	s and online cour	rse materials: <mark>www.civilenggb</mark>	ooks.com		
Course	outcomes:				
On con	npletion of the co	urse, the student will have the	e ability to:		
Course Code	e CO #	Course Outcome (CO)	Blooms Level		
	CO1	Analyze indeterminate beams	and portal		
		frames slope deflection,	moment C4		
		distribution for gravity and late	ral loading.		
	CO2	Analyze indeterminate beams	and portal C4		
		frames by moment distribution	method for		
		gravity and lateral loading			

CO3	Analyze indeterminate beams and non sway & sway(due to unsymmetrical vertical loading only)type portal frames by kani's method.	C4
CO4	Analyze indeterminate beams and portal frames by Matrix methods of Analysis	C4
CO5	Analyze redundant pin jointed frames and explain the basics of structural dynamics and SDOF vibration.	C4

Course Title: GEOTECHNICAL ENGINEERING – I				
Course Code	16CV53	CIE: 50		
Number of Lecture Hours/Week	3hrs. (Theory) + 2hrs. (Tutorial)	SEE: 50		
Total Number of Lecture Hours	42	SEE Hours: 03		
Prerequisite: Engineering	geology			
 Course objectives: To enable the student to acquire the topics. 1. Understand basic properties of soil 2. Use standard methods to classify soils 3. Determine compaction ,permeability of soil. 4. Understand the structure and minerals of th 5. Develop an understanding of Shear strength 		knowledge in the following e soil. of soil.		
Modules	Teaching Hours			
INTRODUCTION : Definition, origin and formation of soil, Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Moisture content, Specific gravity , Bulk density, Dry density, Saturated density, Submerged density and their inter relationships and Density index. Field identification of soils.		04 Hrs		
INDEX PROPERTIES OF SO : Index properties of soils- Particle size distribution, insitu density, Activity Thixotropy of clay and determination of index pri by Pycnometer /density distribution (Sieve analysis Liquid Limit- Casagrande Plastic limit and shi	06 Hrs.			

MODULE-II	
CLASSIFICATION OF SOILS : Particle size classification – MIT classification and IS classification, Textural classification. Unified soil classification and IS classification - plasticity chart and its importance.	03 Hrs
assumption and validity, coefficient of permeability and its determination (laboratory), factors affecting permeability, permeability of stratified soils, Seepage velocity, Superficial velocity and coefficient of percolation, effective stress concept-total pressure and effective stress, quick sand phenomena, Capillary Phenomena.	05 Hrs
MODULE-III	
CLAY MINERALOGY AND SOIL STRUCTURE : Single grained, honey combed , flocculent and dispersed structures, Valence bonds Soil-Water system, Electrical diffuse double layer ,adsorbed water,base-exchange capacity. Common clay minerals in soil and their structures- Kaolinite, Illite	04 Hrs
COMPACTION OF SOILS DEFINITION : Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control-proctor needle.	04 Hrs
MODULE-IV CONSOLIDATION OF SOILS : Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory, assumption and limitations. Normally consolidated, under consolidated and over consolidated soils. Preconsolidation pressure and its determination by casagrande's method and loglogmethod. Laboratory one dimensional consolidation test. Determination of consolidation characteristics of soils-compression index. and coefficient of consolidation, Determination of coefficient of consolidation by square root of time fitting method and logarithmic time fitting method. MODULE-V	08Hrs
SHEAR STRENGTH OF SOIL : Concept of shear strength, Mohr's strength theory, Mohr-coulomb theory, measurement of shear parameters. Direct shear test, unconfined compression test, Triaxial compression test and vane shear test. Test under different drainage conditions. Conventional and modified failure envelops. Total and effective shear strength parameters, factors affecting shear strength of soils.	08Hrs

Question paper pattern: :

i) **Two** questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module

- 1. **Text books:** Dr.V.N.S. Murthy, "Soil Mechanics and Foundation Engineering" Sai Tech Publishers, Chennai.
- 2. Dr B.C Punmia., "Soil Mechanics and Foundation Engineering" Laxmi Publications Private Ltd. New Delhi.
- 3. Iqbal.H.Khan, "Text Book of Geotechnical Engineering" 2nd edition, PHI,India (2005).
- 4. Dr. K.R. Arora, "Soil Mechanics and Foundation Engineering" standard Publishers and Distributors, Delhi.
- 1. **Reference Books:** Braja. M. Das, "Principles of Geotechnical Engineering"
- 2. Dr. C.Venkataramaiah, "Geotechnical Engineering" New age Publications.
- 3. Gopal Ranjan and A.S.R. Rao, "Basic and Applied Soil Mechanics" New age international (P) Ltd., New Delhi, 2nd edition, (2000).

E books and online course materials: <u>www.civilenggbooks.com</u>

Course Code	CO #	Course Outcome (CO)	Blooms Level
CO1	CO1	Determine the index properties of soil	(C4)
	CO2	Apply the principal of flow of water through the soil and also classify the soil	(C3)
	CO3	Explain the importance of clay mineralogy in soil structure and determine the density of soil by compaction	(C4)
	CO4	Determine the consolidation parameters and settlement of soil due to consolidation	C4)
	CO5	Analyze the shear strength of soil for various site conditions.	(C4)

Course Title: DESIGN OF R.C.C STRUCTURES			
Course Code	16CV54	CIE: 50	
Number of Lecture Hours/Week	3hrs. (Theory) + 2hrs. (Tutorial)	SEE: 50	
Total Number of Lecture Hours	42	SEE Hours: 03	
Prerequisite: Elements of	civil engineering ,Strength of mat	erials & Structural analysis- I	
and Concrete technology.			
 Course objectives: To enable the student to acquire the knowledge in the following topics: Basic concepts of RCC, Working Stress method, Limit state method Design of beams, slabs, staircases, columns and isolated column footing using LSM Serviceability requirements 			
Modules Teaching Hours			
Introduction: Basic cond Methods and design philos Stress – Strain behavior stress method (Elastic th Transformed Area conce design, Characteristic load strength and design strength and design strength and design strength and flanged sections, Nur rectangular, flanged section	09 Hrs.		
Limit State of Collapse – S R.C. Sections, Limit State of development length and Numerical examples. Lin deflection, Computation deflection for Singly Reinfo I.S.456-2000. Limit state Control of cracking and co IS 456-2000 for Singly Rein	08Hrs.		
Design of beams, Code beams, cover to reinforce curtailment and splicing	08Hrs.		

reinforced rectangular beams(singly & doubly) with detailing. (Cantilever & Simply supported). Design of flanged beams with detailing.			
MODULE-IV			
Design of slabs, Introduction, General aspects in the design			
of slabs, Design & detailing of rectangular slabs spanning in			
one direction (Simply supported and Continuous) as per IS :			
456-2000, Design & detailing of rectangular slabs spanning			
in two directions (Simply supported and Continuous) as per	08Hrs.		
IS : 456-2000, Design & detailing of Cantilever slabs.			
Design of staircase, Introduction, Structural behavior of staircases, Loads and distribution of load on staircases as per IS : 456-2000, Design & detailing of staircases (Dog legged, Open well type), Design concepts of Free Standing Stair cases			
MODULE-V			
Design of columns, Introduction, Limit state of compression, Minimum eccentricity, slenderness limits, Code provisions for reinforcement & detailing, Design & detailing of short axially loaded columns (Square & Rectangular and circular), Design & detailing of short columns under axial load with uniaxial bending and axial load with biaxial bending using SP-16 (Square & Rectangular sections). Design of footing, Introduction, types of footing, Structural behavior of footing, selection of types of footing, Footing shapes & size, Reinforcement requirement as per IS : 456 : 2000, Design & detailing of Isolated footing).	09Hrs.		
Question paper pattern: i) Two questions are to be set from each module.			
ii) Total five questions are to be answered by selecting n	ninimum one question from		
each module.			
Text books:			
Reference Books: 1. N.Krishna Raju " Design of reinforced concrete stru	uctures, CBS publishers and		
distributors, New Delhi			

- 2. Unnikrishanan and devdas menon "Design of reinforced concrete structures" PHI, New Delhi
- 3. Park and paulay "Reinforced Concrete ", Jhon Wiley & sons
- 4. Kong and Evens "Reinforced and Prestressed Concrete", ELBS London
- 5. P. Purushothaman Reinforced concrete Structural Elements", Tata McGraw-Hill Publishers, New Delhi
- 6. H.J. Shah "Reinforced concrete", Charotor Publishing House, Anand.
- 7. A.K. Jain "Limit state method of design" Nemichand and Bros, Roorkee

E books and online course materials: <u>www.civilenggbooks.com</u>

Course outcomes: On completion of the course, the student will have the ability to:				
Code			Level	
	CO1	Explain working stress method and Limit state method design philosophy in RCC structural Design	C2	
	CO2	Analyze the Reinforced concrete beams by working stress method and Limit state method	C4	
	CO3	Identify and check the serviceability of reinforced concrete elements using Indian standard code procedure	C3	
	CO4	Design RCC beam, slab and staircase by Limit state method using Indian standard code procedure	C4	
	CO5	Design RCC column and footing by- Limit state method using Indian standard code procedure	C4	

Course Title: ENVIRONMENTAL ENGINEERING-I				
Course Code	16CV55	CIE: 50		
Number of Lecture Hours/Week	3hrs. (Theory)	SEE: 50		
Total Number of Lecture Hours	42	SEE Hours: 03		
Prerequisite: None				
 topics: Fundamentals of water supply engineering. Various components of water supply. Quantitative and qualitative assessment of water requirement. Solve water unit design problems using hydraulic principles and methods. Operation of water treatment units, advance treatment methods. 				
Modules		Teaching Hours		
Mo INTRODUCTION: Human pollution. Requirement o	02Hrs.			
uses. Need for protected w	ater supply.			

peak factors, design periods and factors governing the

design periods.	
MODULE-II QUALITY OF WATER : Objectives of water quality management. Concept of safe water wholesomeness, palatability and potable. water born diseases. EXAMINATION OF WATER: objectives – Physical chemical and Microbiological Examinations, (IS: 3025 and IS: 1622) using analytical and instrumental techniques. Drinking water standards BIS and WHO standards. Health significance of Fluoride, Nitrates and heavy metals like Mercury and Cadmium. Sampling of water for examination.	05Hrs
SOURCES: Surface and subsurface sources – suitability with regard to quality and quantity.	05 Hrs.
COLLECTION AND CONVEYANCE OF WATER : Intake structures – different types of intakes; factor of selection and location of intakes. Pumps- Necessity, types – power of pumps; factors for the selection of a pump. Pipes - Design of the economical diameter for the rising main; Nomograms – use; Pipe appurtenances.	05 Hrs.
WATER TREATMENT : Objectives – Treatment of flow-chart. Aeration- Principles, types of aerators.	02 Hrs
SEDIMENTATION: Theory , settling tanks, types, design. Aided sedimentation – with coagulants, dosages, chemical feeding, flash mixing, and flocculater-design of all units.	03 Hrs.
MODULE-IV	
FILTRATION : Mechanism – theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design – excluding under drainage system – back washing filters.	03Hrs.
DISINFECTIONS : Theory of disinfections, methods of disinfections, Chlorination, chlorine demand, residual chlorine, use of bleaching powder.	03 Hrs.
MODULE-V	
SOFTENING – definition, methods of removal of hardness by ime soda process and zeolite process.	03 Hrs.
METHODS OF DISTRIBUTION SYSTEMS : System of supply,	04 Hrs

service reser	voirs and t	heir capacity determination,	
methous of lay			
MISCELLANEOUS : Pipe appurtenances, various valves, 02 Hrs			
pipes in buildings			
concepts of	RAIN WATER	R HARVESTING : Importance of methods of rain water	02Hrs
harvesting.	nurvesting u	in methods of run water	021113
Question paper pattern:			
i) Two questions are to be set from each module.			
each module			
Text books:			
1. S.K.Garg "Water supply Engineering" Vol 1 – Khanna Publishers			
2. B.C. Punmia and Ashok Jain, "Environmental Engineering" –			
3. CPHEEO, "Manual on Water supply and treatment" –Minstry of Urban			
Development, New Delhi			
Reference Books:			
1. Water supply Engg v OL-1 by S.K.Garg, Khanna publications New defin. 2. Environmental engineering by Howard S Peavy Donald R Rowe and			
George Tcho banaglows, Mittal books, India.			
3. Water supply engineering and waste water engineering by, Ashok			
kumar& Jain ,B.C. Punmia, Laxmi publications (p)ltd ,New Delhi			
4. Elements of environmental engineering by			
Dr.K.N.Duggal,S.Chand,New Delhi.			
E books and online course materials: <u>www.civilenggbooks.com</u>			
Course outcomes:			
On completion of the course, the student will have the ability to:			
Course	CO #	Course Outcome (CO)	Blooms
Code			Level
	CO1	Estimate the water demand for	or a known (C3).
		influencing Parameters	
	CO2	Evaluate the quality of w	vater with (C4)
		reference to physical , che	mical and
	biological parameters from different sources.		
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CO3	Describe different types of intake structures, pumps and design the rising main	(C4)	
CO4	Explain the steps involved in the water treatment and design sedimentation, filtration and disinfection units	(C4)	
CO5	Describe the water softening techniques rain water harvesting methods and the concepts Involved in the design of water distribution systems.	C2	

Course Title: ECOLOGY AND ENVIRONMENT			
Course Code	16CV561	CIE: 50	
Number of Lecture Hours/Week	3hrs. (Theory)	SEE: 50	
Total Number of Lecture Hours	42	SEE Hours: 03	
Prerequisite: Environmen	tal studies		
 Components of environment and their interactions and subdivisions of ecology. Structural and functional characteristics of an ecosystem, principles related to energy and concepts of productivity. Bio-geochemical cycles and pathways of matter in the biosphere. Fresh water and marine water ecosystem. Effects of pollution on human health, aquatic and terrestrial ecosystems and global environmental problems. 			
Modules		Teaching Hours	
MODULE-I INTRODUCTION: Environment, definition, components of environment and its interaction. Ecology – Definition, Subdivisions of Ecology		04 Hrs	
CONCEPTS OF ECOSYSTI characteristics of an ec biological control, producti	06 Hrs.		
MO PRINCIPLES AND CONCE ECOLOGICAL SYSTEM: Fu energy, energy environm energy system. Pathways Concept of productivity –	07 Hrs.		

Food webs – trophic levels, trophic structure				
BIO-CHEMICAL CYCLES: Concept of bio-geo chemical cycles – significance, pathways of matter in the biosphere, C, N, S & P cycles	07 Hrs			
MODULE-III				
FRESH WATER ECOLOGY : Fresh water environment types and limiting factors, classification of fresh water organisms, fresh water biota (flora & fauna), zonation in streams, Eutrophication of lakes.	07 Hrs			
MARINE ECOLOGY: Marine environment, marine biota, zonation in the area(case study), estuarine ecology.	05 Hrs.			
MODULE-IV				
POLLUTION AND ENVIRONMENTAL HEALTH: Types of pollution, effect on human health, effects on aquatic and terrestrial system.	03 Hrs			
MODULE-V				
GLOBAL ENVIRONMENT PROBLEMS: Acid rain, ozone layer depletion, green house effect, Global warming.				
 i) Two questions are to be set from each module. ii) Total five questions are to be answered by selecting minimum one question from each module 				
Text books:1.P. D. Sharma, "Ecology and Environment" Rastogi Publishers				
2. E. P. Odum , "Ecology"				
Reference Books: 1. Chantlet. "Environmental Protection"				
2. Arora, K. L, "Fundamentals of Environmental Biology"				
3. Koromandy, "Ecology"				
4. S.K.Garg, "Environmental Engineering" Vol-II				
Koptal and Bali, "Concepts of Ecology" Vishal Publications, Ja	landhar			

E books and online course materials: <u>www.civilenggbooks.com</u>

Course outcomes: On completion of the course, the student will have the ability to:

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Course	CO #	Course Outcome (CO)	Blooms
Code			Level
	CO1	Identify the components of environment	(C1)
and the sub-divisions of ecology.		and the sub-divisions of ecology.	
	CO2	Describe the characteristics of an ecosystem, energy system and the concepts of bio-geochemical cycles.	(C5)
	CO3	Understand the fresh and marine water	(C2)
		ecology,	
	CO4	Understand effects of pollution on human health, and on ecosystems.	(C2)
	CO5	Understand the global environment problems. And its causes and effects of acid rain , ozone layer depletion , green house effect, global warming.	(C2)

Course Title: ADVANCED SURVEYING			
Course Code	16CV562	CIE: 50	
Number of Lecture Hours/Week	3hrs. (Theory)	SEE: 50	
Total Number of Lecture Hours	42	SEE Hours: 03	
Prerequisite: Survey –I an	d Survey-II		
 Field astronomy and determination of meridians, solar time and day Classification of errors and determining precision of surveying applications Basics of modern surveying instrument total station Hydro graphic surveying application and setting out of major projects in civil engineering fields. 			
Modules	Teaching Hours		
M			
FIELD ASTRONOMY: Define terrestrial latitude and loc spherical trigonometry. As relationship between co-or	8 Hrs.		
МО	DULE-II		
TIME: Sidereal time, day a Greenwich mean time – azimuth – their dete determination.	8 Hrs.		
M			
THEORY OF ERRORS AND TRIANGULATION ADJUSTMENT: Errors and classification of errors, Precision and accuracy, Laws of weight and accidental errors		05 Hrs	
PROBABILITY: Probability function – normal distri precision .Rejection of o squares-Normal equations	04 Hrs		

MODULE-IV				
ELECTRONIC DISTANCE MEASUREMENT (EDM): Introduction, Measurement principal EDM, Different wave length bands used by EDM, Electro Magnetic (EM) Waves, Phase comparison and modulation. Instruments – Geodimeter – Tellurimeter – Distomat. Introduction to GPS Total Station.	8 Hrs.			
MODULE-V				
HYDROGRAPHIC SURVEYING: Methods of sounding. Instruments. Three point problem. Tidal and Stream discharge measurement.	04 Hrs			
SETTING OUT WORKS: Introduction .Setting out of buildings, culverts, bridges, pipeline and sewers, tunnels.	05 Hrs			
Question paper pattern: : i) Two questions are to be set from each module. ii) Total five questions are to be answered by selecting minimum one question from each module.				
Text books: Surveying Vol I ,II & III- B.C.Punmia-Lakshmi Publications,New Delhi.				
Surveying Vol I & II- Duggal S.KTata Mc Graw-Hill publishing	g Co.,			
Surveying Levelling - Part I & II – Kanitkar T.P & Kulkarni S.V- Pune Vidhyarthi Gruha Prakashana. Advanced surveying Sateesh Gopi. R Sathkumar and N Madhu 2 nd edition. Dorling				
kinderley(India) pvt ltd, Pearson Education.				
Reference Books: Introduction to Surveying-James, Anderson & Edward, M .Mikhail-MC-Graw - Hill Book Co., 1985.				
Analysis and Survey measurements-M.Mikhail and Gracie, G.Van Nostrand Reinhold Co., (NY)-1980.				
Plane and Geodetic Surveying for Engineers-David Clark – distributors, New Delhi.	Vol I & II-CBS publishers and			

E books and online course materials:	www.civilenggbooks.com

Course outcomes:						
On comple	On completion of the course, the student will have the ability to:					
Course	CO #	Course Outcome (CO)	Blooms			
Code			Level			
	CO1	Understand basic concepts of astronomical	C1,C2			
		field survey				
	CO2	Interpret and solve problems in	C3			
		determining meridians , solar time and day				
	CO3	Understand and interpret classification of	C2, C3			
		errors and determine precision in surveying				
		application				
	CO4	Demonstrate understanding of modern	C2			
		surveying instruments like total station				
	CO5	Understand and solve problems in				
		hydrographic surveying and in setting out	C3			
		various engineering infrastructures works				
		on ground				

Course Title: ALTERNATIVE BUILDING MATERIALS AND TECHNOLOGY			
Course Code	16CV563	CIE: 50	
Number of Lecture Hours/Week	3hrs. (Theory)	SEE: 50	
Total Number of Lecture Hours	42	SEE Hours: 03	
Prerequisite: Building Mat	terial and Constructions.		
 to enable the student to acquire the knowledge in the following topics: 1. Energy in building materials and Environmental friendly and cost effective building technologies. 2. Properties and applications of alternate building materials. 3. Properties and applications of alternative building technologies. 4. Design of masonry compression elements. 5. Cost effective buildings design and equipment for production of alternative materials 			
Modules Teaching Hours			
Mice Introduction: Energy in building issues concerned to building issues in the second secon	05Hrs		
construction industry, and Environmental friendly and cost effective building technologies. Requirements for building of different climatic regions. Traditional building methods and vernacular architecture.			
Alternate Building Materials: Characteristics of building blocks for walls, stones and laterite blocks, Bricks and hollow clay blocks.			
МО	DULE-II		
Alternate Building M stabilized blocks: mud bl G Blocks stone masonry	2 Hrs.		
Lime Pozzolana cement: process, properties and u Matrix materials, Fibers:	Raw materials, manufacturing uses. Fiber reinforced concrete- metal and synthetic, properties	05 Hrs.	

and applications Fibre reinforced plastics, matrix materials ,Fibres: organic and synthetic, properties and applications. Building materials from agro and industrial wastes. Types of agro wastes, Types of industrial and mine wastes, properties and applications. Field quality control test methods.	
MODULE-III	
Alternative Building Technologies: Alternative for wall	
construction, Types construction methods, Masonry	
mortars types, preparation and properties. Ferrocement	
and ferroconcrete Building components, materials and	06 Hrs.
specifications. Properties, construction methods,	
applications, alternative roofing systems- concepts, filler	
slabs, composite beam panel roofs, masonry vaults and	
domes.	
Structural Masonry: Compressive strength of masonry	
elements, factors affecting compressive strength, of units,	03 Hrs.
prisms,/wallets and walls, effect of brick work bond on	
strength.	
MODULE-IV	
Structural Masonny Pond strongth of masonny Elevura	
and shear. Elastic properties of masonry materials and	02 Hrs.
masonry.	
Equipment for Production of Alternative Materials: IS	06 Hrs
Code provisions, Design of masonry compression elements,	00 1113.
concepts in lateral load resistance.	
Repair materials: Polymer based repair materials ,	
MODULE-V	05 Hrs.
Cost Effective Buildings Design: Cost concepts in buildings ,cost saving techniques in planning, design and	
construction. Cost Analysis: Case studies using alternatives	

Equipment fo	or Producti	on of Alternative Materials:			
Machines for manufacture of concrete, Equipments for					
production of	stabilized	blocks.Moulds and methods of			
production of	precast elem	ients.	05	i Hrs.	
Concrete repa	air: Repair	methodology-Determine cause,			
extent, severit	y and urger	ncy of damage repaired damage			
concrete surf	face-ceiling	of large and small cracks.			
Question pap i)Two question ii) Total five c each module	Der pattern Ins are to be s Iguestions ar	: set from each module. e to be answered by selecting m	iinimum one	question from	
K.S. Jagadish a Structural Mas	nd B.V.Venk onry: by Arn	atraman Reddy. IISC Bangalore. Iold W.Henry.			
Reference Bo	ooks: ant IS codes.				
2 Alterna	ative buildin	g materials and technologies.			
3 Procee	dings of wo	rkshop on Alternative building mat	erial and tech	nology. 19 th	
to 20 t	h December	2003 at B.V.B College of Engineeri	ng and Techn	ology Hubli	
E books and	online cou	rse materials: www.civilenggb	ooks.com		
Commente					
On completion	on of the co	ourse, the student will have the	ability to:		
Course	CO #	Course Outcome (CO)		Blooms	
Code	CO1	Understand environmental fr	iendly and	Level	
		cost effective building technolog	gies		
	CO2	Explain raw materials, ma process, properties and uses o building Materials.	inufacturing of alternate	.(C2)	
	CO3	Select alternative building tech	nologies for affecting	(C3).	

		compressive strength of masonry unit	
	CO4	Design of masonry compression elements and repair materials	(C6)
	CO5	Choose cost saving techniques in buildings, equipment for production of alternate materials repair methdology.	(C3).

Course Title: MECHANIZATION IN CONSTRUCTION				
Course Code	16CV564	CIE: 50		
Number of Lecture Hours/Week	3HRS. (THEORY)	SEE: 50		
Total Number of Lecture Hours	42 SEE Hours: 03			
Prerequisite: None				
 Course objectives: This course enables students to Various type of equipments used in constructions advantage & limitations of these equipment. Manufacturing of natural aggregate & recycled aggregate through mechanization. Mechanization in rebar fabrication ,concrete production ,placement, types of form work & scaffolding and materials used . Construction of bridge/flyover by segmented construction and box pushing technology for tunneling &pile driving equipment. Construction methods of drilling blasting, tunneling &various equipments used in this construction . 				
Modules		Teaching Hours		
Me Introduction to mechanizatior limitations of mechanization, Indi Mechanization through construct Machine power, production cyo Finishing equipment, Trucks ar equipment, Draglines and Clamsh	10Hrs.			
МС	DDULE II			
Mechanization in aggregate ma and recycled aggregates	8Hrs.			
МС	DULE III	8Hrs.		
Mechanization in rebar fabricatio Mechanization in concrete produc	n ction and placement			

Mechanization through construction: Formwork and scaffolding types, materials and design principals.						
MODULE IV	8Hrs.					
Mechanization through construction methods/technologies: Segmental construction of bridges/flyovers, box pushing technology for tunneling, trench-less technology. Pile driving equipment: Pile hammers, selecting a pile hammer, loss of energy due to impact, energy losses due to causes other than impact.						
MODULE V						
Mechanization through construction methods of drilling, Blasting and Tunneling Equipment: Definition of terms, bits, Jackhammers, Drifters, wagon drills, chisel drills, piston drills, blast hole drills, shot drills, diamond drills, tunneling equipment, selecting the drilling method equipment, selecting drilling pattern. Selecting and Environmental issues in mechanization.	8Hrs.					
Question paper pattern:						
i) Two questions are to be set from each module.						
ii) Total five questions are to be answered by selecting minimum one	ii) Total five questions are to be answered by selecting minimum one question from each module					
Text books: 1)construction equipments by ,S.C.Shrama						
ReferenceBooks: REFERENCES: 1. "Construction Equipment and its Planning and Appl Metropolitan Book Co.(P) Ltd.,New Delhi. India.	ications", Mahesh Varma,					
 "Construction Machinery and Equipment in India". Published in Civil Engineering and "Construction Review" Published by Civil Engineerin Review New Delbi, 1991 	A compilation of articles					
 Sharma S.C. "Construction Equipment and Management", Khanna Publishers, Delhi, 1988 						
 Peurifoy R L, "Construction Planning, Equipment and Methods", Mc Graw Hill James F Russell, "Construction Equipment", Prentice Hall "Current Literature" 						
E books and online course materials: www.civilenggbooks.c	0 m					
On completion of the course, the student will have the ability to:						

Course Code	CO #	Course Outcome (CO)	Blooms Level
CO1 Det con		Definition and explaining of various construction equipments.	C2
	CO2	Explain the manufacturing process of natural & recycled aggregate	C2
	CO3	Explain the production and placement of concrete through mechanization materials of formwork & design of formwork.	C2
	CO4	Explanation on construction of bridge/flyover by segmental construction & box pushing technology for tunneling and pile driving equipment.	C3
	CO5	Choose the sites for tunneling & drilling method equipment.	C2

Course Title: APTITUDE-I					
Course Code 16HU01					CIE: 50
Number of Lecture2 Hrs (Tutorial)Hours/Week			SEE: 50		
Total Number of Lecture Hours		urs 28			SEE Hours: 03
Prerequisite:					
Course objectives:					
Modules					Teaching Hours
TOPICS	TAKE AWAY	METHODOLOGY	APPLICATION	DURATION (HOURS)	
Quantitative aptitudeaptitudeSimple equationsequationsand HCFRatio, Proportions and VariationsDivisibility rules and Unit digitRemainder theorem	Focus on the concepts of- Simple equation, ages median and mode	Problem Solving Blended Learning	Understanding the concepts and short cuts related to the topics	11	
Verbal Reading					
comprehension Synonyms and antonyms Subject verb agreement Verbal analogies Verbal sequence	Focus on the mentioned topics and application of the concepts related to the same	Blended Learning and NLP	Understanding the application of the verbal topics through examples	08	
Communication Skills Presentation skill Preparing					

presentation Organizing the materials Maintaining and preparing sequence of	Understanding the basics of presentation skill, ways to present effectively	NLP, Blended Learning, Presentation	What is presentation Skills? Ways of effective presentation managing	07	
Dealing with the questions'	Do's and Don'ts of presentation skill		visual aids during presentation		
Marketing					
Interview skills	Introduction to interview	Brainstorming	What is an interview?	01	
Resume Skills					
Introduction to resume writing skill	Introduction to resume	Brainstorming	What is a resume?	01	
			Total	28	
Question paper pattern:					
Text books:					
Reference Books:					
E books and online course materials: www.civilenggbooks.com					
Course outcomes: On completion of the course, the student will have the ability to:					

Course Code	CO #	Course Outcome (CO)	Blooms
			Level
	CO1		
	CO2		
	CO3		
	CO4		
	CO5		

Course Title: GEOTECHNICAL ENGINEERING LABORATORY					
	Course Code	16CV57	CIE: 50		
	Number of Lecture Hours/Week	2 hrs(Practical)	SEE: 50		
T	otal Number of Lecture Hours	28	SEE Hours: 03		
Prere	equisite: Engineering	geology			
To er	 To enable the Student to acquire the knowledge in the following topics Determination of Specific gravity, moisture content, Grain size analysis, density by core cutter Determination of Consistency limits- Liquid limit, plastic limit and shrinkage limit. Determination of Standard Proctor compaction test and Modified Proctor Compaction test, Determination of Coefficient of permeability, Strength tests, Unconfined compression test ,Direct shear test (for small and big particle size). Triavial compression test 				
			Teaching Hours		
1.	Test for determin moisture content.	ation of specific gravity and	2hrs		
2.	Grain size analysis	of soil sample (sieve analysis)	2hrs		
3.	In situ density replacement metho	by core cutter and sand	2hrs		
4.	Consistency limits- cone penetration shrinkage limit.	Liquid limit (casagrande and methods), plastic limit and	2hrs		
5.	Standard Proctor of Proctor Compaction	compaction test and Modified	2hrs		
6.	Coefficient of perm variable head meth	eability by constant head and ods.	2hrs		
7.	Strength tests		2hrs		
a) b)	Unconfined compre Direct shear test (f	ession test or small and big particle size)	2hrs		

c)	Triax	ial compressio	n test	2hrs			
8.	Cons comp conse	2hrs					
9.	Labo	ratory vane she	ear test				
10.	a) D such	emonstration of as Augers, Samplers, Ra	2hrs 2hrs				
	h)	Demonstratio	n of Hydrometer test	21113			
	c)	Demonstratio	n of free Swell Index test	2hrs			
	с) С)	Demonstratio	n of determination of relative	2111.5			
	u)	density					
Refe Soil ,uni	Reference Books: Soil testing –lab manual & question bank by KVS Apparoa,VCS Rao ,university science press						
E bo	ooks ai	nd online cour	se materials:				
Course outcomes: On completion of the course, the student will have the ability to:							
Cou Cod	irse le	CO #	Course Outcome (CO)	Blooms Level			
	CO1 Demonstrate the concepts of GT theory course through series of experiments.			GT theory ries of C2			
		CO2	Share the responsibilities in sr of 4-5 members for condu	nall teams acting the			
1			experiments.	C3			

CO3	Perform the experiments and determination of specific gravity, moisture content, Grain size analysis of soil sample, core cutter and sand replacement methods, Liquid limit, plastic limit and shrinkage limit, Standard Proctor compaction test, Modified Proctor Compaction test, compression index, co-efficient of consolidation, Laboratory vane shear test, Hydrometer test, Swell Index test, relative density.	C3
CO4	Analyze the data and interpret the results.	C4
CO5	Prepare a well organized laboratory report.	C3

Course Title: CONCRETE LAB					
Course Code	16CV58	CIE: 50			
Number of Lecture Hours/Week	2 hrs(Practical)	SEE: 50			
Total Number of Lecture Hours	28	SEE Hours: 03			
Prerequisite: None					
 Determination of physical properties of cement Determination of physical properties of fine and course aggregate. Determination of properties of fresh concrete in terms of workability and effect of super plasticizers on working. Determination of harden state properties of concrete such as, compressive strength and split tensile strength 					
		Teaching Hours			
1. CEMENT : Norma Soundness by Au strength test an fineness, Specific g	Il Consistency, Setting time, toclave method, Compression d Air Permeability test for gravity of cement.	6hrs			
2. FINE AGGREGATE: Sieve analysis, specific gravity and water absorption, Bulk density, Bulking of fine aggregate, Voids Content, Silt content.					
3. COARSE AGGI specific gravity density, Crushing, tests (Flaky, Elong	REGATES: Sieve analysis, and water absorption, Bulk abrasion, impact and shape ation, Angularity number	6hrs			
4. FRESH CONC	CRETE: Workability-slump,				

	Compaction fa tests. Determ super plastici Optimum do workability of	actor Vee Bee tests and flow table nination of Optimum dosage of zer using Marsh cone, Effect of sage of super plasticizers on Concrete.	6hrs				
5.	HARDENED mix by IS and for Compress strength. Effe strength. Com moist cured & of mineral adm	CONCRETE: Design of concrete d Current British Method and test sive strength and split tensile ect of H/D ratio on Concrete parison of compressive strength of accelerated cured concrete. Effect hixture on strength of concrete.	4hrs				
Ques Any stude	Question paper pattern: Any one of the above experiment is to be conducted in the examination by the student.						
Text	Text books:M.L.Shetty						
Refe	rence Books:	Codes and IDC Codes					
		Loues and IRC Codes	lahawataw (Manual				
Ζ.	Nem Chand &	Bros.	Ladoratory Manual —				
3.	3. M.L.Gambhir- Concrete Manual – Dhanpat Rai & Sons New- Delhi.						
E bo	oks and online	course materials:					
Course outcomes: On completion of the course, the student will have the ability to:							
Cou Cod	rse CO #	Course Outcome (CO)	Blooms Level				
	CO1	Demonstrate the concepts of con technology theory course thr series of experiments.	crete ough C2				
	CO2	Share the responsibilities in small t of 4-5 members for conducting	eams the				

	experiments.	C3
CO3	Perform the experiments and determination of Normal Consistency, Setting time, Compression strength test, Specific gravity of cement, Sieve analysis, specific gravity and water absorption, Bulk density, Workability- slump.	C3
CO4	Analyze the data and interpret the results.	C4
CO5	Prepare a well organized laboratory report.	C3

Course Title: ENVIRONMENTAL ENGINEERING LABORATORY						
C	Course Code	16CV59	CIE: 50			
	Number of					
F	Lecture Jours/Week	2 hrs(Practical)	SEE: 50			
То	tal Number of	29	SEE Hourse 02			
L	ecture Hours	28	SEE Hours: 03			
Prereq	uisite: None					
Course	objectives:					
To ena	able the Student to	acquire the knowledge in the f	ollowing topics			
•	 Determination of Solids in Water / Sewage, turbidity, electrical conductivity, optimum alum dosage, Sieve Analysis of Filter Sand. Determination of Chlorides. Alkalinity, Acidity. Total Hardness, COD, BOD, percentage of chlorine, Determination of p^H. Sulphate, Flouride. Iron. Nitrate. Determination of Total Count Test, Most Probable Number (MPN). 					
			Teaching Hours			
I Analy	ysis of Physical Pa	rameters:				
1.	 Determination of Solids in Water / Sewage – Total Solids, Suspended Solids, Dissolved Solids, Volatile Solids, Fixed Solids, Settleable Solids. 					
2.	Determination of T	urbidity present in water.				
3.	Determination of E	lectrical Conductivity of water.				
4.	Determination of O	ptimum Alum Dosage.				
5.	Sieve Analysis of Fi	lter Sand.				
II Ana	II Analysis of Chemical Parameters:					
1.	Determination of C	hlorides.				
2.	Determination of A	Ikalinity, Acidity.				
3.	Determination of	f Total Hardness, Calcium				
	Hardness, Magnesi	um Hardness.				
4.	Determination of	Dissolved Oxygen, Biochemical				

		Oxygen Dem Demand(COD).	and(BOD),	Chemical	Oxy	gen		
	5.	Determination Bleaching Power Demand.	of Percentag der, Residual	e of Chl Chlorine,	orine Chloi	in rine		
III		Analysis of	Chemical	Paramet	ers	by		
Ins	stru	mental Method	s:					
	1.	Determination of	f p''.					
	2.	Determination o	f Sulphate.					
	3.	Determination of	f Flouride.					
	4.	Determination o	f Iron.					
	5.	Determination o	f Nitrate.					
IV	An	alysis of Biolog	jical Paramet	ers:				
	1.	Determination of Number (MPN).	Total Count Te	st, Most Prol	bable			
An stu Te	y or den xt b	on paper parte ne of the above t. ooks:	e experiment	is to be co	onduc	ted	in the exam	ination by the
Re	fere	nce Books:			• • • •			
	1.	Standard Met	hods for Exa	mination	of Wa	ater	& Wastew	ater American
		Publication-Ass	Sociation of N	Water Poll	ution	Con	trol Federat	ion, American
	_	Water Works A	SSOCIATION, W	ashinngtor	1 DC (inew	Edition).	
	2.	Manual of Wat	er Wastewate	r Analysis	– NEE	:RI P	ublication.	
	3. 4.	IS Standards : Chemistry for I	2490-1974, 3 Environmenta	360-1974, I Engineeri	3307 ng By	-197 Saw	4. yer & Macar	ty.
Εŀ	000	ks and online co	ourse materia	als:				
	w.c	e outcomes:						
On	On completion of the course, the student will have the ability to:							
Co Co	urs de	e CO #	Course	Outcome (CO)			Blooms Level
		CO1	Demonst tech serie	trate the c nology the es of exper	concep eory iment	pts c cour s.	of concrete se through	C2

CO2	Share the responsibilities in small teams	
	of 4-5 members for conducting the	
	experiments.	C3
CO3	Perform the experiments and	
	determination of Solids in Water, Sewage	
	- Total Solids Suspended Solids, Dissolved	
	Solids, Volatile Solids, Fixed Solids, Settle	
	able Solids, Turbidity present in water,	
	Electrical Conductivity of water, Optimum	C_3
	Alum Dosage, Filter Sand , Chlorides	05
	Alkalinity, Acidity, Total Hardness, Calcium	
	Hardness, Magnesium Hardness, Oxygen,	
	Biochemical Oxygen Demand(BOD),	
	Chemical Oxygen Demand(COD), Bleaching	
	Powder, Residual Chlorine, Chlorine	
	Demand, p ^H , Sulphate, Flouride, Iron,	
	Nitrate, Total Count Test, Most Probable	
	Number (MPN).	
CO4	Analyze the data and interpret the	
	results.	C4
CO5	Prepare a well organized laboratory	
	report.	C3

SEMESTER VI

Code	Course	Hours/Week				Maximum Marks		
No.		Lecture	Tutorial	Practical	Credits	CIE	SEE	Total
	THEORY							
16CV61	ENVIRONMENTAL ENGG – II	3		0	3	50	50	100
16CV62	TRANSPORTATION ENGG – I	3		0	3	50	50	100
16CV63	GEOTECHNICAL ENGG – II	3	2	0	4	50	50	100
16CV64	WATER RESOURCES ENGG.	4		0	4	50	50	100
16CV654	ELECTIVE – II	3		0	3	50	50	100
16CV66x	ELECTIVE – III	3		0	3	50	50	100
16HU02	APTITUDE TRAINING-II	1		0	1	50	50	100
	F	PRACTICAL						
16CV67	EXTENSIVE SURVEY PROJECT*	2	4	0	4	50	50	100
16CV68	HIGHWAY MATERIAL TESTING LAB	0	0	2	1	50	50	100
	TOTAL	22	02	06	26	450	450	900

* THIS HAS TO BE CONDUCTED DURING VACATION BETWEEN $\mathbf{5}^{\text{TH}}$ & $\mathbf{6}^{\text{TH}}$ semester

16CV65x -ELECTIVE – II

16CV651 – MATRIX METHODS OF STRUCTURAL ANALYSIS 16CV652 – DESIGN OF MASONRY STRUCTURES 16CV653 – RURAL WATER SUPPLY AND SANITATION 16CV654 – REMOTE SENSING & GIS

16CV66x -ELECTIVE –III

- 16CV661 DESIGN OF PRESTRESSED CONCRETE STRUCTURES
- 16CV662 THEORY OF ELASTICITY
- 16CV663 PAVEMENT MATERIALS AND CONSTRUTION
- 16CV664 ENVIRONMENTAL IMPACT ASSESSMENT

Course Title: ENVIRONMENTAL ENGINEERING – II				
Course Code	16CV61	CIE: 50		
Number of Lecture Hours/Week	3hrs. (Theory)	SEE: 50		
Total Number of Lecture Hours	42	SEE Hours: 03		
Prerequisite: Environment	tal engineering –I			
 Course objectives: To enable the student to active 1. Fundamentals of 1. 2. Various compone 3. Quantitative and 0. 4. Solve waste treat methods. 5. Operation of waste Advance treatmet 	 Course objectives: To enable the student to acquire the knowledge in the following topics. Fundamentals of waste water engineering. Various components of sewerage system. Quantitative and qualitative assessment of waste generated. Solve waste treatment unit design problems using hydraulic principles and methods. Operation of waste water treatment units. 			
Modules		Teaching Hours		
INTRODUCTION : waste sanitation, methods of sew systems and their suitabilit	DDULE-I water disposal – Necessity for vage disposal, types of sewerage y.	03 Hrs		
QUANTITY OF SEWAGE : Dry weather flow, factors affecting dry weather flow, flow variations and their effects on design of sewerage system; computation of design flow, estimation of storm flow, rational method and emperical formulae of design of storm water drain; Time of concentration.				
DESIGN OF SEWERS : Hy effects of flow variaitons non-scouring velocities. D circular sewers flowing fu	05 Hrs			

MODULE-II	
MATERIALS OF SEWERS : Sewer materials, Shapes of sewers, laying of sewers, jointing and testing of sewers, ventilation and cleaning of sewers.	03 Hrs.
SEWER APPURTENANCES : Catch basins, manholes, flushing tanks, oil and grease traps, drainage traps, basic principles of house drainage, typical layout plan showing house drainage connections, maintenance of house drainage.	03 Hrs
ANALYSIS OF SEWAGE : Physical, chemical and biological characteristics concepts of aerobic and anaerobic activity, CNS cycles, more emphasis on BOD and COD. Sampling, significance, techiniques and frequency.	04 Hrs.

MODULE-III			
SEWAGE PUMPING : Need, types of pumps and pumping stations.	02 Hrs		
DISPOSAL OF EFFLUENTS : By dilution, self-purification phenomenon, oxygen sag curve, zones of purification, sewage farming, sewage sickness, dispoal standards on land and water, chlorination of sewage.	03 Hrs.		
TREATMENT OF SEWAGE : Flow diagram of municipal sewage treatment Plant.	01 Hrs.		
MODULE-IV			
Primary Treatment : screening, grit chambers, skimming tanks, primary sedimentation tanks – Designs.	02 Hrs		
Secondary Treatment: Trickling filter – types, theory and operation – Designs.	03 Hrs		
Activated sludge process - principle and flow diagram			
methods of aeration, modifications, F/M ratio – Design	04 Hrs		
Sludge : methods of sludge disposal, sludge drying beds,			
sludge digestion tank.			
MODULE-V			
MISCELLANEOUS TREATMENT METHODS : Septic tank and Oxidation Ponds – Designs. Introduction to Aerobic lagoon, Anaerobic lagoon, Oxidation ditch, Anaerobic filters, RBC, UASB and Hybrid reactors. Sequencing of reactors viz., serial and parallel. 04 Hrs	05 Hrs		
Question paper pattern:			
i) Total five questions are to be answered by selecting n	ninimum one question from		
each module			
Text books:			
1. Environmental Engineerig (Vol II) – By S.K.Garg, Khann	a Publishers		
2. Environmental Engineerig – II By B.C.Punmia and Ashok Jain			
3. Manual on Waste Water Treatment – CPHEEO, Mini	stry of Urban Development,		

New Delhi

4. Water and Wastewater Engineering Vol – II By Fair, Geyer, Okun, Willey Eastern Publishers, New York

Waste Water Treatment, Disposal and Reuse - By Metcalf & Eddy Inc... Tata McGraw Hill Publications (2003 Edition)

Reference Books:

- 1. Water Technology By Hammer & Hammer
- 2. Environmental Engineering By Howard.S.Peavy, Donald.R.Rowe, George Tchobanoglouse, McGraw Hill International Edition

E books and online course materials: www.civilenggbooks.com

Course outcomes: On completion of the course, the student will have the ability to:					
Course Code	CO #	Course Outcome (CO)	Blooms Level		
	CO1	Explain the suitability of different sewerage systems and estimate the quantity of sewage and storm water and design sewers (storm water drains)by different methods	C4		
	CO2	Describe the different materials & shape of sewers and sewer appurtenances and evaluate the quality of sewage w.r.t physical, chemical and biological parameters	C4		
	CO3	Describe the different types of pumps ,methods of disposal of effluents and explain the steps involved in the sewage treatment	C2		
	CO4	Design the primary and secondary treatment units –grit chamber ,sedimentation tanks ,trickling filter and activated sludge process.	C4		
	CO5	Design the other treatment units septic tanks, oxidation ponds and ditches ,aerobic lagoons & anaerobic lagoons and describe RBC,UASB and hybrid reactors	C4		

Course Title: TRANSPORTATION ENGINEERING – I			
Course Code	16CV62	CIE: 50	
Number of Lecture Hours/Week	3hrs. (Theory)	SEE: 50	
Total Number of Lecture Hours	42	SEE Hours: 03	
Prerequisite: None			
 planning and highway alignment and survey. Design the horizontal and vertical alignments of roads. Understand the different pavement materials and design the thickness of different types of pavement. Understand about pavement construction and highway drainage system. Gain the skills of evaluating the highway economics by different methods and also introduce the students to highway financing and pavement maintenance. 			
Modules		Teaching Hours	
Minimum Minimu	03 Hrs.		
plan - saturation system	of road planning, phasing road	03 Hrs.	

development programme – problems on best alignment	
among alternate proposals and phasing.	
Highway Alignment and Surveys : Ideal alignment, factors affecting alignment, engineering surveys for new and realignment projects.	03 Hrs.
Highway Geometric Design: Importance, factors	
controlling the design of geometric elements. Highway	
cross section elements – pavement surface characteristics,	
camber, width of carriageway, shoulder width, formation	
width, right of way, typical cross section of roads. Design	
speed – sight distances - Design of horizontal alignment:	08 Hrs.
radius of curve, superelevation, extra widening on curves,	
transition curves and vertical alignment –Summit and	
valley curves. Numerical problems on above (No derivation	
of formulae only brief description)	
MODULE-III	
MODULE-III Pavement Materials: Properties and requirements of	
MODULE-III Pavement Materials: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination	
MODULE-III Pavement Materials: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil.	03 Hrs.
MODULE-III Pavement Materials: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil. Properties and requirements of road aggregates, Bitumen –	03 Hrs.
MODULE-III Pavement Materials: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion – Cutback (Tests on aggregates and bitumen	03 Hrs.
MODULE-III Pavement Materials: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion – Cutback (Tests on aggregates and bitumen not included). Numerical problems on above.	03 Hrs.
MODULE-III Pavement Materials: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion – Cutback (Tests on aggregates and bitumen not included). Numerical problems on above.	03 Hrs.
MODULE-III Pavement Materials: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion – Cutback (Tests on aggregates and bitumen not included). Numerical problems on above. Pavement Design: Types of pavements – Design factors,	03 Hrs.
MODULE-III Pavement Materials: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion – Cutback (Tests on aggregates and bitumen not included). Numerical problems on above. Pavement Design: Types of pavements – Design factors, Determination of ESWL by equal stress criteria using	03 Hrs. 06 Hrs
MODULE-III Pavement Materials: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion – Cutback (Tests on aggregates and bitumen not included). Numerical problems on above. Pavement Design: Types of pavements – Design factors, Determination of ESWL by equal stress criteria using graphical method only, EWL factors and numerical	03 Hrs. 06 Hrs
MODULE-III Pavement Materials: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion – Cutback (Tests on aggregates and bitumen not included). Numerical problems on above. Pavement Design: Types of pavements – Design factors, Determination of ESWL by equal stress criteria using graphical method only, EWL factors and numerical problems. IRC method of flexible pavement design based on CSA method using IRC, 27 – 2001. Streamed in dist	03 Hrs. 06 Hrs
MODULE-III Pavement Materials: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion – Cutback (Tests on aggregates and bitumen not included). Numerical problems on above. Pavement Design: Types of pavements – Design factors, Determination of ESWL by equal stress criteria using graphical method only, EWL factors and numerical problems. IRC method of flexible pavement design based on CSA method using IRC: 37 – 2001. Stresses in rigid pavement and design of rigid pavement as per IRC: 58 –	03 Hrs. 06 Hrs
MODULE-III Pavement Materials: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion – Cutback (Tests on aggregates and bitumen not included). Numerical problems on above. Pavement Design: Types of pavements – Design factors, Determination of ESWL by equal stress criteria using graphical method only, EWL factors and numerical problems. IRC method of flexible pavement design based on CSA method using IRC: 37 – 2001. Stresses in rigid pavement and design of rigid pavement as per IRC: 58 – 2002 excluding design of joints.	03 Hrs. 06 Hrs
MODULE-III Pavement Materials: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion – Cutback (Tests on aggregates and bitumen not included). Numerical problems on above. Pavement Design: Types of pavements – Design factors, Determination of ESWL by equal stress criteria using graphical method only, EWL factors and numerical problems. IRC method of flexible pavement design based on CSA method using IRC: 37 – 2001. Stresses in rigid pavement and design of rigid pavement as per IRC: 58 – 2002 excluding design of joints.	03 Hrs. 06 Hrs
MODULE-III Pavement Materials: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion – Cutback (Tests on aggregates and bitumen not included). Numerical problems on above. Pavement Design: Types of pavements – Design factors, Determination of ESWL by equal stress criteria using graphical method only, EWL factors and numerical problems. IRC method of flexible pavement design based on CSA method using IRC: 37 – 2001. Stresses in rigid pavement and design of rigid pavement as per IRC: 58 – 2002 excluding design of joints.	03 Hrs. 06 Hrs
MODULE-III Pavement Materials: Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion – Cutback (Tests on aggregates and bitumen not included). Numerical problems on above. Pavement Design: Types of pavements – Design factors, Determination of ESWL by equal stress criteria using graphical method only, EWL factors and numerical problems. IRC method of flexible pavement design based on CSA method using IRC: 37 – 2001. Stresses in rigid pavement and design of rigid pavement as per IRC: 58 – 2002 excluding design of joints.	03 Hrs. 06 Hrs

MODULE-IV Pavement Construction: Specifications, construction steps and quality control tests for Granular sub base course, WBM base course. Brief description on bituminous constructions such as prime coat, tack coat, bituminous binder course (BM and DBM), common types of bituminous surfacing courses such as surface dressing, premixed carpet (PMC) and bituminous concrete. Construction steps for cement concrete pavements.	04 Hrs. 04 Hrs.
Surface and Subsurface drainage system for road pavements, types, functions and basic design principles	
MODULE-V	
Highway Economics and Financing: Highway user benefits – VOC using charts only – Highway costs – Economic analysis by annual cost method and benefit cost ratio methods. Numerical problems on above. Highway financing – BOT and BOOT concepts.	04 Hrs.
Pavement Maintenance: Pavement failures, cases. Maintenance of highways. Principles of pavement evaluation – functional and structural evaluation.	04 Hrs.
Question paper pattern: i) Two questions are to be set from each module. ii) Total five questions are to be answered by selecting n each module	ninimum one question from
Text books:1.Khanna, S.K. and Justo, C.E.G., "Highway EngineeringRoorkee 8 th Edition (2003).	ing" Nem Chand and Bros,

- 2. Kadiyali, L.R., "Highway Engineering" Khanna Publishers, New Delhi.
- 3. Subramanyam, K.P., "Tansportation Engineering –I" Scitech Publications, Chennai.

4. Rao, G.V., "Principles of Transportation and Highway Engineering," McGraw – Hill Publishing Company Limited, New Delhi.

Reference Books:

- 1. IRC: 37-2001, IRC: 58-2002 and other relevant IRC codes
- 2. MoRT&H-2001, "Specifications for Roads and Bridges" New Delhi (2001)
- 3. Partha ChakraoBorthy and Animesh Das, "Principles of Transportation Engineering", Prentice-Hall of India Private Limited, New Delhi (2003)

E books and online course materials: www.civilenggbooks.com

Course outcomes: On completion of the course, the student will have the ability to:					
Course Code	CO #	Course Outcome (CO)	Blooms Level		
	CO1	Understand about the road development inIndia, Highway planning &highway alignment	(C2)		
	CO2	Design highway geometries	(C5)		
	CO3	Explainthedifferentpavementmaterialsanddesignthethicknessesofdifferenttypesofpavement	(C2)		
	CO4	Understandaboutpavementconstructionandhighwaydrainagesystem	(C2)		
	CO5	Determine the highway economic cost by different methods and understand about highway financing and pavement maintenance	(C4)		

Course Title: GEOTECHNICAL ENGINEERING – II		
Course Code	16CV63	CIE: 50
Number of Lecture Hours/Week	3hrs. (Theory) + 2hrs. (Tutorial)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisite: GEOTECHNICAL ENGINEERING – I		
 to enable the student to acquire the knowledge in the following topics. 1. Understanding of the essential steps involved in a geotechnical site investigation. 2. Stresses induced under the different types of soils foundations due to the loads . 3. Determining the lateral earth pressures due different soil conditions. 4. Stability of earth slopes and estimating the seepage & exit gradient for various hydraulic structures. 5. Familiarize the students with the procedures used for: estimation of Bearing capacity and settlements, under the foundation 		
Modules		Teaching Hours
M	ODULE-I	
SUBSURFACE EXPLORATION: Importance, Exploration program, Methods of exploration: Boring, sounding tests, geophysical methods-Electrical resistivity and Seismic refraction methods. Types of samples- undisturbed, disturbed and representative samples. Samplers, sample disturbance, area ratio, Recovery ratio, clearance, Stabilization of boreholes .Typical boring log. Number and depth of borings for building and dams. Determination of ground water level by Hvorselev method		
Drainage and Dewatering: Introduction, ditches and sumps, well point system, shallow well system, deep well drainage, vaccum method:forced flow, electro-osmosis		04 Hrs
method.		
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MODULE-II		
STRESS IN SOIL: Boussinesq's and Westergard's theories for concentrated, circular, rectangular, line and strip loads. Newmark's chart, Pressure bulb, contact pressure.	07 Hrs	
MODULE-III		
LATERAL EARTH PRESSURE: Types of Earth pressure, Active and Passive earth pressures, Earth pressure coefficient and their range. Earth pressure theories-Rankine's and Coulomb's – assumptions and limitations, Graphical solutions for active earth pressure (cohesionless soil only) – Culmann's and Rebhann's methods, Lateral earth pressure in cohesive and cohesionless soils, Earth pressure distribution.	08 Hrs	
MODULE-IV		
FLOWNETS: Laplace equation, characteristics and uses of flownets, Methods of drawing flownets for Dams and sheet piles. Estimating quatity of seepage and Exit gradient. Determination of phreatic line in earth dams with and without filter.	04 Hrs.	
STABILITY OF EARTH SLOPES: Types of slopes, causes and type of failure of Slopes. Definition of factor of safety, Stability of finite and infinite slopes- Method of slices, Friction Circle method, Fellineous method ,Taylor's stability number.	05 Hrs	

MODULE-V		
BEARING CAPACITY: Definitions of ultimate, net and safe bearing capacities Allowable bearing pressure. Terzaghi's and Brinch Hansen's bearing capacity equations- assumptions and limitations. Bearing capacity of footing subjected to eccentric loading .Effect of ground water table on bearing capacity. Plate load test, Standard penetration test, cone penetration test.	08 Hrs.	
FOUNDATION SETTLEMENT: Concept, immediate,		
consolidation and secondary settlements (no derivations),		
Tolerance BIS specifications for total and differential		
settlements of footings and rafts.	02 115.	
Question paper pattern:		
i) Two questions are to be set from each module		
ii) Total five questions are to be answered by selecting n	ninimum one question from	
each module	,	
Toxt books:		
 V.N.S. Murthy, "Soil Mechanics and Foundation Engineering" Sai Tech Publishers, Chennai. 		
2. Bowles, J.E., "Foundation Analysis and Design" 5 th Ed York (1996).	, McGraw Hill Pub.Co., New	
Reference Books:		
1. Dr. C.Venkataramaiah, "Geotechnical Engineering" Ne	w age Publications.	
2. Dr. Alam Singh, Modern Geotechnical engineering		
3. Braja M Das, "Principles of Geotechnical Engineering"		

4. Gopal Ranjan and A.S.R. Rao, "Basic & Applied Soil Mechanics" New age international (P) Ltd., New Delhi (2000).

E books and online course materials: www.civilenggbooks.com

Course outcomes:

On completion of the course, the student will have the ability to:

Course	CO #	Course Outcome (CO)	Blooms
Code			Level
	CO1	Explain the methods of subsurface exploration and methods of dewatering.	(C2)
	CO2	Analyze the stresses in soil for different theories.	(C4)
	CO3	Determine the lateral earth pressure for different cases. (C4)	(C4)
	CO4	Explain the importance of flow nets and stability of earth slopes.	(C2)
	CO5	Determine the bearing capacity of foundation and settlement of soil.	(C4)

Course Title: WATER RESOURCES ENGINEERING			
Course Code	16CV64	CIE: 50	
Number of Lecture Hours/Week	4hrs. (Theory)	SEE: 50	
Total Number of Lecture Hours	42	SEE Hours: 03	
Prerequisite: Fluid mech Geotechnical engineering	hanics-I, Fluid mechanics-II, Ge –II.	eotechnical engineering –I,	
 Course objectives: To enable the student to acquire the knowledge in the following topics. Introduce importance of water resource engineering Making students to understand basics of hydrology Introduce problems involved in canal irrigation system. Design of earthen Dam and spillway. Understanding of duty and delta 			
Modules	Modules Teaching Hours		
MODULE-I Introduction, water resources engineering disciplines, water management sectors, Water wealth of India. Hydrological cycle, water shed hydrology, measurement of precipitation by rain gauges, Computation of precipitation, missing rainfall data, rainfall density, rainfall mass curve & hyetograph Problems on above.		10Hrs	
MO RUNOFF: Runoff cycle computation of average an problems.	DULE-II e, factors affecting runoff, nnual runoff, maximum runoff &	8Hrs	

RESERVOIRS: Types, site selection, Investigation for reservoirs. Determination of storage capacity of reservoirs using mass curve, analytical method, storage zones of reservoir, economical height of dam.	
MODULE-III Canal Irrigation: Types of canals, alignment of canals, definition of gross command area, culturable command area, intensity of irrigation, time factor, capacity factor, kharif season, rabi season, types of crops & their duty, delta, base periods determination of canal capacity,frequency of irrigation,field capacity,crop factor,consumptive use of water,Blsney criddle equatiobn,problems. irrigation efficiency, L-section of canal, balancing depth of canal.	8Hrs
MODULE-IV Types of Dams & Spillways: Rigid dams& non rigid dams. Gravity dams, Forces acting on gravity dams. Types of Spillways, Necessity location, ogee spillway. Design of ogee spillway. Energy dissipation below spillway. Use of hydraulic jump & design of stilling basin.	8Hrs
MODULE-V Earthen Dams: Types, Necessity, mode of failures of earth dams, Preliminary section, design of earth dam,determination of Phreatic line in earth dams, seepage discharge, problems. Control of seepage in earth dams & neat sketches. Design criteria of earth dams, stability of slopes,Fellenious method of locating critical slip circle, swedesh slip circle method.	8Hrs
Question paper pattern: i) Two questions are to be set from each module.	

ii) Total five questions are to be answered by selecting minimum one question from each module.

Text books:

Punmia and Pandey Lal, "Irrigation and Water Power Engineering" Lakshmi Publications, New Delhi

Reference Books:

1. R.K.Sharma, "Hydrology & Water resources Engineering"

- 2. Garg, S.K., "Hydrology & Water Resource Engineering" khanna publications
- 3. Modi, P.N., "Irrigation, Water Resources and Water Power Engineering" Standard Book House, New Delhi.

E books and online course materials: <u>www.civilenggbooks.com</u>

Course outcomes:

On completion of the course, the student will have the ability to:

	-		r
Course	CO #	Course Outcome (CO)	Blooms
Code			Level
	CO1	Explain water management sectors and importance of water resource projects	(C2)
	CO2	Describe the components of hydrological cycles and reservoir planning	(C2)
	CO3	Assess requirements of canal irrigation system	(C3)
	CO4	Analyze and Design gravity dams and spillways.	(C5)
	CO5	Design earthen dam.	(C5)

Course Title: MATRIX METHODS OF STRUCTURAL ANALYSIS			
Course Code	16CV651	CIE: 50	
Number of Lecture Hours/Week	3hrs. (Lecture)	SEE: 50	
Total Number of Lecture Hours	42	SEE Hours: 03	
Prerequisite: Elements of and Structural analysis –II.	civil engineering , Strength of ma	aterial, Structural analysis –I,	
 Course objectives: Fundamentals of structures Analysis of trusses, Analysis of trusses, 	stiffness and flexibility methods continuous beams and rigid fram continuous beams and rigid fram	for analyzing indeterminate es by direct stiffness method es by flexibility method	
Modules		Teaching Hours	
MODULE-I Stiffness and flexibility: Development of stiffness and flexibility. Relationship between stiffness and flexibility matrix, member coordinates and global coordinates. Displacement Transformation matrix, force transformation matrix and relationship between them. Development of total stiffness matrix by using basic element approach. Analysis of continuous beams and frames using stiffness method(by using basic element approach).		04Hrs 04Hrs	
MC Introduction to direct stif co-ordinate system, Trans transformation matrix, Rel nodal numbering member global system and local stiffness matrix(global stift load vector,Banded matrix Computation of internal for	DDULE-II fness method, Local and global formation of variables, rotation ationship between member and er, member stiffness matrix in system, Development Overall ffness matrix), Development of k snd band width minimization. orces in members and reactions.	05Hrs	
Analysis of truss by direct of member stiffness mat	Stiffness method: Development rix in global system, numerical	04Hrs	

problems on Analysis of truss by direct Stiffness method(kinematic indeterminacy<=3)	
MODULE-III Application of direct Stiffness method in analysis of beams: Development of member stiffness matrix in global system, numerical problems on Analysis of continuous beams(D.O.F<=3).	04Hrs
Application of direct Stiffness method in the analysis of rigid frames: Development of rotation transformation matrix. Development of member stiffness matrix in global system. Analysis of rigid frames by $DSM(D_k \le 3)$.	05Hrs
MODULE-IV Introduction to flexibility method, Equilibrium equation, Compatibility condition, Choice of released structure, Equilibrium matrix, Element flexibility matrix. Point of contragredience, Construction of flexibility matrix of the structure, Relationship between nodal forces and displacement.	04Hrs
Application of flexibility method in the analysis of continuous beams, numerical problems(static indeterminacy<=3).	04Hrs
MODULE-V	04Hrs
frames, numerical problems ($D_s <= 3$).	04013
Application of flexibility method in the analysis of trusses, numerical problems (D _s <=3).	04Hrs
Question paper pattern: i) Two guestions are to be set from each module.	
ii) Total five questions are to be answered by selecting m	ninimum one question from
each module.	

Text books:

i) M Mukhopadhyay "Matrix, finite elements, Computer and Structural analysis", Oxford & IBW,1984

ii) W. Weaver J.M. Gere "Matrix Analysis of framed structures", CBS publishers and Disributers, 1986

iii) S Rajshekharan. G Sankara Subramanian " Computational structural Mechanics", PHI, 2001

iv) G.S Pandit & S P Gupta " Structural Analysis A Matrix Approach" Tata Mc Graw-Hill,1981

C.S Reddy "Basic structural Analysis", Tata Mc Graw-Hill, 1996

Reference Books:

i) L S Negi and R S Jangid "Structural Analysis", Tata Mc Graw-Hill, 1997

ii) H C Martin "Introduction to Matrix Methods of Structural analysis ",International text book Company,1996

E books and online course materials: <u>www.civilenggbooks.com</u>

Course outcomes: On completion of the course, the student will have the ability to:

Course	CO #	Course Outcome (CO)	Blooms
Code			Level
	CO1	Understand the basic concepts of	C2
		method and develop stiffness method	
	CO2	Application of direct stiffness method in structural analysis	C2
	CO3	Analyze trusses, continuous beams and	C4
		rigid frames by flexibility method	
	CO4	Understand the concepts of flexibility method and develop flexibility matrix	C2
	CO5	Analyze continuous beams, rigid	C4
		frames trusses & by flexibility method.	

Course Title: DESIGN OF MASONRY STRUCTURES		
Course Code	16CV652	CIE: 50
Number of Lecture Hours/Week	3hrs. (Lecture)	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisite: Elements of	civil engineering and Strength of	material
 Course objectives: To enable the students to 1. Masonry types and 2. Strength and stabil 3. Design of masonry 	acquire the knowledge in followin construction, permissible stresses ity of masonry walls	ng topics s for masonry
Modules		Teaching Hours
M	ODULE-I	
MASONRY UNITS, MATERIALS, TYPES & MASONRY CONSTRUCTION: Brick, stone and block masonry units – strength, modulus of elasticity and water absorption of masonry materials – classification and properties of mortars, selection of mortars. Defects and errors in masonry construction, cracks in masonry, types, reasons for cracking, methods of avoiding cracks.		07Hrs.
MODULE-II STRENGTH AND STABILITY: Strength and Stability of concentrically loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship, strength formulae and mechanism of failure for masonry subjected to direct compression. LOAD CONSIDERATIONS FOR MASONRY: Wall carrying axial load, eccentric load with different eccentricity ratios, walls with openings, free standing wall.		10Hrs
MC PERMISSIBLE STRESSES:	DULE-III Permissible compressive stress,	
stress reduction and shap	e reduction factors, increase in	

permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses.				
DESIGN CONSIDERATIONS: Effective height of walls and				
columns, opening in walls, effective length, effective				
thickness, slenderness ratio, eccentricity, load dispersion,				
arching action, lintels.	9Hrs.			
DESIGN OF MASONRY WALLS: Design of load bearing	08Hrs.			
masonry for building up to 3 storeys using IS : 1905 and SP :	CONTRACT			
20 procedure.				
MODULE-V				
REINFORCED MASONRY: Application, flexural and	00/14			
compression elements, snear walls	U8Hrs.			
wall- beam elements, infilled frames.				
,				
Question nonen notterme				
i) Two questions are to be set from each module				
i) Total five questions are to be answered by selecting minimum one a question from				
each module.				
Text books:				
1. Structural Masonry- Henry, A.W. : Macmillan Educatio	on Ltd., 1990.			
2. Brick and Reinforced Brick Structures- Dayaratnam P.	: Oxford & IBH, 1987.			
Defenence Deeler				
1. Design of masonry structures - Sinha B.P. Davies S.R. :	E&FN spon 1997			
2. IS 1905–1987 "Code of practice for structural use	of un-reinforced masonry-			
(3 rd revision) BIS, New Delhi.	,			
SP 20 (S&T) – 1991 "Hand book on masonry design and construction (1^{st} revision) BIS				
New Delhi				
E books and online course materials: www.civilengob	ooks.com			
Course outcomes:	1.11.4			
On completion of the course, the student will have the	e ability to:			

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Explain different types of masonry construction such as brick, stone, reinforced walls in composite action and identify the loads on masonry walls.	C2
	CO2	Analyze for strength and stability of masonry walls under direct compression and eccentric loading.	C4
	CO3	Explain different types of permissible stresses for masonry structures and design consideration such as effective height, effective length, effective thickness etc.	C2
	CO4	Design load bearing masonry walls up to 3 storey	C4
	CO5	Design & application of reinforced masonry & composite walls.	C4

Course Title: RURAL WATER SUPPLY AND SANITATION			
Course Code	16CV653	CIE: 50	
Number of Lecture Hours/Week	3hrs. (Theory)	SEE: 50	
Total Number of Lecture Hours	42	SEE Hours: 03	
Prerequisite: Environment	al studies and Environmental eng	gineering.	
 Course objectives: To enable the students to acquire the knowledge in following topics Characteristics of water quality ,sources for rural water supply sources an treatment methods Problems in rural sanitation , different method of collection and disposals or refuse, rainwater harvesting techniques Milk sanitation and control of insects 			
Modules		Teaching Hours	
MODULE-I Need for a protected water supply Investigation & selection of different water sources for rural places, Water borne diseases. Protection of well waters, Drinking water quality Indian standards - Physical, Chemical and bacteriological parameters. Different types of pumps for rural places		8hrs	
M	DDULE-II		
Supply systems: Metered water supply, Piped water supply, Intermittent and continuous water supply system.Water treatment methods- Disinfection of water , Removal of hardness & iron removal methods, Deflouridation- different methods and Nalgonda techniqueGround water contamination & control.		8hrs	
MODULE-III RURAL SANITATION Conservancy, public latrine, Concept of Eco-sanitation, Trenching method of refuse disposal and compositing methods of garbage disposal, Sewage farming techniques for utilization of treated effluent.Two pit latrines for rural		8hrs	

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places , Aqua privy, Design of Septic tank , Soak.		
MODULE-IV		
DRAINAGE SYSTEMS:Storm water & sullage disposal systems Methods –Roof top and various rain water harvesting methods and its uses COMMUNICABLE DISEASES:Terminology, Classification, Methods of communication of communicable diseases , Methods of control of communicable diseases REFUSE COLLECTION &DISPOSAL:Garbage, ash, rubbish, Collection methods, Transportation.Disposal –salvaging, Dumping, controlled tipping , Incineration,, Dung digester, Biogas plant.	10hrs	
MODULE-V		
MILK SANITATION:Essential of milk sanitation, Test for milk quality, Pasteurization of milk, Quality control, Cattle borne diseases, Planning and design for a sanitary cow shed. INSECT CONTROL :House fly - Life cycle, Diseases, methods of transmission & Control measures Mosquito - Life cycle, Diseases, methods of transmission & Control measures.	8hrs	
Question paper pattern: i) Two questions are to be set from each module. ii) Total five questions are to be answered by selecting minim	num one question from each	
module.		
Text books: 1. Joseph A Solveto, "Environmental sanitation "		
2. E.W.Steel, "Water supply and sanitary engineering"		
3. S.K Garg, "Water supply Engineering " Khanna Publis	hers	
 Reference Books: 1. Environmental sanitation by Joseph Salvato , INK Chapman & hall ltd. 2. Rural water supply & sanitation by,Sanjay Guindia ,SAPNA book house Bangalore. 	John Wiley and sons upta ,vayu education of	

3. Municipal and rural sanitation by, Victor M Ehlevs and earnest .W, steel ,new York Mc graw hillbook company.

E books and online course materials: <u>www.civilenggbooks.com</u>

Course outcomes: On completion of the course, the student will have the ability to:			
Course Code	CO #	Course Outcome (CO)	Blooms Level
	C01	Possess knowledge of drinking water	(C1)
		standards, protected water supply and water borne diseases. Understand and demonstrate techniques of identifying sources and selection of water source, well protection and pumps	.(C2)
	CO2	Possess knowledge of various water	(C1)
		supply systems. Understand techniques of drinking water treatment methods and ground water contaminations	.(C2)
	CO3	Possess of knowledge of eco-sanitation, public latrine and conservancy. Interpret and demonstrate techniques for treatment and disposal of solid waste and sewage farming.	(C2)
	CO4	Define concepts of communicable	(C1)
		diseases and refuse collection.	
		Understand and interpret techniques for rain water harvesting, storm water and sullage disposal, communication and control of communicable diseases and	(C2)

	solid wa	ste disposal.			
CO5	Show	knowledge	of	disease	(C1)
	transmis	sion by milk an	d insec	ts.	
	Interpret	and demonstra	te tech	niques for	
	milk san	itation, life cyc	le and	control of	(C2)
	insects.	-			(02)

Course Title: Remote sensing and Geographical information system			
Course Code	16CV654	CIE: 50	
Number of Lecture Hours/Week	3hrs. (Lecture)	SEE: 50	
Total Number of Lecture Hours	42	SEE Hours: 03	
Prerequisite: Survey-II			
 Course objectives: To enable Basic Remote Sens Concept of geograp GIS data models. Digitizing, Editing & GPS(Basic knowled 	wledge in following topics		
Modules		Teaching Hours	
MODULE-I Remote sensing : Introduction – Historical sketch of Remote sensing, Idealized remote sensing- Basic principles of remote sensing- Electro magnetic energy Electromagnetic spectrum- Wave length regions and their application in remote sensing- characteristics of solar radiation- Basic radiation and atmosphere- interaction of EM radiation-with earth surface-remote sensing observation platform-sensors-Application of Remote sensing.		08 hrs	
MODULE-II		02 hrs	
Geographic Information models. Introduction, S information, conceptual representation of geograp GIS Functionality –In preliminary data process spatial search and analy	03 hrs		

Computer fundamentals of GIS and Data storage: Fundamentals of computers vector/raster storage character files and binary files, file organization, linked lists, chains, trees.	03 hrs
MODULE-III	
Coordinate systems and map projection : Rectangular polar and spherical coordinates, types of map projections, choosing a map projection.	03 hrs
GIS Data models and structures –Cartographic map model, GEO-relation model, vector/raster methods, non-spatial data base structure viz., hierarchal network, relational structures.	03 hrs
Digitizing Editing and structuring map data – Entering the spatial data (digitizing), the non-spatial, associated attributes, linking spatial and non-spatial data, use of digitizers and scanners of different types.	03 hrs
MODULE-IV	
Data quality and sources of error –Sources of errors in GIS data, obvious sources, natural variations and the processing errors and accuracy.	05 hrs
Principles of Spatial data: access and search, regular and object oriented decomposition, introduction to spatial data analysis, and overlay analysis, raster analysis, network analysis in GIS.	04 hrs
MODULE-V	
GIS and remote sensing data integration techniques: in spatial decision support system land suitability and multi criteria evaluation, rule based systems, network analysis, special interaction	04 hrs

modeling, Virtual GIS.					
Global posit sensing, Dip requirements	Global positioning system : Hyper spectral remote sensing, Dip techniques, hardware and software requirements for GIS, overview of GIS software.				
Question pap	per pattern:				
i) Two question	ns are to be s	et from each module.			
II) Total five qu	lestions are to	o be answered by selecting minim	um one question from each		
module.					
Text books: 1. Princi 2. The G 3. Remot 4. Geogr 5. GIS and	 Text books: Principles of GIS – Peter A Burrough Reachael A Mc. Donnel-(Oxford). The GIs Book – George B. Kotre, P.E. – 5th edn., Thomson Learning. Remote sensing and image interpretation – Lillesand – (john Wiley and sons). Geographical Information system: Bemhard Sen-Wiley publications. GIS and Computer cartography – Christopher Jones – (Longman). 				
Reference Bo	ooks:	and GIS by M Anii Poddy - BS pu	blications		
2. Re	 Remote sensing and GIS by MI.Anji Reddy, BS publications Remote sensing and GIS by Basudeb Bhatta, Oxford publication 				
3. Basics of Remote sensing and GIS by S.Kumar ,Laxmi publications					
4. Fundamentals of RS by, George Joseph and Jegantan , university press.					
E books and	online cour	se materials: www.civilenggb	ooks.com		
Course outco On completio	Course outcomes: On completion of the course, the student will have the ability to:				
Course Code	CO #	Course Outcome (CO)	Blooms Level		
	CO1	Define the basics principles	of Remote (C1)		
		sensing, sensors etc.			
	CO2	Classify RS and GIS softwar about GPS device.	re, and also (C2)		
	CO3	Contrast different areas with the	help of RS (C2)		

	and GIS	
CO4	Apply RS and GIS for urban application and water resources etc	(C3)
CO5	Survey the area with respect to altitude, with the help of GPS.	(C4)

Course Title: DESIGN OF PRE-STRESSED CONCRETE STRUCTURES			
Course Code	16CV661	CIE: 50	
Number of Lecture Hours/Week	3hrs. (Lecture)	SEE: 50	
Total Number of Lecture Hours	42	SEE Hours: 03	
Prerequisite: Strength of Structural analysis –II	materials ,Concrete technology	, Structural analysis –I, and	
 Course objectives: Materials for pressing Losses of prestress Analysis of prestress Prediction of deflet Design of prestress 	stressing and systems of pre serviceability nd slabs		
Modules		Teaching Hours	
MODULE-I Introduction, Materials, Need of High Strength concrete & steel, Advantages and Disadvantages of P.S.C. over R.C.C. Stress Strain characteristics and properties. Basic Principles Of Pre-Stressing, Fundamentals, Systems Of Pre-Stressing ,Different systems of Pre-stressing, Pre-tensioning and Post- tensioning systems, Different methods of tensioning and end anchorages.		9Hrs	
Analysis Of Sections For Flexure, Stresses in concrete due to pre-stress and loads for symmetrical and unsymmetrical sections, Stresses in steel due to loads, Effect of cable profile, Load balancing concept, Pressure line concept.		8Hrs	
MODULE-III Losses of pre-stress, various types of losses encountered in pre-tensioned and post-tensioned sections as per I.S1343- 2012. Deflections of PSC members, Prediction of short term and long term deflections as per I.S1343-2012.		8Hrs	

Limit state of recommendat members, Ulti state of servic	8Hrs				
Design of bea post-tensioned sections,perm and eccentrici cable profile. I profile.	MODULE-V Design of beams and slabs, Design of pre-tensioned and post-tensioned symmetrical and un-symmetrical sections, permissible stress, design of pre-stressing force and eccentricity, limiting zone of pre-stressing force and cable profile. limiting zone of pre-stressing force and cable profile.				
Question pap i) Two questio ii) Total five o each module.	Question paper pattern: i) Two questions are to be set from each module. ii) Total five questions are to be answered by selecting minimum one question from each module.				
Text books: None					
 Reference Books: T.Y. Lin and Ned .H.Burns-"Design of pre-stressed concrete structures" Tata Mc-Graw publishers. N. Krishnaraju – "Pre-stressed concrete" Tata Mc-Graw publishers. N.Rajagopolan – "Pre-stressed Concrete P.Dayarathnam – "Pre-stressed concrete" Oxford and IBH publishing Co. N.C.Sinha and S.K.Roy – "Fundamental of pre-stressed concrete" John Wiley and Sons, NEWYORK. 					
Course outcomes: On completion of the course, the student will have the ability to:					
Course	$Course \qquad Co \# \qquad Course Outcome (CO) \qquad Discuss$				
Code			Level		
	CO1	Explain the concepts and ty	pes of pre- C2		
		stressing in Pre-stressed	concrete		

	structures and identify the materials for	
	pre-stressing	
CO2	Analyze a Pre-stressed Concrete section from stress concept, load balancing concept & concept of pressure line	C4
CO3	Estimate losses of pre-stressing	C4
CO4	Estimate short term and long-term deflections of un-cracked members	C4
CO5	Design pre-tensioned and post- tensioned beams and slabs	C4

Course Title: THEORY OF ELASTICITY			
Course Code	16CV662	CIE: 50	
Number of Lecture Hours/Week	3hrs. (Lecture)	SEE: 50	
Total Number of Lecture Hours	42	SEE Hours: 03	
Prerequisite: Strength of	materials, Structural analysis –I, a	nd Structural analysis –II	
 Course objectives: Generalized Hooke's law and strain-displacement relations, Equations of equilibrium and compatibility for two dimensional problems in rectangular a polar co ordinates Plane stress and plane strain problems, measurement of surface strains an strain rosettes, stalk polynomial. Analysis of two dimensional problems in rectangular and polar coordinates 			
Modules	Teaching Hours		
M Introduction to Mathe definition of continuum, constitutive laws, Gen displacement relations.	07 Hrs		
Mi Differential equations of e compatibility equations, / Stress polynomials, St. Ver	08 Hrs.		
MODULE-III Plane stress and plane strain, Principal stresses and strains, measurement of surface strains, strain rosettes, analytical method. Two-dimensional problems in rectangular coordinates, bending of a cantilever beam subjected to end load, effect of shear deformation in beams, Simply supported beam subjected to UDL.			
M Two-dimensional problem	DDULE-IV ns in polar coordinates, strain-	09Hrs.	

displacement	relations,	equations of equilibrium,			
compatibility e	compatibility equation, stress function.				
	M0				
Stress distribu	ution symme	trical about an axis. Rotating			
discs, Lame's	problem. Effe	ct of circular hole in an infinite 0	8 Hrs.		
plate, stress co	oncentration f	factors.			
Question pap i) Two questio	per pattern: ns are to be s	et from each module.			
ii) Total five q	uestions are	to be answered by selecting minimum one	question from		
each module					
Text books:					
1. Timosl	henko. S.P. a	and Goodier.J.N. – " Theory of Elasticity"	, International		
Studer	nts' Edition, N	1cGraw Hill Book Co. Inc., New Delhi.			
2. Wang.	P.C " App	lied Elasticity"			
Reference Bo	ooks:				
1. Valliapp	oan. C- " Con	tiuum Mechanics Fundamentals", Oxford and	IBH Publishing		
Co.Ltd.,	New Delhi.		_		
2. Srinath I	S. – " Adva	anced Mechanics of Solids". Tata McGraw H	Hill Publications		
Co.Itd.	New Delhi				
3. Venkata	raman and Pa	atel- " Structural Mechanics with Introductior	n to Elastity and		
Plasticity	y", McGraw H	lill Book Inc., New York			
E books and	online cour	se materials: <u>www.civilenggbooks.com</u>			
G (
Course outco	omes: on of the cou	urse the student will have the ability to:			
On completion of the course, the student will have the admity to:					
Course	CO #	Course Outcome (CO)	Blooms		
Code			Level		
	CO1	Describe stress and strain at a point,	C2		
		Generalized Hooke's law and strain			
		displacement relations			
	CO2	Explain aquilibrium and compatibility			
		Explain equilibrium and compatibility	C4		
		equation for the two dimensional			

	rectangular co ordinate system & solve problems on stress polynomials.	
CO3	Explain surface strain measurement technique using strain rosettes and solve problems on cantilever and section beams.	C4
CO4	Solve two dimensional problems in polar coordinate system using the concepts of equilibrium and combatibility equation .	C4
CO5	Develop the for stress distribution for the call of rotator discs and effect of circular hole in an infinite rate	C3

Course Title: PAVEMENT MATERIALS AND CONSTRUCTION					
Course Code	16CV663	CIE: 50			
Number of Lecture Hours/Week	3hrs. (Lecture)	SEE: 50			
Total Number of Lecture Hours	42	SEE Hours: 03			
Prerequisite: Concrete te engineering –I	chnology , Mechanization in co	nstruction and Geotechnical			
 Classification, properties, tests, gradation, design gradation to meet specifications, properties and chemical constituent of bitumen road binders. Preparation ,characteristics ,uses,tests,adhesionof bituminious binders to aggregate,mechanism of stripping ,test for bituminious emulsions & cut backs,mechanical properties of bitumen . Field test,bituminious mix,design of bituminious mix using different methods,working of pavement construction equipment . Equipment for bituminious, cement concrete pavement, and stabilized soil constructions equipment. Specifications for various types of flexible pavement, specifications &method of cement concrete pavement. 					
Modules Teaching Hours					
MATERIALS PAVEMENT MATERIALS classification, requirement aggregates, concepts of gradation, maximum aggre	5Hrs.				
BITUMEN AND TAR : Orig chemical constituents c requirements.	3Hrs.				
MC BITUMINOUS EMULSIONS	DDULE-II AND CUTBACKS: Preparation,	6Hrs.			

Binders to Road Aggregates: Adhesion failure, mechanism	
of stripping, tests and methods of improving adhesion.	
BITUMINOUS MIXES: Mechanical properties, dense and open textured mixes, flexibility and brittleness.	2Hrs
MODULE-III	
BITUMINOUS MIXES: Hveem Stabilometer & Hubbar– Field	
Tests, bituminous mix, design methods using Rothfuch's	
Method only and specification, Marshal mixed design	4Hrs.
criteria- voids in mineral aggregates, voids in total mix,	
density, flow, stability,percentage voids filled with	
bitumen.	
PAVEMENT CONSTRUCTION FOUNDMENT IN HIGHWAY	
CONSTRUCTION: Various types of equipment for	3Hrs.
excavation, grading and compaction – their working	
principle, advantages and limitations.	
MODULE-IV	
PAVEMENT CONSTRUCTION EQUIPMENT IN HIGHWAY	
CONSTRUCTION: Special equipment for bituminous and	2Hrs.
construction	
SUBGRADE: Earthwork grading and construction of	
embankments and cuts for roads. Preparation of subgrade,	5Hrs.
quality control tests.	
MODULE-V	
FLEXIBLE PAVEMENTS: Specifications of materials,	
construction method and field control checks for various	6Hrs.
types of flexible pavement layers.	
CEMENT CONCRETE PAVEMENTS: Specifications and	6 Hrs.
method of cement concrete pavement construction (PQC	
Importance of providing DLC as sub-base and polythene	
thin layer between PQC and sub-base); Quality control	

Question paper pattern:

i) **Two** questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module

Text books:

- 1. Highway Engineering-Khanna, S.K., and Justo, C.E.G., : Nem Chand and Bros. Roorkee
- 2. Construction Equipment and its Management- Sharma, S.C. : Khanna Publishers.
- 3. Hot Mix Asphalt Materials, Mixture Design and Construction-Freddy L. Roberts, Kandhal, P.S. : University of Texas Austin,
- 4. Texas. NAPA Education Foundation Lanham, Maryland.

Reference Books:

- 1. RRL, DSIR, 'Bituminous Materials in Road Construction', HMSO Publication.
- 2. RRL, DSIR, 'Soil Mechanics for Road Engineers', HMSO Publication.

3.Relevant IRC codes and MoRT & H specifications.

E books and online course materials: www.civilenggbooks.com

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Explain different types and characteristics of pavement materials	(C2)
	CO2	Design the bituminous Mixes	(C4)
	CO3	The working principles of pavement construction equipments	(C2)
	CO4	Describe the various components of flexible and rigid pavements	(C2)
	CO5	Describe the various components of material used in their specification for flexible and rigid pavement.	C2

Course Title: ENVIRONMENTAL IMPACT ASSESSMENT				
Course Code	16CV664	CIE: 50		
Number of Lecture Hours/Week	3hrs.	SEE: 50		
Total Number of Lecture Hours	42	SEE Hours: 03		
Prerequisite: Environmente engineering.	tal studies, Environmental engine	ering –I and Water resource		
 To enable the student to acquire the knowledge in the following topics. 1. Need for EIA studies, base line information, procedures for conducting EIA, limitations of EIA. 2. Developmental projects, environmental setting, EIA methodologies and techniques of EIA. 3. Assessment and prediction of impacts on air, water, noise, land ecology, soil and socioeconomic attributes and guidelines for developmental projects. 4. Salient features of the project activity, environmental parameters activity, relative steps and matrices. 5. EIA for water resource developmental projects, highway projects, nuclear power plant and mining project. 				
M	lodules	Teaching Hours		
MODULE-IDevelopmental Activity and Ecological Factors EIA, EIS,FONSI. Need for EIA Studies, Baseline Information, Step-by-Step procedures for conducting, EIA, Limitations of EIA.				
MODULE-II				
Framework of Impact Asse Environmental Setting, (Contents of EIA, Methodole	10 Hrs.			

MODULE-III				
Public Participation in Environmental Decision making. Practical Considerations in preparing Environmental Impact	05 Hrs.			
Assessment and Statements.				
MODULE-IV				
Assessment and prediction of Impacts on Attributes Air,	05 11.00			
economic Environment, EIA guidelines for Developmental	US HIS.			
projects, Rapid and Comprehensive EIA.				
MODULEV				
Salient Features of the Project Activity-Environmental				
Parameter Activity Relationships-Matrices.	03 Hrs			
EIA for water resource developmental projects, Highway	10 Hrs.			
Projects: Nuclear Power plant project Mining Project (Coal,				
Iron, Ore).				
Question paper pattern: i) Two questions are to be set from each module				
ii) Total five questions are to be answered by s	selecting minimum			
one question from each module.	-			
Text books:				
Jain R.K.Environmental Impact Analysis, Van Nostrand Reinhold Co.				
Environmental Impact Assessment- Anjaneyalu.Y				
Reference Books:				
Guidelines for EIA of developmental Projects Ministry of Environmer	ntal and Forests GOI			
Environmental Impact Assessment- Larry W. Canter, Mc Graw Hill Publication				
E books and online course materials: <u>www.civilenggbooks.com</u>				
Course outcomes:				
On completion of the course, the student will have the ability	to:			

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Formulate the objectives of the EIA studies.	(C6)
	CO2	Identify the environmental attributes to be considered for the EIA studies.	(C1)
	CO3	Identify the suitable methodology and prepare rapid EIA.	(C1)
	CO4	Identify the environmental attrikentes toe considered for E.I.A studies.	C1
	CO5	Identify the suitable methodology prepare E.I.A for developmental objects	C1

Course Title: APTITUDE TRAINING-II						
Course Code	•	16HU02		CIE: 50		
Number of Lecture Hours/Week	<u>.</u>	2 H	RS (Tutoria	al)	SEE: 50	
Total Number of L Hours	ecture		28		SEE Hours:	03
Prerequisite:						
Course objectives:	I				ſ	
TOPICS	ТАКЕ	AWAY	METHOD	OLOGY	APPLICATION	DURATION (HOURS)
Quantitative aptitudePercentage & Profit and lossTime, speed and distanceTime and workAverage, mixtures and allegationsLogical ability	Focus mentioned and problems the same	on the d topics solving related to	Problem Blended Learning	Solving	Understanding the concepts and short cuts related to the topics	
Clocks and calendars Syllogisms						12
Adductive and inductive logic analogies	Focus mentioned and problems the same	on the d topics solving related to	Problem Blended Learning	Solving	Understanding the concepts and logic related to the topics	12
Verbal abilitySentencecompletionsentencecorrectionIdiomsandphrasesActive	Understar applicatio articles, p pronoun a through e	nding the n of preposition and tenses xamples	Learning	and	application of the verbal topics	03

Interview Skills					
Structured and Unstructured Interview Face- Face interview Techniques to face Video interviews Grooming, Body Language, tips to customize preparation for personal interview Mock Interview	Understanding the skill involved for facing an interview	Blended Learning ar NLP	nd	What is an interview? What are the skills required to face an interview	03
Resume SkillsResume TemplateColor,Font,Structure of theresume,Usage ofpowerVerbs,Formatting,Customizingresume,IntroductiontoCurriculum Vitae	Understanding the skill involved for writing a resume	Blended, Learning ar NLP	nd	What is a resume? How to prepare an industry specific resume?	02
<u>Group</u> Discussion	Do's and Don't of GD Etiquette, Expectations from Industry experts	Blended Learning ar NLP	nd	Tips and tricks to crack GD	03
Modules				TOTAL Teaching Hours	<u>28</u>

Question paper patte	ern:		
Text books:			
Reference Books:			
E books and online of	course mate	erials:	
Course outcomes:			
On completion of the	e course, th	e student will have the ability	to:
Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1		
	CO2		
	CO3		
	CO4		
	CO5		

Course Title: EXTENSIVE SURVEY PROJECT						
Course Code	16CV67	CIE: 50				
Number of Lecture Hours/Week	2hrs. (Theory) + 4hrs. (Tutorial)	SEE: 50				
Total Number of Lecture Hours	28	SEE Hours: 03				
Prerequisite:						
(10 De conducted betw conducted along with 6 th An extensive survey trainir conducted for 2 weeks (14 drawings. Preferably the To	(To be conducted between 5 th & 6 th Semester for a period of 2 weeks, Viva voce conducted along with 6 th semester exams) An extensive survey training involving investigation and design of the following projects is to be conducted for 2 weeks (14 days). The student shall submit a project report consisting of designs and drawings. Preferably the Total Station must be used for the survey work of the projects					
Modules	s. Poconnaissance of the sites and	Teaching Hours				
fly levelling to esta	blish bench marks.					
2. NEW TANK PROJ	ECTS: The work shall consist of					
i) Alignment o Longitudinal line.	f center line of the proposed bund, and cross sections of the center					
ii) Capacity sur	veys.					
iii) Details at W	aste weir and sluice points.					
iv) Canal alignn	nent.					
 3. RESTORATION OF AN EXISTING TANK: The work shall consist of : Alignment of centre line of the existing bund, Longitudinal and cross-sections. along the centre line. ii. Capacity surveys, details at sluice and waste weir. 						
4. WATER SUPPLY AND	SANITARY PROJECT					
Examination of sources of water supply, Calculation of quantity required based on existing and projected population. Preparation of village map by any suitable method of surveying (like plane tabling), location of sites for ground level and overhead tanks, underground drainage system surveys for laying the sewers

5. HIGHWAY PROJECT Preliminary and detailed investigations to align a new road between two terminal stations. The investigations shall consist of topographic surveying of strip of land for considering alternate routes and for final alignment. Report should justify the selected alignment with details of all geometric designs for traffic and design speed assumed. Drawing shall include key plan initial alignment, final alignment, longitudinal section along final alignment, typical cross sections of road

Question paper pattern:

Text books:

Reference Books:

E books and online course materials: www.civilenggebooks.com

Course outcomes:	
On completion of the course, the student will have the ability to:	

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Demonstrate the concepts of survey, water resource engineering ,environmental engineering and transportation engineering theory course through series of experiments	C2

CO2	Share the responsibilities in small teams	
	of 4-5 members for conducting the	C^{2}
	experiments.	05
CO3	Perform the experiments and	C3
	determination of General instructions,	
	Reconnaissance new tank projects	
	Alignment of center line of the proposed	
	bund, Longitudinal and cross sections of the	
	center line. restoration of an existing tank,	
	water supply and sanitary project,	
	Examination of sources of water supply,	
	highway project Preliminary and detailed	
	investigations to align a new road	
	between two terminal stations	
CO4	Analyze the data and design the	C4
	projects such highway ,water supply	
	and sanitation ,over head tank and	
	restoration of existing tank project	
CO5	Prepare a well organized drawings and report containing detail design.	C3

Course Title: HIGHWAY MATERIAL TESTING LAB

Course Code		15CV68	CIE: 50		
Number of Lecture Hours/Week	Number of Lecture2 HRS (Tutorial)Hours/Week				
Total Number of Lectu	are Hours	28	SEE Hours: 03		
Prerequisite:	,				
Course objectives:					
Modules			Teaching Hours		
1. Aggregates: Crushir	ig, 10 percentage	e fine value, Abrasion, Impact, Shape t index and also Angularity number)	2 Shre		
Specific gravity and W	ater Absorption.		01115		
2. Neat Bituminous Bin	der: Specific Gravi	ity, Penetration, Ductility, Softening point	, 2 hrs		
Flash and fire point and	Viscosity tests on	Neat Bitumen.			
3. Modified Bituminou	s Binders: Elastic	Recovery Test and	2hrs		
4. Separation tests.			02HRS		
5. Subgrade Soll: CBR	l'est, Plate load te	st to determine modulus			
6. Tests on Bituminous	Mixes: Proportion	ing of aggregates by	04 HRS		
Rothfutch's method, Ma	rshall method of m	nix design for bituminous concrete			
7. Demonstration of foll	owing tests:		06 Hrs		
a. Repeated load F	atique Test.				
b. Immersion whe	el tracking test				
c. Accelerated poli					
for coarse aggre	4 Hrs.				
d. Determination o					
Benkelman Bear	n Deflection Stu	dies.			
Question names notter	Student have to	anduat two tasts and an main	avnorimente (in		
Question paper pattern: Student nave to conduct two tests one on major experiments (in syllabus)					
and one test on remaining en	xperiments(expe	riments). Picked by the student and h	he has to prepare		
write up and conduct experi	ment.		* *		

Text books:

Reference Books:

E books and online course materials:

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Demonstrate the concepts of highway technology theory course through series of experiments.	C2
	CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments.	C3
	CO3	Perform the experiments and determination of Crushing value of aggregates, Abrasion, Impact, Shape tests, Specific Gravity, Penetration, Ductility, Softening point, Elastic Recovery Test, CBR Test, Plate load test to determine modulus of subgrade reaction, load Fatigue Test, Immersion wheel tracking test,	C3
	CO4	Analyze the data and interpret the results.	C4
	CO5	Prepare a well organized laboratory report.	C3

CURRICULUM

FOR THE ACADEMIC YEAR 2015-16

DEPARTMENT OF CIVIL ENGINEERING

VII AND VIII SEMESTER B.E.

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING (An autonomous college under VTU) KALABURAGI

About the department

Our College has started with Civil Engineering branch 58 years old branch. Department started with a intake of 60 in the year 1958, enhanced to 90 in the year 1994 and further enhanced to 180 in the year 2014.Department has also started Post graduates courses in Environmental Engineering and structural Engineering in the year 1985 and 1992 respectively with intake of 18 each.

Civil Engineering branch consists of faculty with various specilisations (such as Structural Engineering, Environmental Engineering, Water resource Engineering, Geotechnical Engineering, Transpotation Engineering, and Concrete and Material).

Many of our faculty obtained their Master's and Ph.D degree from reputed institutes such as NIT, IIT etc. Average experience of the faculty is 25 years. With the continuous support and encouragement of our management Civil Engineering Department laboratories are well equipped with latest equipments and necessary software's.

Because of this Civil Engineering Department is identified as Research Centre by VTU Belgaum in the year 2002. Six research scholars completed their Ph.D from Civil Engineering Department and 30 research scholars are pursuing their Ph.D. Faculty members have published papers in reputed national and international Journals and also presented papers abroad.

Civil Engineering Department is regularly organizing workshop and short term courses and conferences for engineers and faculty members from engineering colleges topic related to latest development in the field of civil engineering. Civil Engineering Department has procured research grants from AICTE, VGST and KSCST. Some of our UG projects are identified as good projects and selected for state level presentation by IISC expert committee.

Most of our aluminees have occupied higher positions in government and private sector within the country and abroad.

Apart from regular academic work, to strengthen industry and institute interaction and also to contribute to social cause, Civil Engineering department is doing consultancy work such as Material testing Soil, Cement, Aggregate, Steel, Water, Sewage, Mix design of Concrete, Pavement design, structural design for Government and Private works.

Department is conducting NDT tests and issue of Stability certificate for private and Government works since from past 25 years. Because of the lab facilities and availability of expertise service, our department is identified as nodal centre for PMGSY Project in northern part of Karnataka.

VISION OF THE INSTITUTE

To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

MISSION OF THE INSTITUTE

- To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to the national and multinational industries and communities through educational, technical and professional activities.

VISION OF THE DEPARTMENT

To be the preeminent department for imparting technical knowledge and skills in the Civil Engineering field to meet the social, industrial, environmental and research needs at local and global levels.

MISSION OF THE DEPARTMENT

- 1. To provide technical education to meet the challenges in the profession through a well structured curriculum.
- 2. To inculcate innovation and research ideas for sustainable development with ethical background.
- 3. To impart entrepreneurial skills for serving the needs of the Society through technical and professional activities.
- 4. To create Civil Engineering professionals to serve the needs of the industry at local and global levels.

PROGRAM EDUCATIONAL OBJECTIVES

PEO1: To provide the knowledge of mathematics, science and engineering fundamentals for solving Civil Engineering problems.

PEO2: To enable the Graduates to exhibit their technical knowledge and skills of recent practices to identify and solve civil engineering problems.

PEO3: To enable the graduates to conduct and interpret the results of laboratory/ field experiments in basic sciences, engineering sciences and civil engineering.

PEO4: To enable the graduate for pursuing higher education and lifelong learning.

PEO5:To enable the graduates to acquire communication, team work and entrepreneurial skills along with the values of professional ethics.

PROGRAM OUTCOMES

- 1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

- 10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

The Civil Engineering graduates are able to:

- **PSO1**: Plan, Analyze and Design buildings, Water supply and Sewerage systems, Hydraulic structures and Transportation infrastructure using sustainable materials and conceptual knowledge of Geotechnical engineering.
- **PSO2**: Conduct survey and Laboratory experiments/ field investigations and interpret the data for application to real life problems.
- **PSO3**: Prepare detailed estimate of civil Engineering works and Execute the civil Engineering Projects with optimum resources using effective communication skills and Professional ethics.

SCHEME OF TEACHING FOR III SEMESTER TO VIII SEMESTER



Logo of the college PDA COLLEGE OF ENGINEERING, KALABURAGI Autonomous College under VTU

	SEMESTER VII							
Code No.	Course		Hours/	/Week		Maximum Marks		
		Lecture	Tutorial	Practical	Credits	CIE	SEE	Total
		THEORY						
16HU71	ENTREPRENUERSHIP AND MANAGERIAL	3		0	3	50	50	100
	ACCOUNTING							
16CV72	ESTIMATING, COSTING &	3	2	0	4	50	50	100
	SPECIFICATIONS							
16CV73	DESIGN OF STEEL STRUCTURE –I	3	2	0	4	50	50	100
16CV74	TRANSPORTATION ENGINEERING-II	3		0	3	50	50	100
16CV75x	ELECTIVE – IV	3		0	3	50	50	100
16CV76x	ELECTIVE – V	3		0	3	50	50	100
PRACTICAL								
16CV77	CAD LAB	2	0	2	3	50	50	100
16CV78	PROJECT PHASE – I	0	0	3	2	50	50	100
	Total	20	04	05	25	400	400	800

16CV75x -ELECTIVE – IV

16CV751 – ADVANCED RCC DESIGN 16CV752 – TRAFFIC ENGINEERING 16CV753 – AIR POLLUTION AND CONTROL 16CV754 – NUMERICAL METHODS IN CIVIL ENGINEERING

16CV76x -ELECTIVE – V:

16CV761 – DESIGN OF BRIDGES 16CV762 – STRUCTURAL DYNAMICS

16CV763 – ENGINEERING HYDROLOGY

16CV764 – SOLID WASTE MANAGEMENT

	SEWESTER VIII							
Code No.	Course	Hours/Week				Maximum Marks		
		Lecture	Tutorial	Practical	Credits	CIE	SEE	Total
		THE	ORY					
16CV81	DESIGN OF STEEL STRUCTURES-II							
		3	2	0	4	50	50	100
16CV82x	ELECTIVE-VI	3		0	3	50	50	100
16CV83x	OPEN ELECTIVE –VII	3		0	3	50	50	100
16CV8OE	ONLINE COURSE				1			
		PRAC	TICAL					
16CV84	SEMINAR	0	0	2	1	50		50
16CV85	PROJECT WORK PHASE – II	0	0	21	11	50	50	100
16CV86	INDUSTRIAL INTERNSHIP*				2	50	50	100
	Total	09	02	23	25	300	250	550

SEMESTER VIII

*Industrial internship is applicable for the students completing 7th and 8th semester in 2019-20.

ELECTIVE – VI:

16CV821 – FINITE ELEMENT METHOD 16CV822 – DESIGN OF HYDRAULIC STRUCTURES 16CV823 – HARBOURS, DOCKS AND TUNNEL ENGINEERING 16CV824 - PAVEMENT DESIGN 16CV825 – DESIGN OF EARTHQUAKE RESISTANT STRUCTURES 16CV826 – ADVANCED FOUNDATION DESIGN 16CV827 – INDUSTRIAL WASTE WATER TREATMENT

OPEN ELECTIVE – VII:

16CV8 OE - ENGINEERING MANAGEMENT AND ECONOMICS

16ME8 OE - TOTAL QUALITY MANAGEMENT

16EE8 OE – ENERGY CONSERVATION AND AUDITING

16EC8 OE - INTERNET O THINGS

16IP8 OE- STRATEGIC MANAGEMENT/VIRTUAL REALITY

16EI8 OE - INDUSTRIAL AUTOMATION

16AU8 OE- NON CONVENTIONAL ENERGY SOURCES/GREEN ENERGIES

16 CS8 OE – ANDROID/CLOUD COMPUTING

16IS8 OE- BIG DATA 15CC8 OE-SMART MATERIAL

Course Title: ENTREPRENEURSHIP AND MANAGERIAL ACCOUNTING					
Course Code	Credits: 03 CIE: 50				
Number of Lecture Hours/Week	3 (Theory)	SEE: 50			
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03			
Prerequisite: none					
Course objectives: To enable the students to Managerial Accountin 1. The Meaning, Fu Entrepreneurship 2. The Definition, O Problems and step 3. Preparation of Pr 4. Fundamentals of 5. Personnel and M	obtain the basic knowledge about En ag in the following topics:- unctions, Characteristics, Types, Role a Characteristics, Need, Objectives, Role os to start an SSI and Institutional Supp roject and Source of Finance Financial Accounting	atrepreneurship and and Barriers of Advantages, port			
Modules	Teaching Hours				
Module I ENTREPRENEUR : Meani Entrepreneur; Character Entrepreneur; Intrapren Entrepreneurs in ecor entrepreneurship, Gove Entrepreneurship in Inc PMMY, AIM , STEP, BIRA	8 hours				
ModuleII MANAGEMENT: Introduction characteristics of Manager of management, Rol Management, Henry Fay Engineers Social respons Module III PREPARATION OF PROJE PREPARATION OF PROJE Identification; Project Se Significance of Report: Co	uction – Meaning – nature and gement, Scope and functional areas es of Management, Levels of yol - 14 Principles to Management , ibility and Ethics CT AND SOURCE OF FINANCE: CT: Meaning of project; Project lection; Project Report; Need and ontents:	9 hours			

SOURCE OF FINANCE: Long Term Sources(Equity, Preference, Debt Capital, Debentures, Ioan from Financial Institutions etc) and Short Term Source(Loan from commercial banks, Trade Credit, Customer Advances etc)	8 hours
Module IV	
FUNDAMENTALS OF FINANCIAL ACCOUNTING: Definition,	
Scope and Functions of Accounting , Accounting Concepts	
and Conventions: Golden rules of Accounting, Final Accounts	9 hours
- Trading and Profit and Loss Account, Balance sheet	
Module V	
PERSONNEL MANAGEMENT, MATERIAL MANAGEMENT AND	
INVENTORY CONTROL:	
PERSONNEL MANAGEMENT: Functions of Personnel	
Management, Recruitment, Selection and Training, Wages,	
Salary and Incentives	
MATERIAL MANAGEMENT AND INVENTORY CONTROL:	
Inventory Control- Meaning and Eurotions of Inventory	
control : Economic Order Quantity(EQQ) and various stock	
level (Re-order level, Minimum level, Maximum level,	8 hours
Average level and Danger level)	
Question paper pattern:	
Two questions is to be set from each module by intermixing the	ne topic in the same
module. Total five questions to be answered by selecting min	imum one question
from each module.	
Text books:	
Reference Books:	
1. Financial Accounting -B S RAMAN- United Pu	ublishers Manglore,
Maheswar S N & Maheswari S K-Vikas Publishing	House.
2. Management & Entrepreneurship- K R Phaneesh-	Sudha Publications
,Prof Manjunatha & Amit kumar G – laxmi Publica	tion, Veerbhadrappa
Havina l-New Age International Publications.	
3. Industrial Organization & Engineering Economics	-T R Banga & S C
Sharma- Khanna Publishers, Dehli E baalta and anline agura materiala:	
E books and online course materials:	

Course outcomes: On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)					
	C01	Describe about Entrepreneurship					
	CO2	Apply the concepts of management and Engineers Social responsibility & Ethics practice.					
	CO3	Prepare project report & choose different Source of Finance.					
	CO4	Apply Fundamentals of Financial Accounting and interpret the final accounts.					
	CO5	Apply personnel management skills, Material and inventory control techniques.					

Course Titl	. ESTIMATING COSTING AND S	DECIFICATION
	e: ESTIMATING, COSTING AND S	Credits: 04
Course Code	16CV72	CIE: 50
Number of Lecture Hours/Week	03 Hrs	SEE: 50
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03
Prerequisite: building ma	aterial and construction, building planning	ng and drawing
Course objectives: To enable the students topics:- 1.Understand the metho components earth work,Be for sanitary works, culverts 2. Understand the method other works 3. Capable of calculate the	to obtain the basic knowledge about ds of taking out the quantities of eac ed concrete, Size stone masonry, Brickwor s, and steel truss. of writing the detailed specifications for a rate per unit quantity of all items of building	in the following h items of building k, RCC work etc. and Il items of building of ng and other works.
4. Able to valuate the value	e of property for different purposes.	
Modules		Teaching Hours
Module I Estimate: Different to drawings, important tern approximate methods of 1. Estimation: Methor centre line methor Preparation of do following civil en structures & fram- roof. Building co footings & roof slaves estimation of small 2. Estimates: Steel to culverts, manhole spread sheet for estimation	ypes of estimate, Study of various ms, units of measurements, abstracts, f estimating ods of taking out quantities & their cost – od, long wall & short wall method. etailed abstract & estimates for the gineering works – Buildings- masonry red structures with flat & sloped R.C.C omponents such as beams, columns, ab with T beams. Excel spread sheet for I buildings. russes – fink & Howe trusses, R.C.C.slab s & septic tank with soak pits. Excel stimation of slab culvert bridges.	10 hrs 06 hrs
Module II 1 Rate Analysi quantities of items of wo brick work, R.C.C. works, different R.C.C. windows & ver	s: Definitions & purpose, working of and rates for the following standard rks – earth work, cement concrete, stone masonry, flooring, plastering, centering & form work for items, wood & steel works for doors, atilators.	07 hrs

2 Spe specifi of wo partiti variou	02hrs					
Module III 1. Measurement of earthwork for roads – methods for computation of earthwork by different methods. Contracts: Types of contract – essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – tender, earnest money deposits, security deposit, tender forms, documents &						
docum termir contro Admin muste checki	nents & issu nation of co ol, right o nistrative ap r roll, measu ng measur	e of work order. Duties & liabilities, ntract, completion certificate, quality of contractor, refund of deposit. proval, technical sanction, nominal rement books, procedure for reading & rements – preparation of bills.	02hrs			
Module IV Valuation: De	finition of ter	ms used, different methods of valuation				
for different p	urposes with	numerical examples.	08 hrs			
Question pa TWO questio	p er pattern : ns are to be	solved compulsory from module I and	d other THREE			
questions are	e to be answ	ered from remaining THREE modules	selecting one			
question fror	n each modi	ule. Questions are to be set intermixing	g the topics within			
Taxt books:						
Text Dooks:						
 Reference Books: 1. Estimating & Costing by B.N.Dutta 2. Estimating Costing Specification & Valuation in Civil Engineering by N.Chakraborti. 3. Civil Engg Estimating Costing & Valuation by Amariit Agarwal & A.K.Upadhyaya. 						
E books and online course materials:						
www.civilenggebooks.com						
Course outcomes: On completion of the course, the student will have the ability to:						
Course	CO #	Course Outcome (CO)				
	CO1	Prepare the estimate for building items wall, column, beam, roofs lab steel roof works.	such as foundation, trusses and Sanitary			

CO2	Prepare the tender document and tender notice with detailed specifications including the legal aspects of contract of civil engineering projects
CO3	Determine the rates of different items of civil engineering works such as Earth work excavation, stone and brick masonry, woodwork, concrete and Reinforced concrete works.
CO4	Determine the quantity of earthwork by different methods for railways and highway.
CO5	Determine the fair price of the property by different methods of valuation for different.

Course Title: C	DESIGN OF STEEL STRUCTURE – I	
Course Code	16CV73	Credits: 04 CIE: 50
Number of Lecture Hours/Week	3hrs. (Theory) + 2 hrs. (Tutorial)	SEE: 50
Total Number of Lecture Hours	SEE Hours: 03	
Prerequisite: Civil Engineering Materials, Str	ength of Materials, Structural Analysis	
 Design philosophies, loads and load Behavior and design of fasteners typ connections Behaviour and design of axially loade Behaviour and design of simple bear Modules 	combinations ically bolted and welded and simple bea ed members and column bases ms	am-column Teaching Hours
INTRODUCTION: Advantages and Disadvar Load combinations, Design considerations, Failure criteria for steel, Codes, Specification Plastic Behavior of Structural Steel: Intro concept, Plastic collapse load, conditions of collapse, Methods of Plastic analysis, Plastic	3hours 5 hours	
ModuleII		
BOLTED CONNECTIONS : Introduction, Beh of ordinary Black Bolts, Design strength (HSFG), Design of axially loaded and eccentr WELDED CONNECTIONS : Introduction, Wel Types and Properties of Welds, Type specifications, Effective areas of welds, Des loaded joints using fillet and butt welds.	4 hours 4 hours	
Module III Design of Tension Members : Introduction, strands, Slenderness ratio, Behavior of t Factors affecting the strength of tension m		

Sections, Design of tension method	ber, Lug angle	es.	4hours			
Design of Compression Member						
slender compression member						
Effective length of compressio						
angle struts, laced and battened						
	Sant ap com		5hours			
Module IV						
Design of Beams: Introduction,	Beam types,	, Lateral stability of beams, factors				
affecting lateral stability, Behav	vior of simple	e and built-up beams in bending(I-				
sections with flange plates only	/ without ver	tical stiffeners), Design strength of	8 hours			
laterally supported beams in Be	ending, Desig	n strength of laterally unsupported				
beams. Shear strength of steel b	eams. Maxim	um deflection. Design of beams.				
		,,				
Module V						
Design of column bases: Design	of simple sla	b base and gusseted base subjected				
to axial loading. Design of conc	rete pedesta	I along with anchor bolt design for	4 hours			
given uplift load.						
Design of beam to beam and be	am to colum	n connections: Design of simple				
framed and seated (un stiffened	and stiffened	 connections using bolting and 	5 hours			
welding.						
Question paper pattern:	Question paper pattern:					
Two questions is to be set from each module by intermixing the topic in the same module. Total five						
I wo questions is to be set from	each module	by intermixing the topic in the same	e module. Total five			
I wo questions is to be set from questions to be answered by sele	each module ecting minimu	e by intermixing the topic in the same um one question from each module.	e module. Total five			
Two questions is to be set from questions to be answered by selected to the answered by selected to the set books:	each module	e by intermixing the topic in the same um one question from each module.	e module. Total five			
Two questions is to be set from questions to be answered by sele Text books: DESIGN OF STEEL STRUCTURES,	each module ecting minimu N.Subramania	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008	e module. Total five			
Two questions is to be set from questions to be answered by sele Text books: DESIGN OF STEEL STRUCTURES, DESIGN OF STEEL STRUCTURES, S	each module ecting minimu N.Subramania S.K.DUGGAL, I	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008 McGRAW HILL	e module. Total five			
Two questions is to be set from questions to be answered by sele Text books: DESIGN OF STEEL STRUCTURES, DESIGN OF STEEL STRUCTURES, Reference Books:	each module ecting minimu N.Subramania S.K.DUGGAL, I	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008 McGRAW HILL	e module. Total five			
Two questions is to be set from questions to be answered by self Text books: DESIGN OF STEEL STRUCTURES, DESIGN OF STEEL STRUCTURES, S Reference Books: 1. Design of Steel structures, T.Y	each module ecting minimu N.Subramania S.K.DUGGAL, I Y.LIN	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008 McGRAW HILL	e module. Total five			
Two questions is to be set from questions to be answered by sele Text books: DESIGN OF STEEL STRUCTURES, DESIGN OF STEEL STRUCTURES, S Reference Books: 1. Design of Steel structures, T.Y 2. Comprehensive Design of Steel lain Lalahmi Bublications	each module ecting minimu N.Subramania S.K.DUGGAL, I Y.LIN el Structures,	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008 McGRAW HILL Dr.B.C.Punmia, Ashok Kumar Jain, Ar	e module. Total five			
Two questions is to be set from questions to be answered by self Text books: DESIGN OF STEEL STRUCTURES, DESIGN OF STEEL STRUCTURES, S Reference Books: 1. Design of Steel structures, T.Y 2. Comprehensive Design of Stee Jain, Lakshmi Publications	each module ecting minimu N.Subramania S.K.DUGGAL, I Y.LIN el Structures,	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008 McGRAW HILL Dr.B.C.Punmia, Ashok Kumar Jain, Ar	e module. Total five			
Two questions is to be set from questions to be answered by sele Text books: DESIGN OF STEEL STRUCTURES, DESIGN OF STEEL STRUCTURES, Reference Books: 1. Design of Steel structures, T.Y 2. Comprehensive Design of Stee Jain, Lakshmi Publications 3. Design of Steel structures, STI	each module ecting minimu N.Subramania S.K.DUGGAL, I Y.LIN el Structures,	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008 McGRAW HILL Dr.B.C.Punmia, Ashok Kumar Jain, Ar	e module. Total five			
Two questions is to be set from questions to be answered by sele Text books: DESIGN OF STEEL STRUCTURES, DESIGN OF STEEL STRUCTURES, S Reference Books: 1. Design of Steel structures, T.Y 2. Comprehensive Design of Stee Jain, Lakshmi Publications 3. Design of Steel structures, ST 4. Bureau of Indian Standards, IS	each module ecting minimu N.Subramania S.K.DUGGAL, I Y.LIN el Structures, EEVE INGLEKI 800-2007, IS8	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008 McGRAW HILL Dr.B.C.Punmia, Ashok Kumar Jain, Ar RK 375-1987	e module. Total five			
Two questions is to be set from questions to be answered by self Text books: DESIGN OF STEEL STRUCTURES, DESIGN OF STEEL STRUCTURES, S Reference Books: 1. Design of Steel structures, T.Y 2. Comprehensive Design of Stee Jain, Lakshmi Publications 3. Design of Steel structures, ST 4. Bureau of Indian Standards, IS 5. Sp 6(1) or Steel Tables	each module ecting minimu N.Subramania S.K.DUGGAL, I Y.LIN el Structures, EEVE INGLEKI 800-2007, IS8	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008 McGRAW HILL Dr.B.C.Punmia, Ashok Kumar Jain, Ar RK 375-1987	e module. Total five un Kumar			
 Iwo questions is to be set from questions to be answered by sele Text books: DESIGN OF STEEL STRUCTURES, S DESIGN OF STEEL STRUCTURES, S Reference Books: 1. Design of Steel structures, T.Y 2. Comprehensive Design of Steel Jain, Lakshmi Publications 3. Design of Steel structures, ST 4. Bureau of Indian Standards, IS 5. Sp 6(1) or Steel Tables E books and online course mate 	each module ecting minimu N.Subramania S.K.DUGGAL, I Y.LIN el Structures, EEVE INGLEKI 800-2007, IS8 erials:	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008 McGRAW HILL Dr.B.C.Punmia, Ashok Kumar Jain, Ar RK 875-1987	e module. Total five un Kumar			
 Iwo questions is to be set from questions to be answered by sele Text books: DESIGN OF STEEL STRUCTURES, DESIGN OF STEEL STRUCTURES, S Reference Books: 1. Design of Steel structures, T.Y 2. Comprehensive Design of Steel Jain, Lakshmi Publications 3. Design of Steel structures, STI 4. Bureau of Indian Standards, IS 5. Sp 6(1) or Steel Tables E books and online course mate www.civilenggebooks.com 	each module ecting minimu N.Subramania S.K.DUGGAL, I Y.LIN el Structures, EEVE INGLEKI 800-2007, IS8 erials:	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008 McGRAW HILL Dr.B.C.Punmia, Ashok Kumar Jain, Ar RK 375-1987	e module. Total five un Kumar			
 Iwo questions is to be set from questions to be answered by sele Text books: DESIGN OF STEEL STRUCTURES, DESIGN OF STEEL STRUCTURES, S Reference Books: 1. Design of Steel structures, T.Y 2. Comprehensive Design of Steel Jain, Lakshmi Publications 3. Design of Steel structures, ST 4. Bureau of Indian Standards, IS 5. Sp 6(1) or Steel Tables E books and online course mate www.civilenggebooks.com Course outcomes: On completion of the course the 	each module ecting minimu N.Subramania S.K.DUGGAL, I Y.LIN el Structures, EEVE INGLEKI 800-2007, IS8 erials:	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008 McGRAW HILL Dr.B.C.Punmia, Ashok Kumar Jain, Ar RK 375-1987	e module. Total five			
 Iwo questions is to be set from questions to be answered by sele Text books: DESIGN OF STEEL STRUCTURES, S DESIGN OF STEEL STRUCTURES, S Reference Books: 1. Design of Steel structures, T.Y 2. Comprehensive Design of Steel Jain, Lakshmi Publications 3. Design of Steel structures, STI 4. Bureau of Indian Standards, IS 5. Sp 6(1) or Steel Tables E books and online course mate www.civilenggebooks.com Course outcomes: On completion of the course, the 	each module ecting minimu N.Subramania S.K.DUGGAL, I Y.LIN el Structures, EEVE INGLEKI 800-2007, IS8 erials:	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008 McGRAW HILL Dr.B.C.Punmia, Ashok Kumar Jain, Ar RK 375-1987 Il have the ability to:	e module. Total five un Kumar			
 Iwo questions is to be set from questions to be answered by sele Text books: DESIGN OF STEEL STRUCTURES, DESIGN OF STEEL STRUCTURES, S Reference Books: 1. Design of Steel structures, T.Y 2. Comprehensive Design of Steel Jain, Lakshmi Publications 3. Design of Steel structures, STI 4. Bureau of Indian Standards, IS 5. Sp 6(1) or Steel Tables E books and online course mate www.civilenggebooks.com Course outcomes: On completion of the course, the 	each module ecting minimu N.Subramania S.K.DUGGAL, I Y.LIN el Structures, EEVE INGLEKI 800-2007, IS8 erials: ne student will CO #	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008 McGRAW HILL Dr.B.C.Punmia, Ashok Kumar Jain, Ar RK 375-1987 Il have the ability to: Course Outcome (CO)	e module. Total five			
Two questions is to be set from questions to be answered by self Text books: DESIGN OF STEEL STRUCTURES, DESIGN OF STEEL STRUCTURES, S Reference Books: Design of Steel structures, T.Y. Comprehensive Design of Steel Jain, Lakshmi Publications Design of Steel structures, STI Bureau of Indian Standards, IS Sp 6(1) or Steel Tables E books and online course mata www.civilenggebooks.com Course outcomes: On completion of the course, the 	each module ecting minimu N.Subramania S.K.DUGGAL, I 7.LIN el Structures, EEVE INGLEKI 800-2007, IS8 erials: ne student will CO #	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008 McGRAW HILL Dr.B.C.Punmia, Ashok Kumar Jain, Ar RK 375-1987 Il have the ability to: Course Outcome (CO)	e module. Total five un Kumar			
Two questions is to be set from questions to be answered by sele Text books: DESIGN OF STEEL STRUCTURES, DESIGN OF STEEL STRUCTURES, S Reference Books: Design of Steel structures, T.Y. Comprehensive Design of Steel Jain, Lakshmi Publications Design of Steel structures, STI Bureau of Indian Standards, IS Sp 6(1) or Steel Tables E books and online course mate www.civilenggebooks.com Course outcomes: On completion of the course, the 	each module ecting minimu N.Subramania S.K.DUGGAL, I Y.LIN el Structures, EEVE INGLEKI 800-2007, IS8 erials: ne student will CO # CO1	e by intermixing the topic in the same um one question from each module. an, Oxford, 2008 McGRAW HILL Dr.B.C.Punmia, Ashok Kumar Jain, Ar RK 375-1987 II have the ability to: Course Outcome (CO) Explain different design philosop	e module. Total five un Kumar hies and analyze			

CO2	Design axially loaded and eccentrically loaded bolted and welded connections
CO3	Design axially loaded tension and compression members
CO4	Design simply supported beams using single I sections and simple built up sections
CO5	Design simple beam to column connections using bolting and welding

Course Title: TRANSPORTATION ENGINEERING-II					
Course Code	16CV74	Credits: 03 CIE: 50			
Number of Lecture Hours/Week	3hrs. (Theory)	SEE: 50			
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03			
Prerequisite: TRANSPORT	ATION ENGINEERING-II				
 Course objectives: To enable the students to acquire the knowledge in the following topics Understand role of railway and different route selection for the construction railway track Learn different types of structural components , engg properties of material to construct the material to calculate the material quantities required for construction Understand the various aspects of geometric element , points and crossings ,significance of maintenance of track Design and plan Airport layout, design facilities required for runway ,taxiway and impart knowledge about visual aids. Understand different types of harbour structure, dock and necessary pavigational aids : also expect them to various methods of tuppeling and 					
Modules	Teaching Hours				
Module I Railways: Role of railw routes.	1hours				
Permanent way – Gauges in railways – railway track, cross- sections, coning of wheels, rails, rail sections, Ballast and sleepers. Rail fixtures, calculation of quantity of materials needed for laying of tracks. Wear on rails, rail joints, welding of rails, creep of rails, traction and tractive resistances, tractive power, Hauling capacity. Problems on above					
ModuleII		7110013			
Geometric design of tra pusher grade, minimum curves. Speed of train negative cant- speed ca High speed tracks only-p	5 hours				

Points and crossing: Necessity, components, turnout, design of turnout (no derivations, only relevant problems).	4 hours			
Module III				
Points and crossing Continued: stations and yards, Signalling and interlocking, track defects, track maintenance, level crossing, Indian Railway standards.	4hours			
Airport Planning: Layout of an airport with component parts and functions of each, Aircraft Characteristics – Airport Classifications, - Site selection- regional Planning.	4hours			
Module IV Runway Design- Analysis of Wind data-determination of the best orientation of the runway configurations by using two types of wind rose diagrams- basic length of the runway – corrections to runway length by ICAO and FAA specification- runway cross Sections- problems on above.	4 hours			
Taxiway Design: Factors affecting the layout of the taxiway- geometrics of taxiway- design of exit taxiways, - ICAO Specifications. Problems on	3 hours			
Above.	2 hours			
Module V				
Tunnels: Tunnels for railway and roads, cross-section,				
principle of tunnelling through hard and soft rocks, tunnel lining, drainage and Ventilation.	4 hours			
Harbours: Types, components, typical layout, objects and functions of docks. different harbour structures.	4 hours			
Question paper pattern:	e tonic in the same			
module. Total five questions to be answered by selecting mini	mum one question			
from each module	······································			
Text books:				
 Saxena and Arora, "Railway Engineering", Dhanpat F Delhi 	ai and Sons, New			
2. Satish Chandra and Agarwal, M.M., "Railway Engineering" Oxford				
Oniversity Press, New Deini 3 Agarwal M M "Indian railway Track" Jaico Publications Rombay				
 Khanna, Arora and Jain – Airport Planning and Design – Nemchand Roorkee. 				

5. Srinivasan,	R.,	"Harbour,	Dock	and	Tunnel	Engineering",	Charotar
Publishing H	ouse						

Reference Books:

1. Mundrey J.S – Railway Track Engineering – Tata McGraw Hill Publications, New

Delhi.

E books and online course materials:

www.civilenggebooks.com

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)			
	CO1	Identify various components of permanent way and determine hauling capacity of railway.			
	CO2	Determine the permanent parameters required for geometric design of track.			
	CO3	Explain the components of points, crossings, signalling and interlocking systems and design the turnouts.			
	CO4	Explain the component parts and functions of an airport and design the runway length and exit taxiway.			
	CO5	Compare different techniques of tunneling in hard and soft rock and explain different dock and harbor structures.			

Course Title: ADVANCED R.C.C. DESIGN						
Course Code	16CV751	Credits: 03 CIE: 50				
Number of Lecture Hours/Week	Number of Lecture 3hrs Hours/Week					
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03				
Prerequisite:Elements of analysis 1, s	civil engineering and strength of mate tructural analysis 2	erial,structural				
To enable the students to 1.Understand the design 2.Understand the design on ground. 3.Understand the design 4.Understand the base shapes of RCC slabs.Under 5.Understand the design	Course objectives: To enable the students to acquire the knowledge in the following topics 1.Understand the design procedure of cantilever & counterfort retaining walls 2.Understand the design procedure o circular & rectangular water tanks resting on ground. 3.Understand the design procedure of slab type & beam type combined footings. 4.Understand the base concept of yield line theory for the design of different shapes of RCC slabs.Understand the design concept of grid floors & flat slabs. 5.Understand the design procedure for continuos beams & single bay & single					
Modules	Teaching Hours					
Module I Different types of Retain & detailing of cantileve detailing of counterfort re	Module I Different types of Retaining walls, types of backfill. Design & detailing of cantilever type retaining walls. Design & detailing of counterfort retaining walls.					
ModuleII Different types of wa circular water tanks rest rigid base. Design & de resting on ground with fl	7hours					
Module III Different types of combi slab type combined foot beam type combined foot	7hours					
Module IV Yield line theory: Intro theory, location of yield analysis of one way & slab, hexagonal slab, tra shapes of slabs. Design of grid floor and design of grid floors by a	duction, basic ideas of yield line lines for standard cases, yield line two way rectangular slab, circular angular slab & design of different flat slabs: Introduction, analysis & approximate & plate theory, design	10 hours				

of flat slabs					
Module V Design of continuous beams and portal frames: Introduction, effective span, and calculation of BM & SF,					
single bay, s	single story ed data, reinf	portal frame (hinged & fixed)for forcement detailing	10 hours		
Question na	ner nattern:	5			
Two question	ns is to be se	t from each module by intermixing t	the topic in the same		
module Tota	al five questi	ons to be answered by selecting mi	nimum one question		
from each m	ndule		innum one question		
Text books:	ouure.				
1 Dr S^{1}	S Bhavikatti	"Advanced RCC Design			
Reference R		Advanced Rec Design			
$1 \text{ N } K_1$	ishnaraju -'	Design of Advanced Reinforced (oncrete structures"		
CBS	nublishers N	lew Delhi	concrete structures		
$2 \Delta K$	Iain — "I	imit State method of design" Ne	michand and Bros		
Z. A.K. Roorl		mint State method of design 100	differentiation and Dios.,		
3 Park	& Paulay —	"Reinforced Concrete" John Wiley	v & Bros		
4. B.C.	Punmia As	hok kumar Jain & Arun kumar Ja	in — "Limit State		
desig	n of Reinfor	ced concrete". Laxmi Publication. N	Jew Delhi		
5. V.Ra	makrishnan d	& P.D.Arthur. "Ultimate strength	design of structural		
concr	ete". Wheel	er Books. Allahabad			
6. IS 45	6-2000. SP 1	6			
E books and	online cour	se materials:			
www.civilen	gebooks con	m			
Course outc	omes:				
On completi	on of the co	urse the student will have the abili	ty to•		
on completi	on or the co	arse, the student will have the abili	ity to.		
Course	CO #	Course Outcome (CO)			
Code					
Couc	CO1	Design cantilever and counter fort	retaining walls		
	COI		returning wans.		
	CO2	Design circular and rectangular wa	ater tanks resting on		
	ground				
	<u>CO3</u>	Desan slah type and slah & ho	am type combined		
		footings	in type combined		
		Design singular slab, srid flagers and	l flat clabe		
		Design circular slab, grid floors and	I HAT SIADS		
	COF	Design contineus because and rests	Iframac		
		besign continuous beams and porta	i ii dilles		

Course	e Title: TRAFFIC ENGINEERING	Ĵ			
Course Code	16CV752	Credits: 03 CIE: 50			
Number of Lecture Hours/Week	3hrs. (Lecture)	SEE: 50			
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03			
Prerequisite: Transportat	ion Engg-I				
Course objectives: To entropics: 1. Understand the characteristics 2. Understand sate conducting variation of the signed of th	 Course objectives: To enable students to acquire the knowledge in the fallowing topics: Understand the components of road traffic, vehicle and road user characteristics. Understand sampling of data, analysis and interpretation of data in conducting various survey. Determine the problems on traffic flow by using different theories Design the signals and rotary as per IRC. Understand the traffic regulation, pollution caused by traffic and 				
Modules		Teaching Hours			
Module I Introduction: Compone androad, Objectives-Sco Road user characteri Characteristics: Stati Power,Performance of V vehicles- Reaction time of	Module I Introduction: Components of road traffic, the vehicle, driver androad, Objectives-Scope of Traffic Engineering. Road user characteristics, human factors and vehicle Characteristics: Static and dynamic characteristics-Power,Performance of Vehicles-Resistances to the motion of the proventies of the proventies of the motion of the proventies of the proventies of the motion of the proventies of the proventies of the motion of the proventies of the proventies of the proventies of the motion of the proventies of the proventi				
Madulall	-	6 hours			
Traffic parameter s andMethod of study – D Data Collection and A TrafficStudies- Volume, and Destination, - parki Accidents-Causes, Anal parked vehicle), Measu problems. Module III Traffic Flow Theorie methods shock wave the	tudies and Analysis: Objectives befinition of study area- Sample size – analysis- Interpretation of following Spot Speed, Speed and Delay, Origin ng- on street and off street Parking- ysis (right angle collision only with area to reduce Accident. Numerical s: Element of Traffic flow, linear part and bottleneck problems. Simple	10 hours			

queuing theo following the				
tone wing the	8 hours			
Module IV				
Traffic cont	rol Devices	: Trattic signs, trattic Markings,		
signals, signa	l coordinatio	on, intelligent Transport system IRC		
method of si	gnal design,	road side Furniture. Traffic rotary		
elements, des	ign of rotary	y as per IRC. Relevant problems on		
above (No pro	oblems on ve	chicle actuated signals).	0.1	
Modulo V			8 hours	
Traffic Reg	oulation ar	d control: General regulations		
regulations of	n vehicles,dr	ivers, flow and other regulations and		
control. Traff	fic managen	nent; noise and air pollution due to		
road traffic ar	nd method of	control.	8 hours	
Question pap	oer pattern:			
Two question	s is to be se	t from each module by intermixing th	e topic in the same	
module. Tota	l five questio	ons to be answered by selecting mini	mum one question	
Text books.	dule.			
1. Matson	Smith and I	Hurd., "Traffic Engineering"., McGrav	v Hill and Co	
2 LRKa	, livali "Tra	affic Engineering and Transport F	Planning" Khanna	
Publish	ers.	and mansport r	Tanining . TChanna	
3. Khanna	and Justo, "	Highway Engineering", Nemchand B	ros.	
4. Wells, C	G.R., "Traffi	e Engineering – An Introduction", Grit	ffin, London.	
5. Drew, '	"Traffic flow	r theory" – McGraw Hill Co		
Reference Bo	ooks:			
I. Matso	n, Smith and	Hurd., "Traffic Engineering"., McGra	aw Hill and Co	
2. L.R.K Publis	adiyali., "T hers.	raffic Engineering and Transport I	Planning". Khanna	
3. Khanr	na and Justo,	"Highway Engineering", Nemchand	Bros.	
4. Wells,	, G.R., "Traf	fic Engineering – An Introduction", G	riffin, London.	
5. Drew,	"Traffic flo	w theory" – McGraw Hill Co		
E books and	online cour	se materials:		
www.civileng	gebooks.com	<u>n</u>		
On completion of the course, the student will have the ability to:				
Course Codo	CO #	Course Outcome (CO)		
Jule	CO1	Analyze different factors and com	ponents affecting	
	~~	road traffic.		

CO2	Analyze the traffic data and interpret the result.	
CO3	Determine the relation between the parameters of traffic flow using traffic flow theories.	
CO4	Illustrate the design of signals and design of rotary as per IRC.	
CO5	Explain the traffic regulation and management and also the method of controlling pollution.	

Course Title: AIR POLLUTION AND CONTROL				
Course Code	16CV753	Credits: 03 CIE: 50		
Number of Lecture Hours/Week	3hrs	SEE: 50		
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03		
Prerequisite:Envirnomen	Prerequisite:Envirnomental engg-1, Envirnomental engg-2			
 Course objectives: To enable students to acquire the knowledge in the fallowing topics: To enable the students to understand fundamentals of air pollution. Enable the students to understand meterology and air pollution. Enable the students to understand measurement of pollutants. Students to understand about control equipments. 				
Modules		Teaching Hours		
Module I Introduction: Defin air pollutants, primary source, non point sourc Effects of air pollution: (and properties. Major air	4 hours 6 hours			
ModuleII Meteorology: Meteoro inversion, stability co behaviors, Gaussian bo model. Air quality standards – C	ological variables, lapse rate, onditions, wind rose, plume ehavior or Gaussian dispersion Clean dry air constituents.	6 hours 3 hours		
Module III Sampling and analysis: gaseous and particulate Emission standards	sampling and measurement of pollutants.	5 hours 2 hours		
Module IV Control of air pollutar emission control, gra cyclones, fabric filters, scrubbers. Module V	nts: control methods-particulate avitational settling chambers, electrostatic precipitators, wet	9 hours		
1. industrial plant locations and planning. 5 hours				

2. Emission standards	2 hours
Question paper pattern:	
Two questions is to be set from each module by intermixin	g the topic in the same
where the transfer of the second seco	

module. Total five questions to be answered by selecting minimum one question from each module.

Text books:

Reference Books:

- 1. Air Pollution : HVN Rao and M N Rao
- 2. Environmental Pollution Control: C S Rao
- 3. Air Pollution: Henry Perkins

E books and online course materials:

www.civilenggebooks.com

Course outcomes:

On completion of the course, the student will have the ability to:

Course	CO #	Course Outcome (CO)	
Code			
	CO1	Classify and explain various constituents of clean dry air and pollutants.	
	CO2	Explain the effects of air pollution on humans, animals and properties.	
	CO3	Sampling and analysis of gaseous and particula pollutants, environmental impact assessment.	
	CO4	Understand air pollution control equipments to minimize pollution.	
	CO5	Identify air quality and emission standards. Become professional consultant to work for air pollution monitoring.	

Course Title: NUMERICAL METHODS IN CIVIL ENGINEERING				
Course Code	16CV754	Credits: 03 CIE: 50		
Number of Lecture Hours/Week	3hrs	SEE: 50		
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03		
Prerequisite:Mathematic	Prerequisite:Mathematics- III,Mathematics- IV			
 Course objectives: To enable students to acquire the knowledge in the fallowing topics: To understand and apply a suitable technique for solution simultaneous equations. To understand and apply a suitable non lienier differentiation equation method among the given , for the solution of beam problems. Application of different methods for non lienier algebraic and transcendental equations. To understand numerical integration method to be applied for beam problems. To understand and apply finite difference techniques for beams and columns to and solpes, deflections, torsion. 				
Modules		Teaching Hours		
Module IINTRODUCTION:Historical development of Numericaltechniques, role in investigations, research and design in thefield of civil engineering.1 hoursNUMERICAL SOLUTIONS OF SIMULTANEOUS EQUATIONS FORCIVIL ENGINEERING PROBLEMS.Development of Algorthims for				
(i) Cr (ii) Ga (iii) Ga (iv) Cr (v) M (v) M (vi) Ei er	amer's rule aussian elimination method auss- Siedel iteration method aolesky decomposition method atrix inversion method gen value problems in civil agineering.	9 hours		
ModuleII SOLUTION OF NON-LINE EQUATION- APPLICABLE (i) Eu (ii) Ta (iii) BI	AR FIRST ORDER DIFFERENTIAL TO BEAM PROBLEMS. Iler's method ylor's series Inge-Kutta 2 nd and 4 th order methods			

Gaussian qua	drature met	nod	
			9 hours
Module III			
SOLUTION	FOR NON-	LINEAR AND ALGEBRAIC AND	
TRANSCENDE	NTAL EQUA		
	(I) Nev	vton-Raphson method	
	(II) BISE	ection method	6 hours
		shoff s theory	
	NIEGRATIO	N	
	Numerical	method for solving simole beam	3 hours
Madula IV	problems		
		and deflection of cantilover	
	(I) 5104 hos	m simply supported beam fixed	
	bea	m propped beem	
	(ii) Bea	ms of elastic foundation	
	(ii) Dea		
			8 hours
Module V			
FINITE DIFFERENCE TECHNIQUES:			
(i) Buckling load from column			
(ii) Torsion problem of non-rectangular sections.			
(iii) Membrane problem.			6 hours
Question pap	er pattern:		
Two question	s is to be se	t from each module by intermixing th	e topic in the same
module. Total five questions to be answered by selecting minimum one question			
from each mo	dule.		
Text books:		le fen En zin e ens hu Chenne & Chenele	
1. Nume	rical method	is for Engineers by Chapra & Chanale	
2. Numerical algorithms, by E V Krishnamurthy			
3. Numerical methods for civil Engineers by Muthu & Raju			
Reference Books:			
Computation Wiley Fastern Ltd New Delhi			
2 Numerical methods for Engineers, by B S Grewal			
E books and	online cours	se materials:	
www.civilenggebooks.com			
Course outcomes:			
On completion	on of the cou	rse, the student will have the ability	to:
Course	CO #	Course Outcome (CO)	
Code	·	(22)	

C01	 Determine the solutions simultaneous for equations and develop algorithm for numerical technique such as cramer's rule,Gaussian elimination method,Gauss siedel Iteration method, Cholesky decomposition method and Eigen value problems in civil engineering. 	
CO2	solve non linear first order differential equations especially applicable to beam problem using technique such as Euler;s method, Taylor's series,Runge-kutta and Gaussian quadrature method.	
CO3	Solve non linear first order equation.about the mo widely used (Newton-Ripsaw method) to find the roc also the simplest method (Bisectional method) for the solution of non linear equation.	
CO4	Students will understand about the application of finite difference techniques to solve for soles & deflections for beams with different boundary conditions.	
CO5	Application off FDT'S for column buckling, torsion and membrane problems.	

Course Title: DESIGN OF BRIDGES			
Course Code	16CV761	Credits: 03 CIE: 50	
Number of Lecture Hours/Week	3hrs	SEE: 50	
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03	
Prerequisite:Elements of analysis- I,Structural ana	engg and engg mechanics,Strength lysis- II	of material,Structural	
 Course objectives: To enable students to acquire the knowledge in the fallowin topics: Types and importance of bridges and basic investigations for proposin bridge at a site. Details of different types of foundations for a proposed bridge it stability analysis for different components of substructures. Loads as per IRC and stresses on different components of bridge and design of RCC slab culvert. Design of pipe culvert and box culvert for a proposed highway road. Design of RCC T-beam girder bridge by different methods and detailing 			
Modules		Teaching Hours	
Module I Introduction: Definition Classification, types of b Bridge Site Investigation of bridge site, determinn artificial and linear wa	2 hours		
scour depth for alluvia Numerical problems on a	6 hours		
ModuleII Substructure and Found wing walls, forces to Principles of stability and walls.Codal provisions of abutment, pier, wing wo of abutments. Foundation: . Types of foundations ,spread a foundation : bearing, for friction piles. Caisson for caissons. Module III	lations: Types of abutments, piers, be considered for the design, alysis of abutment and pier & wing for fixing of tentative sections of alls. problems on stability analysis f foundations. Shallow and deep and raft type foundation. Pile riction and combined bearing and undations and open and pneumatic	4 hours 4 hours	

Loads and stresses: various loads to be considered while	2 hours				
designing bridges. IRC Loading standards.					
Design of RC					
slab culvert for IRC class AA tracked and class A two lane					
loading using effective width method. Neat dimensioned					
sketches of slab culvert showing half section plan at	6 hours				
foundation, half front elevation, half plan at foundation	0 110013				
level and half top view.					
Module IV					
pine subject for challow and high embandments. Design of					
pipe culvert for shallow and high embankments. Design of					
pipe cuivert for nigh embankments . given site particulars.					
neat dimensioned sketches of pipe culvert for given site	5 hours				
Design of Boy Culvert , Design of single how sulvert by	e nowis				
setual analysis using moment distribution method for					
different combinations of leads such as dead lead live					
load oarth prossure from outside, and water prossure					
from inside	5 hours				
Module V					
Design of T-Beam Bridge: Design of all the components of					
T-Beam bridge for class AA tracked vehicle only. Design of					
interior deck slab panel by Pigeaud's theory. Design of					
interior longitudinal girder by Courbon's load distribution					
method. Approximate method of design of interior cross					
girder. Neat sketches showing reinforcement details in					
slab and beams.	8 hours				
Question paper pattern:					
Two questions is to be set from each module by intermixing	the topic in the same				
module. Total five questions to be answered by selecting m	inimum one question				
from each module.					
Text books:					
1. Victor, D.J., "Essentials of Bridge Engineering".	Oxford and IBH				
Publications, New Delhi.					
2. Krishna Raju, N., "Design of Bridges", Oxford and	IBH Publications New				
Delhi.					
Reference Books:	structures" Drantice				
1. Jagadish T.R., and Jayaram, M.A., Design of Bridge	structures , Prentice				
Dali Of India, New Delini.	Dailway Engineering"				
2. Billula, S.P. Elements of Bridge, Turmer and F	anway Engineering,				
3 Relevant IRC and RIS codes					
E books and online course materials.					
www.civilenggebooks.com					
Course outcomes:					
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On completi	On completion of the course, the student will have the ability to:				
Course	CO #	Course Outcome (CO)			
Code					
	CO1	Explain different types of bridges and determine			
		hydraulic inputs required for design of bridges			
	CO2	Explain different types of foundation, principles of			
		stability analysis of abutment, pier and wing walls and			
		analyse abutment from stability criteria			
		, , ,			
	CO3	Explain different types of loads for design of bridges			
		and design a RCC slab culvert			
	CO4				
	C05	Design a T-Beam Bridges			

Course Title: STRUCTURAL DYNAMICS				
Course Code		16CV762	Credits: 03 CIE: 50	
Number of Lecture Hours/Week		3 hrs	SEE: 50	
Total Nu Lecture	mber of Hours	42 Hrs	SEE Hours: 03	
Prerequisite:	Knowledge o	f basic structural engineering subjects, suc	h as SOM, SA-I	
	SA-II & Matr	ix methods of structural analysis.		
Course object To enable st	ctives: udents to ac	quire the knowledge in the fallowing to	opics:	
 To at struc 	tain the kno tures.	wledge of effect of vibrations & earthq	uake force on the	
2. To at SDOF	tain the kno :	wledge of rotating unbalance, Duhame	l's integral, DLF,	
3. To at shea	 To attain the knowledge of free vibration of MDOF, natural frequencies, shear buildings modeled as MDOF. 			
4. To at build	 To attain the knowledge of forced vibration of MDOF, response of shear building to base motion, base isolation. 			
5. To at bean	tain the kno ns, lumped n	wledge of continuous systems, dynami nass and consistent mass formulation.	c analysis of	
Modules T			Teaching Hours	
Module I				
Introduction to structural dynamics, Brief history of vibration and Earthquakes, Major earthquakes, Earthquakes zones, some basic definitions, Vibration of single degree of freedom system, undamped, damped, free vibrations, logarithmic decrement. Forced vibrations of single degree freedom systems, response of undamped and damped systems subjected to harmonic loading.				
ModuleII . Rotation unbalance, reciprocating unbalance. Duhamel's integral, response due to general system of loading, dynamic load factor, response spectrum, response of SDOF subjected to harmonic base excitation, vibration isolation. 7 hours Module III				

Free natural frequ normal mod					
multi degree	e of freedor	n systems, free vibrations, natural			
irequencies.			11 hours		
Module IV					
Forced vibra position met motion, harn buildings, eq damped equa	11 hours				
Module V					
Dynamic ana and consister	alysis of bea nt mass form	ms stiffness matrices lumped mass ulation equations of motion.			
			5 hours		
Question pay Two question module. Tota from each mo	per pattern: ns is to be se al five questi odule.	t from each module by intermixing th ons to be answered by selecting mini	e topic in the same mum one question		
Text books:					
1. Vibrations, structural dynamics- M. Mukhopadhaya : Oxford IBH					
2. Structural Dynamics- Mario Paz : CBS publishers.					
3. Stru	3. Structural Dynamics- Anil Chopra : PHI Publishers.				
Reference Be Structural I	ooks: Dynamics-	Clough & Penzen:TMH			
E books and	online cour	se materials:			
<u>www.civilen</u>	ggebooks.coi	<u>m</u>			
On completion of the course, the student will have the ability to:					
Course Code	CO #	Course Outcome (CO)			
	CO1	Explain the terminology associated and the basic concepts of SDOF System and its response to harmoni	d with earthquake cloads.		
	CO2	Explain Duhamel's integral vibrat analyze SDOF subjected to general system of load, harmonic base excita	ion isolation and		

CO3	Analyze MDOF system subjected to free vibration,
CO4	Determine the response of shear building to forced vibration, base motion and Harmonic forced excitation.
CO5	Analyze beams by dynamic approach using technique of lumped mass and consistent mass formulation.

Course Title: ENG	INEERING HYDROLOGY		
Course Code	16CV763	Credits: 03 CIE: 50	
Number of Lecture Hours/Week	3 hrs	SEE: 50	
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03	
Prerequisite: The students should have engineering	knowledge of Engg. Mechanics &	water resources	
 Course objectives: The students will be al Hydrological cycle & Measuremen Engineering Analysis of Rainfall da Rainfall-Runoff relationship & Ana Hydrograph theory & Application Ground water hydrology & Estima 	ble to acquire knowledge in the follow at rainfall over a catchment. ata. alysis of stream flow data. to predict floods. ation of yield of well.	wing topics	
Modules		Teaching Hours	
Module I INTRODUCTION: Introduction and p and water Resources. Hydrologic Representation). Concept of Catchment a PRECIPITATION: Definition a precipitation – seasons in India Meas recording and recording type rain gauges. precipitation over an area. Statistical in precipitation record.	4 hours 4 hours		
ModuleII ANALYSIS OF RAINFALL DATA : rainfall data Rain gauge networks – o Hyetograph, Average & Maximum inte curves. Problems on dependable rain, freq	8 hours		
Module III			
RUNOFF & STREAM FLOW MEASUREMENT: Components. Factors affecting runoff. Basin yield. Rainfall – Runoff relationship using simple regression analysis. Computation of maximum flood discharge by rational formula, Empirical equations, frequency analysis. Stream flow measurement, Stage of a river, area-velocity method. Slope area method, Dilution method, Units of stream flow, flow duration curve, flow mass curve.9 hours			
Module IV HYDROGRAPH THEORY: Compone	ents of hydrograph. Separation of		

base flow. hydrograph. durations . S	Unit hydrograp Computatior S-Curve and its u	h theory. of unit l use. Compu	Derivation and application of unit hydrographs ordinates of different tation of Run off Hydrograph using			
unit hydrog	init hydrograph. Unit hydrograph for complex storms. 9 hours					
Module V GROUND Scope and i water. Defi Aquifer para well in conf Pumping tes	WATER HYD importance of gro initions: Aquifers ameters. Darcy's ined and unconfir at and recuperation	PROLOGY ound water , aquitard, a law and its ned aquifers n test. probl	AND WELL HYDRAULICS: hydrology. Occurrence of ground aquifuge, aquiclude, perched aquifer. s validity. Steady radial flow into a s. Safe yield, yield of an open well tems	8 hours		
Question pa Two question five question	aper pattern: ons is to be set fro ns to be answere	om each mo d by selectio	odule by intermixing the topic in the sangle of the sangle	ame module. Total module.		
Text books:	:					
1.	Subramanya K	. Engineeri	ng Hydrology, Tata McGraw Hill, Ne	w Delhi.		
2.	R.K. Sharma and Sharma – Hydrology and Water Resource Engineering					
3.	Linsley, Kohler and Paulhus: Applied Hydrology, McGraw Hill, New Delhi					
4.	4. Jayarami Reddy P: A textbook of Hydrology, Lakshmi Publications, New Delhi					
Reference H	Books:	- · ·				
1.	Mutreja. K.M. Engineering Hydrology					
2.	H.M. Raghunath: Hydrology, Wiley Eastern Publications					
3.	Ven Tee Chow Handbook of applied hydrology					
4.	Garg. S.K: Hydrology and Water resources engineering, Khanna Publications					
5.	nic@karnic.in					
6.	Water resources systems and management B.L.Gupta & Amit Gupta Standard					
	Publishers distributers Dheeli					
E books and	d online course n	naterials:				
www.civiler	nggebooks.com					
On complet	tion of the course	e, the stude	nt will have the ability to:			
Course Cod	le	CO #	Course Outcome (CO)			
		CO1	Students will be in a position to ana and apply the principles to the real p	lyze the rainfall data roblems.		
	-	CO2	Students in a position to understand and apply the principles.	runoff computations		

CO3	Students acquire the knowledge of hydrographs and its components also students can apply the principles of	
	various hydrographs to solve field problems.	
CO4 Students gain knowledge in ground water apply the principles to different problems.		
CO5	Students will acquire the skills to interpret the hydrological data pertaining to surface and ground water.	

Course Title: SOLID WASTE MANAGEMENT			
Course Code	16CV764	Credits: 03 CIE: 50	
Number of Lecture Hours/Week	3 hrs	SEE: 50	
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03	
Prerequisite:Envirnomental studies,Envirnoment	al engg- II		
 Course objectives: To enable the students to accontend of the solid waste management structure management. To identify the sources of wastes collections. Method o disposal of wastes. Knowledge of the hazardous solid wastents. Concept of reduce recycle and reuse of wastes. 	uire the knowledge in the f udies scope and importar on and transportation of w and impacts on environme vastes.	following topics: ace of solid waste astes. nt.	
Modules		Teaching Hours	
INTRODUCTION : Solid waste – Definition, Lar importance of solid waste management, fund waste management. SOURCES : Classification and characteristics biomedical waste, Quality – generation rate, me	6 hours		
ModuleII COLLECTION AND TRANSPORTATION : System equipment, garbage, chutes, transfer stations - route optimiztion. TREATMENT / PROCESSING TECHNIQUES : volume reduction, size reduction, chemical processing.	5 hours 5 hours		
Module III INCINERATION : Processes – 3 T's, factors affect incinerators – types, prevention of air pollution, COMPOSTING : Aerobic and anaerobic comp composting, Indore and Bangalore processes semimechanical, composting processes, Vermice	5hours 4 hours		

Module IV					
SANITARY LAN method, site se pollution, lea systems. Open dumping	9 hours				
Module V					
Disposal meth merits and der	od : Incinera nerits .	ation, pyrolysis, composting, sanitary landfilling,	3 hours		
RECYCLE AND	REUSE : Ma	aterial and energy recovery operations, reuse in			
other industrie	es, plastic w	astes, environmental significance and reuse.	5 hours		
Question pape Two questions Total five ques	er pattern: is to be se tions to be	et from each module by intermixing the topic in answered by selecting minimum one question from the selecting minimum one ques	the same module. om each module.		
Text books:					
 Integra Solid W Publica 	ted Solid W /aste Mana tion	aste Management By Tchobanoglous, Tata Mcgra gement in developing countries By Bhide, & Sund	aw Hill Publication eresan, NEERI		
Reference Boo	oks:				
1. Hand b	ook on Solid	d Waste Disposal BY Pavoni. J. L			
2. Enviror	imental Eng	ineering Vol-II By S.K.Garg, Knanna publishers	carow Hill		
Publica	tion	meeting by reavy, towe, renobatioglous rata w			
4. Biomed	lical Waste	Handling rules – 2000			
E books and o	online cours	se materials:			
www.civilengg	gebooks.con	<u>n</u>			
Course outcomes: On completion of the course, the student will have the ability to:					
Course Code	CO #	Course Outcome (CO)			
	CO1 Identify the sources, types, composition and characteristics or solid wastes.				
CO2 Identify the systems of collection, equipments used for the collection of solid waste.					
	CO3 knowledge of the hazardous of solid waste and the necessity to treat solid waste.				
	CO4	Identify the methods of disposal for different so	olid waste.		
	CO5 know the importance of reduce , recycle and reuse of solid wastes.				

Course Title: COMPUTER AIDED DESIGN LABORATORY			
Course Code	16CV77	Credits: 03 CIE: 50	
Number of Lecture Hours/Week	03+02 Lectures	SEE: 50	
Total Number of Lecture Hours	28 Hrs	SEE Hours: 03	
Prerequisite: none			
Course objectives: To enable the students topics:-	to obtain the basic knowledge abo	out in the following	
Modules		Teaching Hours	
 AUTOCAD: - E package a) Plan,Elevatio 2BHK resider (with Scale) b) Reinforcemen Footings & S (without scale c) Steel drawing column to b with lacing & Creation of sprea a) Design of sin b) Design of dot c) Design of Ax d) Design of On e) Design of two f) Estimation of g) Estimation of 	Drating of following using autoCAD n and sectional view of 1BHK and ntial building. nt details of Beams, Slabs, Columns, taircases. e) gs such as beam to beam connections, eam connections, Built up columns battens.(Without scale) d sheets using Microsoft Excel for gly reinforced beam. ubly reinforced beam. ially loaded column. e way slabs. o way slab. Small building.	8 hrs 10 hrs	
 3. Use of following civil engineering application software for analysis & design of 2D & 3D structures. (Maximum of 2 bay & 2 story) a) STAAD-PRO b) NISA 			
Question paper pattern perform one question fr	: om each part for total three parts.		
Text books: AutoCAD manual, IS456-2000, Manual of STAADPro & Nisa software			

Reference Books:

A.K. Jain – "Design of R.C. Structures" Mcgrawhill edition

E books and online course materials:

www.civilenggebooks.com

Course outcomes:

Course Code	CO #	Course Outcome (CO)		
	CO1	Demonstrate the concepts of SOM theory course through series of experiments.		
	CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments.		
	CO3	 Perform the experiments and determine Autocad-Plan,elevation,RCC details,spread sheets using excel design of singly,doubly RCC beams,axially loaded column,design of one way slab,two way slab,estimation of building and bridge. STAAD- PRO,NISA parameters. 		
	CO4	Analyse the data and interpret the results.		
	CO5	Prepare a well organized laboratory report.		

Course Title: PROJECT PHASE-I				
Course Code	16CV78	Credits: 02 CIE: 50		
Number of Lecture Hours/Week	03 Hrs	SEE: 50		
Total Number of Lecture Hours	28 Hrs	SEE Hours: 03		

Prerequisite:

Course objectives:

To enable the students to conduct literature survey in the field of their interest in latest in civil engg field such as new materials, construction techniques, design tools for structures (softwares), environmental and water resource engg.

Prepare a report containing literature review, objective, methodology.

Question paper pattern:

Evaluation of CIE marks:50% marks will be evaluated by concerned guide on the basis of the performance of the student during project work remaining 50% marks will be evaluated by expert committee constituted by HOD containing minimum two experts of the department in the relevant field. Students have to deliver seminar before expert committee.

Evaluation of SEE marks:Viva-voce examination will be conducted in the presence of internal and external examiners appointed by HOD.

Text books:

Papers from the international journals(scopus index and web of science).

Reference Books:

Papers from the international journals(scopus index and web of science).

E books and online course materials:

www.civilenggebooks.com

Course outcomes:

Course	CO #	Course Outcome (CO)
Code		
	CO1	Propose an engineering based project in a clear and consize manner.
	CO2	Identify and summarize the literature review and relate them to current project.
	CO3	Formulate clearly a work plan and procedures consisting of fore casting of project costs, time lines, quality & ethical issues
	CO4	Present the project outlining the literature review, methodology and expected results using good oral and written presentation skills.
	CO5	Prepare a well organized and compiled project report involving literature review, methodology and expected results.

EIGHTH SEMESTER

Course Title: DESIGN OF STEEL STRUCTURES-II		
Course Code	16CV81	Credits: 04 CIE: 50
Number of Lecture Hours/Week	3hrs. (Theory)+2hrs. (Tutorial)	SEE: 50
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03
Prerequisite: Civil Engineering Materials, of steel structures-I	Strength of Materials, Structural An	alysis, Design
 Course objectives: To enable the students to obtain the basic knowledge about in the following topics:- 1. Behaviour and design some specialized steel structures such as plate girder, gantry girder, and tubular structures. 2. Components and design of roof trusses for the given analysed forces. 2. Behaviour and design of rigid and somi rigid hear column connections. 		
Modules		Teaching Hours
Module I Design of welded plate girder: Design stiffeners, connection design, curtailment ModuleII	9 hours	
Design of gantry girder: Design of g manually operated travelling crane in sin	8 hours	
Module III		
Design of roof trusses: Types of roof tru (forces in the members to be given), design of purlins.	9 hours	
Module IV		
Design of rigid and semirigid connections: Design of Small moment resistant connections, large moment resistant connections, semi-rigid and		
behavior of semi-rigid connections.		8 hours
Module V		
Design of Tubular structures – Introduc columns, tube tension members. Design for given member forces and the joints i	ction, permissible stresses, tubular n of members of tubular roof truss n tubular trusses, design of tubular	

beams and	purlins.
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Question paper pattern:

Two questions is to be set from each module by intermixing the topic in the same module. Total five questions to be answered by selecting minimum one question from each module.

Text books:

DESIGN OF STEEL STRUCTURES, N.Subramanian, Oxford, 2008 DESIGN OF STEEL STRUCTURES, S.K.DUGGAL, McGRAW HILL

Reference Books:

Design of Steel structures, T.Y.LIN

Comprehensive Design of Steel Structures, Dr.B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications

Design of Steel structures, STEEVE INGLEKIRK

Bureau of Indian Standards, IS800-2007, IS875-1987

Sp 6(1) or Steel Table

E books and online course materials: www.civilenggebooks.com

www.crvnenggebooks.

Course outcomes:

Course Code	CO #	Course Outcome (CO)
	CO1	Design the welded plate girder
	CO2	Design the gantry girder
	CO3	Design the roof trusses
	CO4	Design rigid beam- column connections and explain the behavior of semi rigid connections
	CO5	Design the axially loaded and flexural tubular structural members

Course Title: FINITE ELEMENT METHOD OF ANALYSIS

Course Code	16CV821	Credits: 03 CIE: 50
Number of Lecture Hours/Week	3 Hrs	SEE: 50
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03

Prerequisite: Strength of material, structural analysis-1, Structural analysis 2, and Numerical methods

Course objectives:

To enable the students to acquire the knowledge in the following topics

1.To provide the fundamental concepts of the theory of the finite element method:

2.To develop the ability to generate the governing finite element equations for systems governed by partial differential equations

2. To learn basic principles of finite element analysis procedure for structural applications using truss, beams, frame and [plane elements.

3. To learn and apply finite element solutions to linear and non linear Structural analysis problem and to develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others.

5. Learn to model complex geometry problems and solution techniques.

Modules	Teaching Hours
Module I	
INTRODUCTION: - Basic concept, Background review of	
Theory of Elasticity, Matrix displacement formulation, Energy	
concept, Equilibrium and energy methods for analyzing	
structures, Rayleign-Ritz method, Galerkin's method, Simple	
	8 hours
ModuleII	
FUNDAMENTALS: - Displacement function and natural co-	
ordinates, construction of displacement functions for 2 D	
truss and beam elements, applications of FEM for the	
analysis of truss, continuous beam and simple frame	8 hours
problems.	0 110 415
Module III	
shape functions. Triangular rectangular and guadrilateral	
elements different types of elements their characteristics	
and suitability for application, polynomial shape functions.	
Lagrange's and Hermitian polynomials, compatibility and	

convergence requirements of shape functions.9 hours			
Module IV THEORY OF ISOPARAMETRIC ELEMENTS: - Iso-parametric, Sub – Parametric and Super-parametric elements, Jacobian transformation matrix-numerical integration, plane stress and plane strain problems, characteristics of iso-parametric quadrilateral elements, structure of computer program for FEM analysis, description of different modules, pre and post processing			
Module V			9 110013
Developmen Choice of dis and triangula	t of stiffness placement fu r elements ,	matrix for plate bending element. unction (C0,C1 and C2), rectangular mindlin elements .	
	,		8 hours
Question pa Two question module. Tota from each m	Question paper pattern: Two questions is to be set from each module by intermixing the topic in the same module. Total five questions to be answered by selecting minimum one question from each module.		
I CAT DOORS.			
 Reference Books: C.S. Krishnamurthy – "Finite Element Analysis - Theory and programming" Tata – Mcgraw Hill Co. Ltd., New Delhi. J.F. Abel and Desai C.S. – "Introduction to the Finite Element Method", Affiliated Eat West Press Pvt. Ltd., New Delhi. Zeinkeiwicz O.C. – "Finite Element Method", Tata – Mcgraw Hill Co. Ltd., New Delhi. Rajashekharan. S. – "Finite Element analysis in engineering design", Wheeler Publishers. R D Cook and Passla. "Finite element analysis " 			
E books and	online cour	se materials:	
www.civilenggebooks.com Course outcomes: On completion of the course, the student will have the ability to:			
Course	CO #	Course Outcome (CO)	
CO1 Understand the concepts behind variational method weighted residual methods in FEM. CO2 Identify the application and characteristics of FEA elessuch as bars, Truss, beams, plane and isopara		ational methods and stics of FEA elements and isoparametric	
CO3 C		Develop element characteristic equation procedure and generation of global stiffness equation will be applied.	

CO4	Able to apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form.
CO5	Able to identify how the finite element method expands beyond the structural domain, for problems involving dynamics, Contineous beams, Trusses, portal frames, slabs, with different boundary conditions.

Course Title: DESIGN OF HYDRAULIC STRUCTURES		
Course Code	16CV822	Credits: 03 CIE: 50
Number of Lecture 3Hrs Hours/Week		SEE: 50
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03
Prerequisite: The students should have resources engineering.	knowledge of Fluid Mechanics, H	ydrology & Water
 Course objectives: To enable the students to acquire the knowledge in the following topics 1. Irrigation canal standards & Design of canals. 2. Aqueducts & their design. 3. Design & causes of failure of Gravity dams. 4. Stability Analysis & seepage analysis of Earth dams. 		
Modules		Teaching Hours
Module I Canal Designs: Design procedure for irrigation channels, cross section of an irrigation canal, balancing depth, fixing the section and other design consideration of irrigation channels, Canal standards, schedule of area statistics and other channel dimensions. 9 hours Module II Cross Drainage Works: Introduction, classification, various types of aqueducts and siphon aqueducts, design considerations for CD works, fluming of canal, Mitra's hyperbolic transition formula, design of back connection, canal wings and drainage		
design only). Design of aqueduct & siphon aqueduct. 9 hours		
Module III Gravity Dams: Introduction, causes of failure, design principles, principal and shear stresses, elementary profile of a gravity dams, stress intensities in		
elementary profile, stability analysis of Gravity Dams by analytical method. 8 hours		
Module IV Earth Dams: Introduction, causes of fa dams, stability of slopes (both upstream method. Determination of phreatic 1	ilures typical cross section of earth n and down stream) by slip circle ine by Casagrande's method and	8 hours

analytical method.		
Module V		
Spillways & Outlets: Introduction, design considerations for the main		
spillway, Ogec spillway, design of crest of ogee spillway. Discharge formula		
for the ogee spillway. Design of surplus weirs, design of outlet and sluices. 8 hours		
Question naner nattern:		

Question paper pattern: Two questions is to be set from each module by intermixing the topic in the same module. Total five questions to be answered by selecting minimum one question from each module.

Text books:

Reference Books:

- Text book of Irrigation Engineering & Hydraulic Structure R.K. Sharma, Oxford & IBH Publishing Co., New Delhi.
- Irrigation Engineering & Hydraulic Structures Santosh Kumar Garga. Khanna Publishers, New-Delhi.

E books and online course materials: www.civilenggebooks.com

Course outcomes:

Course Code	CO #	Course Outcome (CO)
	CO1	Students will apply principles and standard procedures for structures.
	CO2	Students will analyze and design of hydraulic structures such as canal designs, and apply the principles of canal design.
	CO3	Students analyze design of cross drainage works and apply the principles of design of aqueducts, siphon aqueducts etc
	CO4	Students can design gravity dams, earthen dams and apply the principles of design.
	CO5	Students can design spillways; surplus weirs and sluices and apply the principles of design.

Course Title HARBOUR, BRIDGE AND TUNNEL ENGINEERING			
Course Code	16CV823	Credits: 03 CIE: 50	
Number of Lecture Hours/Week	3Hrs	SEE: 50	
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03	

Prerequisite: Transportation Engg-I

Course objectives: To enable students to acquire the knowledge in the fallowing topics:

- 1. Understand the different parameters influencing layout of a Harbour and types of dock
- 2. Learn Tunnel survey and methods of constructing of tunnels in soft and hard rock
- 3. Design of pipe culvert and classification of different types of bridges
- 4. Determining the flood discharge in bridge hydrology by different methods
- 5. Understand the different types of abutment, piers and wing walls and different types of foundations e.g pile,raft and well

Modules	Teaching Hours
Madula I	
Module I Harbour: Definition of Harbour Port & Dock I avout	
nan of a typical artificial Harbour types of harbor	
plan of a typical artificial Harbour, types of harbour	
requirements for site selection. Natural phenomenn-tides,	
wind & waves, effect of waveson coastal structures, types	
of break water and construction.	
Docks: wet and dry docks, working principle of dry dock	
lock gates	9 hours
ModuleII	
Tunnel Engineering: Advantages of Tunnel with respect	
to open cut, Types and cross-section of tunnels, Tunneling	
surveys, Transferring centre line grade from ground to the	
invert, methods of Tunneling in soft soil and hard rock by	
any two methods, Tunnel lining,	
	8 hours

ventilation, lig	ghting & dra	inage		
Module III Classification	n of bridges	and Design of pipe culvert:		
preliminary d	esign princip	les of each type of bridge		
(Masonry, Ar	ch Bridge, R	CC, PSC and Steel). Hydraulic		
and structural	design of pi	pe culvert. Neat dimensional		
sketches of pi	pe culvert fo	r given site particulars.	10 hours	
Module IV				
Bridge Hydr	ology: Sele	ction of site for a bridge, Flood		
discharge cal	culations by	different methods, Waterway,		
Afflux, Scou	ir depth ar	nd Economic span. Numerical		
problems on a	above.		8 hours	
Module V	and Found	ation of Alexter ante Diana and		
Substructure	and Found	ations: Abutments, Piers and		
wing walls an	d their types	, Forces acting on them and		
stability analy	vs1s, IRC loa	ding. Types of foundation (Pile,		
Raft and well), (No desig	gns and problems)	7 hours	
Question pap	Question paper pattern:			
Two question	is is to be set	t from each module by intermixing	g the topic in the same	
module. Tota	I five question	ons to be answered by selecting r	ninimum one question	
Trom each mo	dule.			
1 ext books:	and 074 "	Deals and Harbour Engineering"		
$\begin{array}{c} 1. \text{OZA a} \\ 2 \text{Dindex} \end{array}$	allu OZA, I	Dindra V Elementa of Dridga	Tunnal and Dailway	
2. Billula En ain	a. S.F allu	anat Dai Dublications (D) Ltd. No.	runner and Kanway	
Engin	eering, Dhan	apat Rai Publications (P) Ltd., Ne		
3. S.P.Bi	indra , Doc	ks & Harbour Engineering., D	hanpat Rai and sons	
public	ations			
Reference Bo	ooks:			
1. Jagadi	sh T.R., and	Jayaram, MA., "Design of Bridg	e structures", Prentice	
Hall of	f India, New	Delhi.		
2. Releva	ant IRC and E	IS codes.		
E books and	online cours	se materials:		
www.civileng	ggebooks.cor	<u>n</u>		
On completi	omes: on of the act	urse the student will have the ab	ility to.	
		n se, the student will have the ad	mry 10.	
Course	CO #	Course Outcome (CO)		
Code		× /		

CO1	Explain different parameter influencing layout of a	
	harbor and types of dock	
CO2	Compare different types of tunneling with respect to	
	type of soil and explain ventilation, lighting and	
	drainage requirement for tunneling.	
CO3	Design the pipe culvert and explain design principles of	
	different types of bridges.	
CO4	Hydraulic design of different types of bridges.	
CO5	Explain the design concept of abutment, piers and wing	
	walls and different types of foundations e,g pile, raft	
	and well.	

Course Title: PAVEMENT DESIGN			
Course Code	16CV824	Credits: 03 CIE: 50	
Number of Lecture Hours/Week	3 Hrs	SEE: 50	
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03	
Prerequisite: Transportat	ion Engg-I and Transportation En	gg-II	
Course objectives: To entropics:	nable students to acquire the know	owledge in the fallowing	
 Gain knowledge about the types of pavement, factors affecting pavement design and Excel in the path of analysis of stress, strain and deflection in pavement. Design Pavement using Burmister Theory Understand design concepts of flexible pavement by various methods Determine the stresses in Rigid pavements 			
5. Design the Rigid	Pavement using IRC:58 metho		
Modules		Teaching Hours	
Module I Introduction: Types pavements, functions of and rigid pavements, performance of paveme airport pavements. Adv rigid or	4 hours		
Stresses and Deflections Stresses and deflections using Boussinesq's theo limitations. Design of fle elastic theory . numerica 04 hrs ModuleII	ons in Flexible Pavements: s in homogenous masses ory, Principle, assumptions and xible paement using single layer I problems on above	4 hours	
	arious factors in traffic whool		

loads, ESWL of dual and multiple wheel loads using	
loads and EW/L factors using Macleod and IRC methods	
numerical problems on above	4 hours
Burmister two layer theories Principle, assumptions	
and limitations. Vertical stress distribution in two layer	
system. Design of pavement using vertical surface	
deflections, numerical problems on Above.	4 hours
Module III	
Burmister three layer theories, Principle, assumptions	
and limitations . stresses and strain using Peattie's	
charts and forces tables. Numerical problems on above.	
Flexible Pavement Design Methods for Highways and	4 hours
Airports: Empirical, semi empirical and theoretical	
approaches. Perpetual pavement .IRC: 37-2012 method	
of pavement design. Principles of pavement design.	
Design of flexible pavement with following two	
pavement compositions .	
I] granular base and granular sub base.	
II Certifications base and granular sub base with rack relief layer of aggregate above comentitions	
hase	
	5 hours
Module IV	
Stresses in Rigid Pavements: Types of stresses and	
causes, factors influencing stresses, general	
considerations in rigid pavement analysis, wheel load	
stresses, warping stresses, frictional stresses, combined	5 hours
Types of joints in cement concrete payements and their	
functions contraction warning ad construction joints.	
Joint spacings and layout . numerical problems.	3 hours
Module V	
Rigid Pavement Design: Design of plain jointed rigid	
pavements for highways using IRC-58:2011. Procedure	
for slab design. Design of, dowel bars and tie bars by	
IRC-58:2011. Numerical problems on above.	
	9 nours
Question paper pattern:	
Two questions is to be set from each module by intermixing	ing the topic in the same

Two questions is to be set from each module by intermixing the topic in the same module. Total five questions to be answered by selecting minimum one question from each module.

Text books:				
1.Yoder and	Witezak, "F	Principles of Pavement Design", 2 nd Edition, John Wiley		
and sons,				
1975.				
2. Yang H. Ha	aung, "Paver	nent Analysis and Design" 2 nd Edition,		
3. Khanna,	S.K., and J	usto, C.E.G., "Highway Engineering" Nemchand Bros,		
Roorkee, 8 th				
Edition, 20	002.			
4. Khanna,	S.K., Justo,	C.E.G. and A. Veeraragavan "Highway Engineering"		
Nemchand				
Roorkee, 2	LO th Edition, 2	2014.		
Reference Bo	ooks:			
1. Yoder	E.J., "Princi	ples of pavement design", 1 st edition, John Wiley and		
Sons,				
2. IRC-37	7: 2012 and I	RC-58: 2011.		
E books and	online cour	se materials:		
www.civileng	ggebooks.com	<u>n</u>		
Course	CO #	Course Outcome (CO)		
Code	<u> </u>			
	COI	Explain types of pavement, factors effecting design of		
		pavement and determine stresses and deflection in		
	603	flexible pavement		
	CO2 Design Pavement using Burmister Theory			
Design flexible pavement using empirical, semi-				
	empirical, theoretical and IRC:37 approach			
	004	Explain different types of joints in concrete pavement		
	<u> </u>	and determine stresses in rigid pavement		
	005	Design a Rigid Pavement using IRC:58 method		

Course Title: DESIGN OF EARTH QUAKE RESISTANT STRUCTURES			
Course Code	16CV825	Credits: 03 CIE: 50	
Number of Lecture Hours/Week	3 Hrs	SEE: 50	
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03	
Prerequisite: Engg.Geolo	gy,Design of RCC structures,Structural	dynamics.	
 Course objectives: To enable the students to acquire the knowledge in the following topics: 1. Different types of earthquakes and different seismic instruments. 2. Analysis, Design of building according to earthquake design philosophy. 3. Strctural configuration of earthquake resistance design. 4. Concept of ductility and design of column and beams with reference to ductility as per codal provisions. 			
Modules	Teaching Hours		
Module I Introduction to endoge earthquakes, General fe Indian continent, magnit instruments. ModuleII Seismic design philosop forces, dynamics of mul- and mode shapes, analy	8 hours		
1893. 10 hours			
Module III Structural configuration t shear walls and dual sys frames, capacity design p	8 hours		
Module IV			
Ductility and energy ab concrete for ductility, du	sorption in buildings, confinement of actility of columns and beams – code		

provisions, problem of soft storey	8 hours
Module V Behavior of masonry building during earthquake failure pattern, strength of masonry in shear and flexure, codal provisions for earthquake resistant masonry buildings.	9 hours
	8 nours

Question paper pattern:

Two questions is to be set from each module by intermixing the topic in the same module. Total five questions to be answered by selecting minimum one question from each module.

Text books:

Reference Books:

- 1. Clough and Penzien "Dynamics of Structures" (McGraw Hill book Co)
- 2. AY Yakushova "Geology with the Elements Geomorphology" (M[R Publisher Moscow).
- 3. Polyakov "Design of Earth Quake Resistant Structures" (MIR Publishers Moscow).
- 4. S F Borg "Earth quake Engineering Damage assessment and Structural design" (John Wiley and sons 1983)
- 5. Anil Chopra "Earthquake Resistant Design".
- 6. Ghose.S.K, **"Earthquake resistance design of concrete structures"**, SDCPL R & D Center New Mumbai.

E books and online course materials:

www.civilenggebooks.com

Course outcomes:

Course	CO #	Course Outcome (CO)	
Code			
	CO1	Explain different types of earthquake and their	
		features & working of different seismic instruments.	
	CO2	Analyse multistory building for determining natural	
		frequencies & mode shapes using static and	
		dynamic techniques.	
	CO3	Compare performance of different structural	
		configuration for earthquake resistance design.	
	CO4	Design columns & beams with reference to ductility	
		using codal provisions.	
	CO5	Determine strength of masonry buildings in shear,	
		flexure & failure pattern during earthquake.	

Course Title:	ADVANCED FOUNDATION DESIGN	
Course Code	16CV826	Credits: 03 CIE: 50
Number of Lecture Hours/Week	3 Hrs	SEE: 50
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03
Prerequisite: Geotechnic	al engg- I , Geotechnical engg- II	
following topics: 1. Types of shallow 2. Classification of p 3. Construction of d 4. Components of w 5. Classification of Drilled piers, Und	foundations, Bearing capacity according bile foundation, Group efficiency of piles lifferent types of drilled piers and caisso vell foundation and forces acting on it. expansive soils, Design of foundations ler reamed piles.	to BIS. s. ns. s in swelling soils,
Modules		Teaching Hours
Module ISHALLOW FOUNDATIONS:Presumptive Bearing Capacity according to BIS, Factors affecting bearing capacity and settlement.Factors influencing selection of depth of foundation, type of shallow foundations – isolated footing. Combined footing, strap footing, Strip footing and Raft (Proportioning only)9 hours		
PILE FOUNDATIONS: N capacity by static formul Penetration tests, pipe g and clay, group efficienc skin friction,	8 hours	
Module III DRILLED PIERS AND CA advantages and disadvar pneumatic and float disadvantages of floating	ASISSONS: Introduction, construction, ntages of drilled piers. Design of open, ing caissons. Advantages and g caissons.	8 hours
Module IV WELL FOUNDATION : [Different shapes and characteristics of	

wells. Components of well foundation. Terzaghi's Analysis, IRC			
method, Forces acting on well foundation. Sinking of wells.			
Causes and re	emedies of t	nis and shirts.	7 hours
Module V			
FOUNDATI	ON IN EX	PANSIVE SOILS: Expansive soils,	
Parameters of	of moisture	e soils, Classification of Expansive	
on building	of moisture s Preventi	ve measures for expansive soils	
Modification	of expansi	ive soils, Design of foundations in	
swelling soils	s, Drilled pi	ers, Belled drilled pier, Under-reamed	
piles, constru	uction of U	Inder-reamed piles, Identification of	
collapsible so	oils, Design	of foundation on collapsible soils not	
subjected to	wetting, o	design of foundations subjected to	
wetting, Illus	trative exam	pies, problems.	10 hours
Question pa	per pattern:		
Two question	ns is to be se	et from each module by intermixing the	topic in the same
module. Tota	al five questi	ons to be answered by selecting minin	num one question
from each me	odule.		
l ext books:	lachanics Q	Foundation Engineering DV//N.C. Murt	by Duby Cai Tach
	lechanics &	Foundation Engineering By V.N.S. Wurth sis and Dosign by Rowles IF (1996) 5^{th} E	d McGrow Hill
2. Found Pub C	o New Yor	k	
Reference B	ooks:		
1. Pile Fe	oundation b	y Chellies	
2. Geotechnical Engineering By Dr. C.Venkataramaiah :Pub:			New age
Public	cations.		
E books and	online cour	se materials:	
www.civileng	ggebooks.co	<u>m</u>	
Course outco	omes:	unce the student will have the ability	to
On completi	on of the co	urse, the student will have the admity	10:
Course	CO #	Course Outcome (CO)	
	CO1	Apply principles of soil design for shal	low foundations
	001		
	CO2	Design pile and pile groups wi	th reference to
		dimensions.	
	CO3	Explain the construction of drilled pi	ers and principles
		of design for open, pneumatic and flo	ating caissons.
	CO4	Explain the construction of drilled pi	ers and principles
		of design for open, pneumatic and flo	ating caissons.
	C05	Determine the effects of expansive so	oil on toundations
		swelling soil.	
	CO2 CO3 CO4 CO5	Design pile and pile groups wi dimensions. Explain the construction of drilled pi of design for open, pneumatic and flo Explain the construction of drilled pi of design for open, pneumatic and flo Determine the effects of expansive so and apply soil design principle for swelling soil.	th reference to ers and principles ating caissons. ers and principles ating caissons. oil on foundations or foundation in

Course Title: INDUSTRIAL WASTEWATER TREATMENT			
Course Code	16CV827	Credits: 03 CIE: 50	
Number of Lecture Hours/Week	3 Hrs	SEE: 50	
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03	
Prerequisite: Engg Chemistry,Envirn	omental engg- I, Envirnomental	engg- II	
 Course objectives: To enable the Student to acquire the knowledge in the following topics 1. To enable the students to understand fundamentals of industrial waste water treatment. 2. To make students to understand theoretical treatment of industrial wastewater in order to reduce the cost of treatment. 3. To make students to understand minimise cost of treatment by joint treatment with munciple wastewater. 4. To enable students to understand characterization suitable treatment and disposal of industrial wastewater. 5. To enable students to understand reuse and recovery of by products from 			
Modules		Teaching Hours	
Module IIntroduction:Industrial wastewater, difference between Industrial and domestic wastewater, effects of industrial wastewater on municipal sewage treatment systems and on receiving streams.4 hoursDissolved oxygen sag curve in stream, streeter-phelps formulation, stream sampling, effluent and stream standards.4 hoursModuleIITreatment methods:Volume reduction, strength reduction, neutralization, equalization, proportioning.4 hoursRemoval of suspended and dissolved solids.Treatment and disposal of sludge solids.3 hours			
Module III Combined treatment: Feasibility industrial raw wastewater with don raw, partially treated and complete streams.	of combined treatment of nestic wastewater. Discharge of ely treated industrial wastes to	6 hours	

Module IV				
Treatment of industrial wastes: Processes involved, flow sheet				
showing origin of wastes, their characteristics, treatment methods,				
disposal, reuse and recovery	of bi-pro	ducts.		
			11 hours	
Integrated cotton textile,	sugar, c	lairy, canning, brewery and		
distillery and tanning indust	ry.			
Module V				
Treatment of industrial wa	astes: Flo	w chart of process involved.		
origin of wastes character	ristics tre	eatment disposal reuse and		
recovery of by-products of c	anning n	aper and pulp pharmaceutical		
industries metal plating and	l radio-ac	tive wastes	10 hours	
Question naner nattern.			10 110013	
Two questions is to be set	from on	ch module by intermixing the	tonic in the same	
module Total five questions		sword by colocting minimum	and quarties from	
and module. Total live questions	s to be an	swered by selecting minimum (one question from	
each module.				
Text books:				
Reference Books:				
1. Industrial wastew	vater trea	tment – Nelson Nemerow		
Industrial waste t	treatment	. – M N Rao and A K Dutta		
3. Industrial waste disposal – Ross R D				
4. Pollution control in process industries – Mahajan.				
E books and online course materials:				
www.civilenggebooks.com				
Course outcomes:				
On completion of the cours	se, the stu	dent will have the ability to:		
_				
Course Code	CO #	Course Outcome (CO)		
	CO1	differentiate between dome	stic waste water	
		and industrial waste water.		
	CO2	Understand the effects of	industrial waste	
		water on domestic treatment	nt plants and on	
		streams		
CO3 Understand the different methods of treatmen			hads of traatmont	
	of industrial wastes			
	COA	ot industrial wastes.		
	CO4 the feasibility of combined treatment			
	industrial waste water with domestic was			
	water.			
CO5 Understand the origin of wastes in differ			astes in different	
		industries , their characteristic	s and treatment.	

Course Title: ENGINEERING MANAGEMENT AND ECONOMICS			
Course Code	16CV8OE	Credits: 03 CIE: 50	
Number of Lecture Hours/Week	03 Hrs	SEE: 50	
Total Number of Lecture Hours	42 Hrs	SEE Hours: 03	
Prerequisite: Building material and constr	ruction,Building planning and draw	ing,Estimation	
To enable the Student to acquire the knowledge in the following topics:- 1. Planning scheduling controlling bar chart mild stone chart elements of a network and PERT network analysis for a proect. 2.Probability of meeting the scheduled date for PERT network, CPM Network analysis and cost model. 3.Resource allocation (man power) and economics concepts. 4.To apply economy in design material selection, location and standardization. Interest and interest formulae. 5.Compare the alternatives in civil engg problem using PW,AE,FW and rate of return.Evaluate replacement alternatives breakeven and minimum cost analysis and benefit cost analysis for			
Modules		Teaching Hours	
Module	I		
Engineering Management:			
Project Management: Introduction, plan charts and milestone charts. Elements of activity, network rules, numbering of even Net Work Analysis: PERT network, unc	5 hours		
estimates, earliest expected time(T_E) la (T_L), slack, critical path,	4 hours		
Module II Probability of meeting the scheduled date for PERT network. CPM net work analysis- Activity time estimates, start and finish times of activity, float, critical path. Cost Model: Costs involved in a project, total project cost, optimum duration and optimum cost, contracting network for optimization. 4 hour		4 hours 4 hours	
Module I Engineering Management:	11		

Resource Allocation: Resource	e smoothing a	nd resource leveling.	4hours	
Introduction to Management s	oftware pack	age "Primavera"		
Engineering Economics:				
Economic Concepts: Economy	/ deals with l	behavior of people, value and		
utility, consumer and producer goods, economy of exchange,			21	
classification of cost, price is	determined b	by supply and demand, law of	3hours	
diminishing return.				
	Module IV			
Elementary Selection in Econo	omic Analysis	:		
Design and economy, econo	my of mate	rial selection, perfection and		
economy, size and econom	iy, economy	and location, economy of		
standardization and simplificat	tion.		3 hours	
Interest and Interest Formula	s: Interest rat	te and interest, earning power		
of money, time value of mon	ey, interest fo	ormulas, annual compounding		
interest-annual payments, no	minal and ef	fective interest rates, interest		
formula for continuous compo	ounding.		5 hours	
· · ·	Module V			
Basis for Comparison of Alt	ernatives: Pr	esent worth amount, annual		
equivalent amount, future wo	rth amount, r	ate of return.	5 hours	
Evaluating replacement alte	rnatives, bre	eakeven and minimum cost		
analysis, benefit cost analysis.	,		5 hours	
Ouestion paper pattern:	Ouestion naner nattern:			
Two questions is to be set fro	m each mod	ule by intermixing the topic in t	the same module.	
Total five questions to be answered by selecting minimum one question from each module.				
Text books:				
Reference Books:				
1) CPM and PERT by "Punmia"				
2) CPM and PERT by "L.S.Srinath"				
3) Engineering Economics by "Theusen"				
E books and online course materials:				
www.civilenggebooks.com				
Course outcomes:				
On completion of the course, the student will have the ability to:				
Course Code	CO #	Course Outcome (CO)		
	CO1	Duououo the estad is for it		
		Prepare the schedule for d	rawing milestone	
chart,CPM and PERT net work for a project			tor a project	
	002	Analyze CPM and PERT netwo	rk for determining	
	optimum cost and duration for a project.			
	CO3	Allocate and Level resource for	r a project.	
	004	Apply the concepts and princi	pies of economics	
		tor civil engineering problems		
CO5 Evaluate different alternatives			s tor project using	

		Present v equivalent	worth, Future	worth and	Annual
	Course Title:	SEMINAR			
Course Code	16CV84		Credits: 01 CIE: 50		
Number of Lecture Hours/Week	02 Hrs		SEE: N	١IL	
Total Number of Lecture Hours	28 Hrs		SEE Hou	rs: 03	
Prerequisite: none					
Course objectives: To enable the students to engg field such as new m (softwares),environmenta	o obtain the knowl naterials,construction al and water resour-	edge about on techniques ce engg.	latest developm s,design tools fo	ent in civil r structures	
Seminar is intended to give an exposure to the students about recent trends and advances in various field of Civil Engineering. In view of this student shall select the topics from recently published literature in National and International Journal and also topics from conference proceedings of high standards approved by Guide.					
Seminar shall be presented in the department in presence of a committee consisting of Batch of minimum two teachers including Guide constituted by HOD. The seminar marks are to be awarded by the committee. Students shall submit the seminar report in the prescribed standard format.					
Question paper pattern	:	1 1 . 1	1 1	.1 .1	
Evaluation of CIE marks: 50% marks will be evaluated by concerned guide on the basis of the performance of the student during project work remaining 50% marks will be evaluated by expert committee constituted by HOD containing minimum two experts of the department in the relevant field. Students have to deliver seminar before expert committee. Evaluation of SEE marks: Viva-voce examination will be conducted in the presence of internal and external examiners appointed by HOD.					
Papers from the internation	onal journals(scopu	is index and	web of science).		
Reference Books:Papers from the internationE books and online court	onal journals(scopt rse materials:	is index and	web of science).		
Course outcomes: On completion of the co	ourse, the student	will have the	e ability to:		

Course Code	CO #	Course Outcome (CO)	
	CO1	Identify a technical seminar topic using the criteria of recent trends in civil engineering, industrial development and societal issues.	
	CO2	Collect exhaustive literature relevant to the selected topic	
	CO3	Summarize effectively the literature review and provide the critical analysis of the selected topic.	
	CO4	Present the seminar topic using good oral and writing skill.	
	CO5	Prepare a well organized and compiled seminar report.	
Course Title: PROJECT WORK (PHASE II)			
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Course Code	16CV85	Credits: 11 CIE: 100	
Number of Lecture Hours/Week	21Hrs	SEE: 100	
Total Number of Lecture Hours	Nil	SEE Hours:	
Prerequisite: none			
Course objectives: To enable the students to conduct the project in the field related to civil engg such as construction materials,drinking water,waste water or design of structures,pavement,irrigation structures,Analysis of structures using latest softwares. Project work Phase-II shall be carried out in par with			
Phase-I.			
 The project report shall be presented in the following form: Definition of the problem Exhautive literature survey Analysis of results and Discussion Conclusions References 			
The project report shall be submitted in the prescribed standard format (04 copies) to the HOD on or before the last working day of the semester after the certification of the concerned guide and HOD.			
Question paper pattern:			
 Evaluation of CIE marks:50% marks will be evaluated by concerned guide on the basis of the performance of the student during project work remaining 50% marks will be evaluated by expert committee constituted by HOD containing minimum two experts of the department in the relevant field. Students have to deliver seminar before expert committee. Evaluation of SEE marks:Viva-voce examination will be conducted in the presence of internal and external examiners appointed by HOD. 			
Text books: Papers from the international journals(scopus index and web of science).			
Reference Books:			
Papers from the international journals(scopus index and web of science).			
www.civilenggebooks.com			
Course outcomes:			
On completion of the course, the student will have the ability to:			

Course	CO #	Course Outcome (CO)	
Coue	CO1	Demonstrate the technical knowledge of the selected project topic.	
	CO2	Execute the project work independently in small group of 4-5 members demonstrating strong working knowledge of ethics & professional responsibility.	
	CO3	Compile and analyze the project data using modern tools and produce a good quality project work.	
	CO4	Present the project outcomes effectively using good presentation skills.	
	CO5	Prepare a well organized and compiled project thesis.	