

Course Title	<b>BUILDING MATERIALS &amp; CONSTRUCTION</b>						
Course Code	<b>22CVT301</b>						
Category	<b>Professional Core Course (PCC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>40</b>	<b>03</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 hours</b>		

**Course Learning Objective:** To understand engineering properties of various materials used in civil engineering construction & their applications, the techniques & requirements involved in designing the components of buildings and method of construction and gain the knowledge in the field of civil engineering and to achieve economy in the construction.

<b>UNIT – I</b> <b>ROCKS:</b> Classification of rocks, distinction between Igneous, Sedimentary and Metamorphic rocks. Engineering properties of rocks. <b>STONES:</b> Quarrying of stones, Tests on stones, properties and uses, Deterioration and preservation of stone work, <b>TIMBER:</b> Timber, classification, seasoning of timber. Defects in timber, preservation of timber, uses & their properties. Plywood, Block Board, Particle Board, Laminates.	<b>8 Hours</b>
<b>UNIT – II</b> <b>BRICKS:</b> Ingredients of good brick earth, manufacturing of Bricks, classification and qualities of bricks, Test on Bricks. <b>CEMENT:</b> Introduction, Ingredients, Manufacturing, Types. <b>MORTAR:</b> Definition, types, Proportions and Requirements of a good Mortar.	<b>8 Hours</b>
<b>UNIT – III</b> <b>FOUNDATION:</b> Function and requirements of a good foundation, Types of foundations, Preliminary investigation of soil, Safe Bearing Capacity of Soil, Introduction to spread, combined, strap, mat and pile foundations, Design of shallow foundations. <b>MASONRY:</b> Classification of Masonry, Definition of terms used in Masonry, Classification of stone masonry, Joints in stone masonry, Bonds in Brick work - English Bond & Flemish Bond, Characteristics and requirements of good brick masonry.	<b>8 Hours</b>
<b>UNIT – IV</b> <b>ARCHES:</b> Elements of an arch, Classification of arches, Stability of arch. <b>LINTELS:</b> Definition and classification of Lintels, Definition and functions of Chejja, Canopy & Balcony. <b>DOORS AND WINDOWS:</b> Doors and windows, Definition of technical terms, Types of Doors, Types of windows, commercially available windows and doors (PVC, CPVC and Aluminium).	<b>8 Hours</b>
<b>UNIT – V</b> <b>STAIRS:</b> Definition of technical terms, Requirements of good stair, Types of Stairs, Geometrical design of RCC Dog-legged and open well stairs (Plan and sectional elevation). <b>PLASTERING, PAINTING AND DAMP PROOFING:</b> Purpose of plastering, Methods of plastering, Materials of plastering. Paints, Constituents of paints & types. Purpose of Painting, Application of Paints to new and old surfaces. Damp Proofing - Causes of Dampness, Effects of Dampness, Methods of Damp Proofing.	<b>8 Hours</b>

**Teaching & Learning Process:**

Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

<b>Course Outcomes:</b> The students will be able to	
CO1	Identify suitable materials for buildings and adopt suitable construction techniques
CO2	Demonstrate suitable type of foundations, masonry structures, arches, lintels and their applications.
CO3	Exhibit the knowledge of construction of staircase and building finishes.

<b>Text Books:</b>	
1	Punmia, B. C., Ashok Kumar Jain, and Arun Kumar Jain. "Building construction", Firewall Media, 2005.
2	Sharma, Sudesh Kumar. "A textbook of building construction", S. Chand Publishing, 1987.
3	Rangawala S. C. "Engineering Materials", Charter Publishing House, Anand, India.
4	S.K. Duggal, "Building Materials", (Fourth Edition)New Age International (P) Limited, 2016 National Building Code(NBC) of India
5	Jagadish. K.S, "Alternative Building Materials Technology", New Age International, 2007.
6	Varghese, P. G. "A Text Book of Building Materials."
7	Building Materials and Components, CBRI, 1990,India

<b>Question paper pattern:</b>	
<ul style="list-style-type: none"> <li>• The question paper will have ten full questions carrying equal marks.</li> <li>• Each full question will be for 20 marks.</li> <li>• There will be two full questions (with a maximum of three sub - questions) from each unit.</li> <li>• Each full question will have sub - question covering all the topics under a unit.</li> <li>• The students will have to answer five full questions, selecting one full question from each unit.</li> </ul>	

<b>CO-PO Mapping</b>												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓						✓					✓
CO2	✓		✓									
CO3	✓											

Course Title	<b>ENGINEERING SURVEYING</b>						
Course Code	<b>22CVU302</b>						
Category	<b>Integrated Professional Core Course (IPCC)</b>						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	<b>3</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>5</b>	<b>50</b>	<b>04</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 Hours</b>		

**Course Learning Objectives:** To provide basic knowledge about principles of surveying for location, design and construction of civil engineering projects, develop skills for using surveying instruments including, levelling instruments, plane tables, theodolite, compass and to familiarize in acquiring surveying data and applying fundamental concepts to eliminate errors and set out the works which are used for abstracting the information of earth Surface

<b>UNIT-I</b>	<b>08 Hours</b>
<b>INTRODUCTION TO SURVEYING:</b> Importance of surveying in Civil Engineering, Classification of surveys, Concepts of plane and geodetic surveying, Principles of surveying –Plans and maps, conventional symbols – Surveying equipment.	
<b>UNIT-II</b>	<b>08 Hours</b>
<b>COMPASS SURVEYING:</b> Basic definitions, Meridians, Bearings, Dip, Declination, Prismatic and surveyor’s compasses, temporary adjustments. Quadrantal bearings, whole circle bearings, Calculation of bearings and included angles, Local attraction, problems on relevant.	
<b>PLANE TABLE SURVEYING:</b> Plane table and accessories, Advantages and limitations of plane table survey, Orientation and methods of orientation.	
<b>UNIT-III</b>	<b>08 Hours</b>
<b>LEVELLING:</b> Principles and basic definitions, Types of Levels, Types of adjustments and objectives, Types of levelling, Simple, Differential, Fly, Reciprocal, Profile, Cross sectioning, Booking of levels – Rise & fall and H. I methods, problems on relevant.	
<b>THEODOLITE:</b> Theodolite, Fundamental axes and parts of theodolite, uses of theodolite, Temporary adjustments of theodolite, measurement of horizontal and vertical angles.	
<b>MODERN SURVEYING EQUIPMENT:</b> Electronic distance measurement (EDM), Principles of EDM, Salient features of Total Station, Advantages of Total Station over conventional instruments, Application of Total Station.	
<b>UNIT-IV</b>	<b>08 Hours</b>
<b>AREAS AND VOLUMES:</b> Measurement of area – by dividing the area into geometrical figures, area from offsets, midordinate rule, trapezoidal and Simpsons one third rule, introduction to planimeter, digital planimeter.	

Measurement of volumes-trapezoidal and Prismoidal formula, problems on relevant. <b>CONTOURING:</b> Contours and their characteristics, Methods of contouring, direct and indirect methods, Interpolation techniques, Uses of contours.
<b>UNIT-V</b> <span style="float: right;"><b>9 Hours</b></span> <b>CURVE SURVEYING:</b> Curves – Necessity – Types, Simple curves, Elements, Designation of curves, setting out simple curves by linear methods (numerical problems on offsets from long chord & chord produced method), Setting out curves by Rankine’s deflection angle method (numerical problems). Compound curves, Elements, Design of compound curves, Setting out of compound curves (numerical problems). Reverse curve between two parallel straights(numerical problems on Equal radius and unequal radius).

Expt. No	<b>LABORATORY EXPERIMENTS:</b>	No. of Sessions
1	To set regular geometric figure (Pentagon) using chain, tape and prismatic compass.	<b>10</b>
2	To find the distance between two inaccessible points, using chain, tape and prismatic compass.	
3	To locate the points using Radiation and Intersection method of Plane table Surveying.	
4	To determine the difference in elevation between various points by differential levelling using Auto level.	
5	To find the true difference in elevation between various points by profile levelling and Cross-section method using Auto level.	
6	To establish contour of a given area by Block leveling using Auto level	
7	To find the distance between two inaccessible points shown in the field using Theodolite.	
8	To establish simple circular curve using Rankine’s deflection method using Theodolite	
9	To set out a compound curve using Deflection angle method using Theodolite	
10	Demo: Total Station, GPS	

<b>Course Outcomes:</b> At the end of the course the student will be able to	
1	Relate the importance, principles and basic equipments required for surveying.
2	Discuss the bearing system and plane table for simple field survey.
3	Examine the level of ground surface, Calculation of area and volumes and contours.
4	Analyze the different types of curves for deviating type of alignments.

<b>Teaching-Learning Process</b>	Chalk and talk, videos, PowerPoint Presentation, animations, YouTube videos.
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<b>Text Book(s) and Nptel Videos</b>
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1	Surveying Vol. 1, 2 & 3. 17 <sup>th</sup> edition, B. C. Punmia, Ashok Kumar Jain, Arun Kuma Jain, lakshmi publication.
2	Surveying and leveling, 3 <sup>rd</sup> edition, T P Kanetkar, Pune Vidyarthi Griha Prakashan, Pune Vidyarthi Griha Prakashan publisher.
3	Surveying and Leveling, 2 <sup>nd</sup> edition – R Subramanian. Oxford University Press (2007) Publisher.
4	Fundamentals of Surveying, 3 <sup>rd</sup> edition, - Milton O. Schmidt – Wong, Thomson, Cengage Learning Publishing.
5	Surveying Vol. I, 5 <sup>th</sup> edition, S.K. Duggal, Tata McGraw Hill - Publishing Co. Ltd., New Delhi.
6	<a href="https://nptel.ac.in/courses/105107122">https://nptel.ac.in/courses/105107122</a>
7	<a href="https://archive.nptel.ac.in/courses/105/104/105104101/">https://archive.nptel.ac.in/courses/105/104/105104101/</a>

**CO – PO Mapping**

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓					✓						
CO2						✓						
CO3	✓	✓	✓	✓	✓	✓	✓					
CO4		✓	✓	✓	✓	✓	✓					✓

Course Title	<b>STRENGTH OF MATERIALS</b>						
Course Code	<b>22CVU303</b>						
Category	<b>Integrated Professional Core Course (IPCC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>3</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>5</b>	<b>50</b>	<b>04</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 hours</b>		

**Course Learning Objective:** To understand the basic concepts of the stresses and strains for different materials and strength of structural elements, Interpret different internal forces and stresses induced due to representative loads on structural elements, determine slope and deflections of beams and evaluate the behavior of torsion members, columns and struts.

<b>UNIT – I</b> <b>SIMPLE STRESS AND STRAIN:</b> Introduction, Properties of Materials, Stress, Strain, Hooke’s law, Poisson’s Ratio, Stress – Strain Diagram for structural steel and non-ferrous materials, Principles of superposition, Total elongation of tapering bars of circular and rectangular cross sections	<b>08 Hours</b>
<b>UNIT – II</b> <b>SIMPLE STRESS AND STRAIN (CONTINUED):</b> Elongation member due to self– weight, Composite section, Volumetric strain, expression for volumetric strain, Elastic constants, relationship among elastic constants, Thermal stresses (including thermal stresses in compound bars).	<b>08 Hours</b>
<b>UNIT – III</b> <b>BENDING MOMENT AND SHEAR FORCE IN BEAMS:</b> Introduction, Types of beams loadings and supports, Shearing force in beam, Bending moment, Sign convention, Relationship between loading, shear force and bending moment, SFD and BMD with salient values for cantilever beams, simply supported beams and overhanging beams considering point loads, UDL, UVL and Couple.	<b>08 Hours</b>
<b>UNIT – IV</b> <b>BENDING STRESS AND SHEAR STRESS IN BEAMS:</b> Introduction – Bending stress in beam, Assumptions in simple bending theory, Pure bending derivation of Bernoulli’s equation, Modulus of rupture, section modulus, Flexural rigidity, Expression for shear stress in beam, Shear stress diagram for rectangular, symmetrical ‘I’ and ‘T’ section.	<b>08 Hours</b>
<b>UNIT – V</b> <b>TORSION OF CIRCULAR SHAFTS:</b> Introduction – Pure torsion-Torsion equation of circular shafts, Strength and stiffness, Torsional rigidity and polar modulus, Power transmitted by shaft of solid and hollow circular sections. <b>ELASTIC STABILITY OF COLUMNS:</b> Introduction – Short and long columns, Euler’s theory on columns, Effective length slenderness ration, radius of gyration, buckling load, Assumptions, , Limitations of Euler’s theory, Rankine’s formula and problems.	<b>08 Hours</b>

Expt. No	LABORATORY EXPERIMENTS:	No. of hours
1	Shear Test on Mild steel.	<b>10</b>
2	Impact test on Mild Steel (Charpy and Izod).	
3	Hardness tests on ferrous and non-ferrous metals – Brinell’s method	
4	Hardness tests on ferrous and non-ferrous metals – Rockwell method	

5	Hardness tests on ferrous and non-ferrous metals – Vicker’s method	
6	Tension test on Mild steel and HYSD bars.	
7	Compression test of Mild Steel and Cast iron.	
8	Torsion test on Mild Steel circular sections.	
9	Bending Test on Wood Under two point loading.	
10	Test on Springs (demo)	

**Teaching & Learning Process:**

Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

**Course Outcomes:** At the end of the course the student will be able to:

CO1	Understand the basic principles of internal stress distribution, deflection and their causes in beams.
CO2	Study the behaviour of beams and columns under different loading conditions.
CO3	Solve the problems under various loadings and boundary conditions on beams and columns.
CO4	Apply the basic concepts of torsion for analysis of members.

**Text Books:**

1	Strength of Materials, R K Bansal, Lakshmi Publications (P) Ltd.,
2	Strength of Materials, S Ramamrutham, Dhanpath Rai, Publishing Co.
3	Strength of Materials, Bhavikatti S S, Vikas Publishing house (P) Ltd.,
4	Elements of Strength of Materials, Timoshenko and Young Affiliated East-West Press.
5	Strength of Materials, R Subramanyam, Oxford University Press, Edition 2008
6	Strength of Materials, B C Punmia, Ashok Jain, Arun Jain, Lakshmi Publications (P) Ltd.,
7	Strength of Materials web course by IIT Roorkee <a href="https://nptel.ac.in/courses/112107146/">https://nptel.ac.in/courses/112107146/</a>
8	Strength of Materials video course by IIT Kharagpur <a href="https://nptel.ac.in/courses/105105108/">https://nptel.ac.in/courses/105105108/</a>
9	Strength of Materials video course by IIT Roorkee <a href="https://nptel.ac.in/courses/112107147/18">https://nptel.ac.in/courses/112107147/18</a>

**Question paper pattern:**

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

**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓										
CO2	✓	✓	✓									✓
CO3	✓		✓									✓
CO4	✓	✓	✓									

Course Title	<b>FLUID MECHANICS &amp; MACHINERY</b>						
Course Code	<b>22CVT304</b>						
Category	<b>Professional Core Course (PCC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	0	0	0	3	40	03
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 hours</b>		

**Course Learning Objective:** To understand fundamentals of fluid properties, fluid pressure and hydrostatic laws, gain knowledge on fluid dynamics and basic design of flow through pipes and able to measure flow of fluid with different devices.

<b>UNIT – I</b>	<b>08 Hours</b>
<b>BASIC PROPERTIES OF FLUIDS:</b> Mass density, Specific weight, Specific gravity, Viscosity, Surface tension, Capillarity, Numericals, Classification of fluids.	
<b>PRESSURE AND ITS MEASUREMENT:</b> Pascal's law, Hydrostatic law, Types of pressure, Measurement of pressure using piezometer, U tube manometers (Simple, Compound, inverted & differential), Numericals.	
<b>UNIT – II</b>	<b>08 Hours</b>
<b>DYNAMICS OF FLUID FLOW:</b> Continuity of a liquid flow, Euler's equation, Bernoulli's equation, Practical Applications of Bernoulli's equation (Venturimeter, Orificemeter and Pitot tube), Force exerted by a flowing fluid on a pipe bend, Numericals.	
<b>FLOW THROUGH SIMPLE PIPES:</b> Losses of head of liquid flowing in a pipe, Major loss (Friction) and Minor losses in pipe flow (Sudden enlargement, Sudden contraction, Entrance in a pipe, Exit of a pipe, an obstruction in a pipe). Numericals.	
<b>UNIT – III</b>	<b>08 Hours</b>
<b>MEASUREMENT OF DISCHARGE:</b>	
<b>ORIFICE:</b> Flow through small orifice, Hydraulic coefficients (Coefficients of contraction, velocity, discharge and resistance), Numericals.	
<b>NOTCHES:</b> Flow over Notches (Rectangular, Triangular, Trapezoidal and Stepped), Error measurement in the head, Numericals.	
<b>WEIRS:</b> Flow over Weirs (Rectangular, Cippoletti, Narrow-crested, Broad-crested, Sharp-crested, Ogee and Submerged), End contraction, Velocity approach, Ventilations, Numericals.	
<b>UNIT – IV</b>	<b>08 Hours</b>
<b>UNIFORM FLOW THROUGH OPEN CHANNELS:</b> Classification of open channels, Chezy's equation, Manning's equation, Discharge through Rectangular, Triangle, Trapezoidal, Circular and composite sections, Most economical open channels, Numericals.	
<b>UNIT – V</b>	<b>08 Hours</b>
<b>IMPACT OF JETS:</b> Force of jet imping on a fixed vanes, moving vanes, unsymmetrical curved vane Conditions: ( $\beta < 90^\circ$ , $\beta = 90^\circ$ and $\beta > 90^\circ$ ), Series of flat and curved vanes fitted on periphery of wheel, Numericals.	
<b>CENTRIFUGAL PUMPS:</b> Components, Working proportions of pump, Priming, Multi-stage Centrifugal Pumps, Numericals.	

**Teaching & Learning Process:**

Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

**Course Outcomes:** The students will be able to



CO1	Understand fundamental properties of fluids and solve problems on hydrostatics.
CO2	Apply principles of Bernoulli's and compute discharge losses in flow through simple pipes.
CO3	Compute discharge through orifice, notches and weirs.
CO4	Design of open channels of various cross sections and operational functions of hydraulic machineries.

**Text Books:**

1	A Text Book of Fluid mechanics & Hydraulic Machines'- R.K. Rajput, S. Chand & Co, New Delhi, 2006 Edition.
2	'Principles of Fluid Mechanics and Fluid Machines'- N. Narayana Pillai, Universities Press (India), Hyderabad, 2009 Edition.
3	'Text Book Of Fluid Mechanics & Hydraulic Machines'- R.K. Bansal, Laxmi Publications, New Delhi, 2008 Edition.
4	Hydraulics and Hydraulic Machines- Dr. P. N. Modi and Seth, McGraw Hill Publications.
5	Fundamentals of Fluid Mechanics – Bruce R. Munson, Donald F. Young, Theodore H. Okiishi, Wiley India, New Delhi, 2009 Edition.
6	'Introduction To Fluid Mechanics' – Edward j. Shaughnessy, Ira m. Katz, James P Schaffer, Oxford University Press, New Delhi, 2005 Edition.
7	Fluid Mechanics' – Streeter, Wylie, Bedford New Delhi, 2008(Ed)
8	Fluid Mechanics and Turbomachines'- Madan Mohan Das, PHI Learning Pvt. Limited, New Delhi. 2009 Edition.

**Question paper pattern:**

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

**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓			✓							
CO2	✓	✓			✓							
CO3	✓		✓				✓			✓		
CO4		✓										

Course Title	<b>COMPUTER AIDED BUILDING PLANNING AND DRAWING</b>						
Course Code	<b>22CVL305</b>						
Category	<b>Professional Core Course Lab (PCCL)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>24</b>	<b>01</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 hours</b>		

**Course Learning Objective:** To expose to the bye-laws and develop skills to prepare civil engineering drawings using Auto-CAD, apply engineering concepts to draw various components of the structure. Understand the details of construction of different building elements and visualize the completed form of the building and the particulars of construction based on the engineering drawings.

<b>UNIT – I</b>	<b>3 Hours</b>
<b>DRAWING BASICS:</b> Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS: 962.	
<b>SIMPLE ENGINEERING DRAWINGS WITH CAD DRAWING TOOLS:</b> Lines, Circle, Arc, Poly line, Multiline, Polygon, Rectangle, Spline, Ellipse, Modify tools: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet, Using Text: Single line text, Multiline text, Spelling, Edit text,	
<b>SPECIAL FEATURES:</b> View tools, Layers concept, Dimension tools, Hatching, Customizing toolbars, Working with multiple drawings, 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.	
<b>UNIT – II</b>	<b>6 Hours</b>
<b>DRAWINGS RELATED TO DIFFERENT BUILDING ELEMENTS:</b> Following drawings are to be prepared for the data given using CAD Software	
<ul style="list-style-type: none"> <li>✓ Cross section of SSM Foundation</li> <li>✓ Lintel and chejja.</li> <li>✓ Layout plan of Rainwater recharging and harvesting system.</li> <li>✓ Preparation of site plan of a residential building</li> </ul>	
<b>UNIT – III</b>	<b>15 Hours</b>
Development of Line diagram from Architectural drawings	
<ul style="list-style-type: none"> <li>✓ Primary Health Center</li> <li>✓ School Building</li> </ul>	
Development of plan, elevation, section, schedule of openings, electrical, plumbing and sanitary services from the given line diagram of residential buildings using AutoCAD.	
<ul style="list-style-type: none"> <li>✓ Single and Two bed room building.</li> <li>✓ Two storied building (Ground and First floor)</li> <li>✓ Pitched roof</li> </ul>	

**Teaching & Learning Process:**

Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

**Course Outcomes:** The students will be able to

CO1	Understanding the byelaws to prepare Civil Engineering drawings using AutoCAD.
CO2	Prepare, read and interpret the drawings in a professional set up for various building components.
CO3	Draw the buildings as per the planning requirements.

<b>Text Books:</b>	
1	MG Shah, CM Kale, SY Patki, “Building drawing with an integrated approach to Built Environment Drawing”, Tata McGraw Hill Publishing co. Ltd, New Delhi.
2	Gurucharan Singh, “Building Construction”, Standard Publishers, & distributors, New Delhi.
3	Malik RS and a Meo GS, “Civil Engineering Drawing”, Asian Publishers/Computech Publication Pvt Ltd
4	Time Saver Standard by Dodge F.W, F.W Dodge Corp.
5	IS: 962-1989 (Code of practice for architectural and building drawing)
6	National Building Code, BIS, New Delhi.

<b>CO-PO Mapping</b>												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓				✓			✓				✓
CO2	✓				✓							
CO3	✓				✓							✓

Course Title	<b>GREEN BUILDING</b>						
Course Code	<b>22CVT306A</b>						
Category	<b>Emerging Technology Course (ETC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>40</b>	<b>03</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 hours</b>		

**Course Learning Objective:** To understand the Definition, Concept & Objectives of the terms cost effective construction and green building. Apply cost effective techniques in construction. Apply cost effective Technologies and Methods in Construction. Understand the Problems due to Global Warming and effectively utilize Renewable Energy in Construction.

<b>UNIT – I</b>	<b>8 Hours</b>
<b>GREEN BUILDINGS AND ENVIRONMENT:</b>	
Introduction, Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits - Health and Social benefits - Major Energy efficient areas for buildings. Contribution of Buildings towards Global Warming - Carbon Footprint – Global Efforts to reduce carbon Emissions.	
<b>UNIT – II</b>	<b>8 Hours</b>
<b>TECHNOLOGIES IN GREEN BUILDING:</b>	
Need for Green Technology, Uses of different types of materials and their availability -Stone and Laterite blocks- Burned Bricks- Concrete Blocks- Stabilized Mud Blocks- Lime Pozzolana Cement- Gypsum Board- Fibre Reinforced Cement Components.	
<b>UNIT – III</b>	<b>8 Hours</b>
<b>COMPONENTS OF BUILDING:</b>	
Different substitute for wall construction, Rat Trap Bond – Arches – Panels - Cavity Wall - Ferro Cement and Ferro Concrete constructions – different pre cast members using these materials - Wall and Roof Panels – Beams – columns - Door and Window frames.	
<b>UNIT – IV</b>	<b>8 Hours</b>
<b>APPLICATION OF RENEWABLE ENERGY IN GREEN BUILDING:</b>	
Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case Studies with respect to utilization of Solar Energy.	
<b>UNIT – V</b>	<b>8 Hours</b>
<b>GREEN BUILDING &amp; RATING SYSTEMS:</b>	
BREEAM – LEED - GREEN STAR -GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings – Purpose - Key highlights - Point System with Differential weight age. Green Design – Definition - Principles of sustainable development in Building.	

**Teaching & Learning Process:**

Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

<b>Course Outcomes:</b> The students will be able to	
CO1	Understand the effects of Global Warming.
CO2	Identify different building materials for construction and Apply effective environmental friendly building technology
CO3	Explain the utility of the Renewable Energy of Green Buildings.
CO4	Assess the Green Building on its predicted performance.

**Text Books:**

1 | HarharaIyer G, Green Building Fundamentals, Notion Press, 2022

2	Dr. Adv. HarshulSavla, Green Building: Principles & Practices, Notion Press, 2021
3	Hand Book of Green Building Design and Construction, 2017, Second Edition, Sam Kubba.
4	Sustainable Construction, 2016, Charles J.Kibert.
5	Zero Energy Buildings, 2018, Shady Attia.Hibbler R. C.,
6	<a href="https://www.youtube.com/watch?v=THgQF8zHBW8">https://www.youtube.com/watch?v=THgQF8zHBW8</a> <a href="https://www.youtube.com/watch?v=DRO_rlkywxQ">https://www.youtube.com/watch?v=DRO_rlkywxQ</a>

**Question paper pattern:**

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

**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓						✓					
CO2	✓						✓					
CO3	✓					✓	✓					
CO4	✓						✓					

Course Title	<b>ENVIRONMENTAL PROTECTION AND MANAGEMENT</b>						
Course Code	<b>22CVT306B</b>						
Category	<b>Emerging Technology Course (ETC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>40</b>	<b>40</b>	<b>03</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 hours</b>		

**Course Learning Objective:** To gain knowledge in Environmental protection and Management systems. Understand and evaluate the environmental problems and Reflect on their roles, responsibilities as citizens and consumers. Environmental management is necessary for environmental planning which implies the optimal utilisation of the earth's resources and preservation of the quality of environment for the healthy growth of society.

<b>UNIT – I</b> <b>ENVIRONMENTAL MANAGEMENT STANDARDS:</b> Unique Characteristics of Environmental Problems - Systems approach to Corporate environmental management - Classification of Environmental Impact Reduction Efforts - Business Charter for Sustainable Production and Consumption – Tools, Business strategy drivers and Barriers - Evolution of Environmental Stewardship. Environmental Management Principles - National Policies on Environment, abatement of pollution and conservation of resources - Charter on Corporate Responsibility for Environmental Protection.	<b>8 Hours</b>
<b>UNIT – II</b> <b>ENVIRONMENTAL MANAGEMENT OBJECTIVES:</b> Environmental quality objectives – Rationale of Environmental standards: Concentration and Mass standards, Effluent and stream standards, Emission and ambient standards, Minimum national standards, environmental performance evaluation: Indicators, benchmarking. Pollution control Vs Pollution Prevention - Opportunities and Barriers – Cleaner production and Clean technology, closing the loops, zero discharge technologies.	<b>8 Hours</b>
<b>UNIT – III</b> <b>ENVIRONMENTAL MANAGEMENT SYSTEM:</b> EMAS, ISO 14000 - EMS as per ISO 14001– benefits and barriers of EMS – Concept of continual improvement and pollution prevention - environmental policy – initial environmental review – environmental aspect and impact analysis – legal and other requirements- objectives and targets – environmental management programs – structure and responsibility – training awareness and competence- communication – documentation and document control – operational control – monitoring and measurement – management review.	<b>8 Hours</b>
<b>UNIT – IV</b> <b>ENVIRONMENTAL AUDIT:</b> Environmental management system audits as per ISO 19011- – Roles and qualifications of auditors - Environmental performance indicators and their evaluation – Non-conformance – Corrective and preventive actions -compliance audits – waste audits and waste minimization planning – Environmental statement (form V) - Due diligence audit.	<b>8 Hours</b>
<b>UNIT – V</b> <b>APPLICATIONS:</b> Applications of EMS, Waste Audits and Pollution Prevention Control- Textile, Sugar, Pulp & Paper, Electroplating, Tanning industry. Hazardous Wastes - Classification, characteristics Treatment and Disposal Methods, Transboundary movement, disposal.	<b>8 Hours</b>

**Teaching & Learning Process:**

Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

<b>Course Outcomes:</b> The students will be able to	
CO1	Understand the elements of Corporate Environmental Management systems complying with international environmental management system standards.
CO2	Perceptive to pollution prevention assessment team and implement waste minimization options.
CO3	Develop, Implement, maintain and Audit Environmental Management systems for Organizations.
CO4	Understand, analyse and evaluate industrial wastes.

<b>Text Books:</b>	
1	Christopher Sheldon and Mark Yoxon, “Installing Environmental management Systems – a step by step guide” Earthscan Publications Ltd, London, 1999.
2	ISO 14001/14004: Environmental management systems – Requirements and Guidelines – International Organisation for Standardisation, 2004
3	ISO 19011: 2002, “Guidelines for quality and/or Environmental Management System auditing, Bureau of Indian Standards, New Delhi, 2002
4	Paul L Bishop „Pollution Prevention: Fundamentals and Practice, McGraw- Hill International, Boston, 2000.
5	Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations, Second Edition, NSF International, Ann Arbor, Michigan, January 2001.

<b>Question paper pattern:</b>	
<ul style="list-style-type: none"> <li>• The question paper will have ten full questions carrying equal marks.</li> <li>• Each full question will be for 20 marks.</li> <li>• There will be two full questions (with a maximum of three sub - questions) from each unit.</li> <li>• Each full question will have sub - question covering all the topics under a unit.</li> <li>• The students will have to answer five full questions, selecting one full question from each unit.</li> </ul>	

<b>CO-PO Mapping</b>												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓				✓	✓					✓
CO2	✓	✓		✓								✓
CO3	✓	✓		✓								✓
CO4	✓	✓		✓								✓

Course Title	<b>PAVEMENT MATERIALS &amp; CONSTRUCTION</b>						
Course Code	<b>22CVT306C</b>						
Category	<b>Emerging Technology Course (ETC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>40</b>	<b>03</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 hours</b>		

**Course Learning Objective:** Expose students to different materials which are used in pavement construction, impart knowledge about the engineering properties required, to train students to perform various types of bituminous mix designs as per the guidelines (MORTH), Student to get knowledge about different highway construction equipment with their suitability and adaptability in various field scenarios, expose students to construction practice and quality control aspects of embankment, flexible and rigid pavement as per the required specifications (MORTH) and to introduce students to possible improvisation in various layers of pavement to increase the structural strength by the use of non-basic materials (DLC, polythene sheets).

<b>UNIT – I</b> <b>PAVEMENT MATERIALS AGGREGATES:</b> Origin, Classification, Requirements, properties and tests on Road aggregates, Concepts of size and gradation- design gradation, maximum aggregate size, aggregate blending by different methods to meet specification. Bitumen and Tar- Origin, Preparation, Properties and Chemical Constitution of bituminous road binders, Requirements.	<b>8 Hours</b>
<b>UNIT – II</b> <b>BITUMINOUS EMULSION AND CUTBACKS:</b> Preparation, Characteristics, uses and test. Adhesion of bitumen binders to road aggregates, Adhesion failure, Mechanism of stripping, tests and methods of improving adhesion.	<b>8 Hours</b>
<b>UNIT – III</b> <b>BITUMINOUS MIXES:</b> Mechanical properties, dense and open textured mixes, flexibility and brittleness, (No Hveem stabilometer and Hubbar- field tests) bituminous mixes, Design methods using Rothfutch’s method only and specification, Marshall mix design criteria, voids in mineral aggregates, voids in total mix, density, flow, stability, percentage voids filled with bitumen. Problems on above.	<b>8 Hours</b>
<b>UNIT – IV</b> <b>EQUIPMENT IN HIGHWAY CONSTRUCTION:</b> Various types of equipments for excavation, grading and compaction- their working principles, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction. Sub grade: Earthwork grading and Construction of embankments and cuts for roads, Preparation of subgrade, quality control tests.	<b>8 Hours</b>
<b>UNIT – V</b> <b>FLEXIBLE PAVEMENTS:</b> Specifications of materials, Construction method and field control checks for various types of flexible pavement layers. Cement Concrete Pavements: Specifications and 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 tests, Construction of various types of joints.	<b>8 Hours</b>

**Teaching & Learning Process:**  
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

**Course Outcomes:** The students will be able to



CO1	Evaluate and assess the suitability of any pavement material to be used in various components of pavement by conducting required tests as per IS, IRC specifications.
CO2	Formulate the proportions of different sizes of aggregates to suit gradation criteria for various mixes as per MORTH and also design bituminous mixes.
CO3	Differentiate various types of equipments used for construction and execute the construction of pavements.

**Text Books:**

1	Highway Engineering- S.K. Khanna and C.E.G Justo: Nem Chand and Bros. Roorkee Publisher, Revised 10th Edition.
2	Construction Equipment and its Management- Sharma S.C: Khanna Publishers -2013
3	Hot Mix Asphalt Materials, Mixture Design and Construction- Freddy L. Roberts, E. R Brown, Prithvi S Kandhal, NAPA Education Foundation Lanham, Maryland Publisher-2015, Third Edition.
4	DSIR / RRL (1963). Bituminous Materials in Road Construction, HMSO, London. R. N. Traxler (1961). Asphalt, Its Composition, Properties and Uses, Reinhold Publishing Corporation, New York. A. J. Hoiberg ( 1964/5/6 )
5	Relevant IRC codes and MORT& H specifications, 5th revision.

**Question paper pattern:**

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

**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓										✓
CO2	✓		✓									
CO3	✓			✓	✓	✓						✓

Course Title	<b>BASICS OF STRUCTURAL ANALYSIS</b>						
Course Code	<b>22CVT306D</b>						
Category	<b>Emerging Technology Course (ETC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>40</b>	<b>03</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 hours</b>		

**Course Learning Objective:** To understand the concept of determinate, indeterminate structures, degree of freedom & degree of redundancy, determine principle stress by using Mohr circle concept, gain knowledge regarding thin & thick cylinders pressure, analysis of simple trusses and analyze determinate beams & frames by strain energy & Castigliano's methods.

<b>UNIT – I</b> <b>INTRODUCTION TO STRUCTURAL ENGINEERING:</b> Nature of structures, Equilibrium & Compatibility & Boundary Conditions, Linearity, Stability & loading, Structural systems, Forms of Degree of freedom, Degree of Redundancy, Determinate & Indeterminate structures, Numerical examples.	<b>8 Hours</b>
<b>UNIT – II</b> <b>COMPOUND STRESSES:</b> Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses. Theory Numerical examples.	<b>8 Hours</b>
<b>UNIT – III</b> <b>THIN &amp; THICK CYLINDERS:</b> Introduction, Thin cylinders subjected to internal pressure; Hoop stresses, Longitudinal stress and change in volume. Thick cylinders subjected to both internal and external pressure; Lamé's equation, radial and hoop stress distribution. Numerical examples.	<b>8 Hours</b>
<b>UNIT – IV</b> <b>DETERMINATE STRUCTURES-SIMPLE TRUSS:</b> Analysis of Simple trusses- Method of Joints & Method of section. Numerical examples.	<b>8 Hours</b>
<b>UNIT – V</b> <b>DETERMINATE STRUCTURES- BEAMS &amp; FRAMES:</b> Strain Energy Method & Castigliano's method- Derivation of Strain energy due to Bending, Shear & Torsion, Analysis of Cantilever beam & Frame due to Point load by Strain energy method to calculate Deflection, Analysis of Beams & Frame due to Point & UDL loads by Castiglianos method.	<b>8 Hours</b>

**Teaching & Learning Process:**

Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

**Course Outcomes:** The students will be able to

CO1	Understand the basic structural systems, Classification and parameters required for Structural Analysis.
CO2	Interpret the concepts of compound stresses by using Mohr's Circles.
CO3	Study on Thin and Thick cylinders pressure.
CO4	Analyse and solve problems on Simple Trusses.
CO5	Analyse and Solve problems on Indeterminate Beams and Frames by Strain energy and Castiglianos method.

**Text Books:**

1 | Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and

	Engineering Mechanics, 2015, Laxmi Publications.
2	Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB
3	Beer F.P. and Johnston E. R., Mechanics for Engineers, Statics and Dynamics, 1987, McGraw Hill.
4	Irving H. Shames, Engineering Mechanics, 2019, Prentice-Hall.
5	Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press.
6	Timoshenko S, Young D. H., Rao J. V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.
7	Bhavikatti S S, Engineering Mechanics, 2019, New Age International
8	Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 2011, BS publication.

**Question paper pattern:**

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

**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓											
CO2	✓											
CO3	✓	✓										
CO4	✓	✓										
CO5	✓	✓		✓								

Course Title	<b>ENGINEERING GEOLOGY</b>						
Course Code	<b>22CVT308A</b>						
Category	<b>Ability Enhancement Course (AEC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>15</b>	<b>01</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 01 hours</b>		

**Course Learning Objective:** To study and identify different types natural materials like rocks & minerals and soil. To understand the various natural dynamic processes their influence on the surfacial features, natural material and their consequences. To know the physical properties of rocks and minerals.

<b>UNIT – I</b> <b>PHYSICAL GEOLOGY:</b> Geology in civil engineering-branches of geology-structure of the earth and its composition-Soil-Wind-Plate tectonics	<b>3 Hours</b>
<b>UNIT – II</b> <b>MINEROLOGY:</b> Physical properties of minerals-Silicate minerals -Non silicate minerals – Rock forming minerals – Non silicate minerals – Ore forming minerals	<b>3 Hours</b>
<b>UNIT – III</b> <b>PETROLOGY:</b> Physical properties of rocks - Classification of rocks based on their genesis - Igneous rocks – Sedimentary rocks- Metamorphic rocks	<b>3 Hours</b>
<b>UNIT – IV</b> <b>STRUCTURAL GEOLOGY:</b> Outcrop- Dip- Strike- Folds -Joints- Faults – Unconformities.	<b>3 Hours</b>
<b>UNIT – V</b> <b>GROUNDWATER GEOPHYSICS:</b> Gravity prospecting method- Magnetic prospecting method – Electric and electromagnetic prospecting method.	<b>3 Hours</b>

<b>Teaching &amp; Learning Process:</b> Chalk and talk, Power point presentations, Animations and Videos.
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<b>Course Outcomes:</b> The students will be able to	
CO1	Understand the basic principles of Engineering geology.
CO2	Remember the physical properties and chemical composition of minerals and rocks.
CO3	Analyze the various methods of structural Geology and ground water.

<b>Text Books:</b>	
1	Marutesha Reddy M.T., Applied Engineering Geology, Subhash Publishers, Bengaluru 2015.
2	Parbin Singh. A, A text book of Engineering and General Geology, B.S. Publications, Hyderabad 2011.
3	Gokhale K.V.G.K. Principles of Engineering Geology, B.S. Publications Hyderabad 2011.
4	Chenna kesavulu N., Text Book of Engineering Geology, Macmilan India Ltd 2009.
5	Banagar K.M., Principles of Engineering Geology, Standard Publishers Distributers, New Delhi 2001.

**Question paper pattern:**

- ✓ The question paper will have fifty objective questions carrying equal marks.
- ✓ Each objective question will be for one mark.
- ✓ The students will have to answer fifty questions.

**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓		✓									
CO2	✓	✓			✓							
CO3	✓				✓							

Course Title	<b>ECONOMICS FOR CIVIL ENGINEERS</b>						
Course Code	<b>22CVT308B</b>						
Category	<b>Ability Enhancement Course (AEC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>15</b>	<b>01</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 01Hrs</b>		

### Course Learning Objective:

This course is to understand the fundamental economic concepts applicable to civil engineering used to evaluate the feasibility, cost-effectiveness, and profitability of different construction projects. To learn the basic concepts of principle Cash flow, techniques of incorporating inflation factor in economic decision making, Understand the project planning with a specific view on project Financing, depreciation methods and replacement analysis.

<b>UNIT – I</b>	<b>3 Hours</b>
<b>BASIC CONCEPTS OF ENGINEERING ECONOMICS:</b>	
Definition of Economics, Concept of Costs, Break Even Analysis, Law of Supply and Demand, Budget and budgetary provisions in Micro and Macro Economies, Applications of economics in civil engineering.	
<b>UNIT – II</b>	<b>3 Hours</b>
<b>METHODS OF ECONOMIC EVALUATION:</b>	
Benefit Cost ratio, Cash flow, financial ratios, Discounted Cash flows, Sinking Fund, Single payment compound amount factor. Single payment, present worth factor, Equal payment series, Equal payment series payment, Present worth factor, Net Present Value.	
<b>UNIT – III</b>	<b>3 Hours</b>
<b>COST ENGINEERING:</b>	
Capital Cost, Operational costs, Estimation and Estimation Techniques, Approximate estimates, Unit estimate, Time Value of Money Concept	
<b>UNIT – IV</b>	<b>3 Hours</b>
<b>FINANCING OF PROJECTS:</b>	
Introduction to Micro and Macro Economics, Financial Statements-Profit and loss, Balance sheets, Working capital management, Sinking Fund factor and Return on Investment, Job cost report.	
<b>UNIT – V</b>	<b>3 Hours</b>
<b>DEPRECIATION AND REPLACEMENT ANALYSIS:</b>	
Depreciation methods and calculation. Equipment costs, Ownership and operating costs Buy/Rent/Lease options, Replacement analysis.	

### Teaching & Learning Process:

Chalk and talk, Power point presentations, Animations and Videos

### Course Outcomes: The students will be able to

CO1	Understand the fundamental concepts of Economics and application of economics in civil Engineering.
CO2	Describe the different methods of economic evaluation and cost engineering concepts.
CO3	Discuss the project planning with a specific view on project Financing.
CO4	Explain the different depreciation and replacement analysing techniques.

### Text Books:

1	Panneer Selvam, R. "Engineering Economics". Prentice Hall of India Ltd, New Delhi, Latest Edn
2	Chopra PN." Principles of Economics", Kalyani Publishers, Latest Edn
3	Donald G. Newman, Jerome P Lavelle, "Engineering Economics and analysis" Enge Press, Texas,

	Latest Find
4	Degumo, E.P., Sullivan, W. Grand Canada, I.B. Tagineering Economy, Macuillan New York, Latest Edn
5	Zahid A kian Engineering Economy, "Engineering Feimony", Dorling Kindersley, Latest Edn.
6	Thuesen H. G., Fabrycky W. J., and G. J. Thuesen G. J., Engineering Economy, Prentice Hall International, Latest Edn 7. Paul E. De Garmo, and Canada. 1. R. (1997), Engineering Economy, Prentice Hall. Latest Edn.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓											
CO2	✓	✓										✓
CO3	✓										✓	✓
CO4	✓											✓

Course Title	<b>SUBSURFACE EXPOLRATION</b>						
Course Code	<b>22CVT308C</b>						
Category	<b>Ability Enhancement Course (AEC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>15</b>	<b>01</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 01 hours</b>		

### Course Learning Objective:

To learn various soil investigation techniques, identify the appropriate techniques for soil exploration, determine the nature of soil strata, location of ground water table using direct, indirect methods and prepare site investigation report

<b>UNIT – I</b> <b>PLANNING AN EXPLORATION PROGRAM:</b> Introduction, Objectives, Site reconnaissance, Number, Disposition of Trial Pits, Borings and Depth of Exploration.	<b>3 Hours</b>
<b>UNIT – II</b> <b>METHODS OF SOIL EXPLORATION:</b> General, Direct methods-Open trail pits, Borings Auger, Shell and Auger, Wash Boring, Rotary and Percussion Drilling, Stabilisation of bore hole and Indirect methods-Seismic refraction method and electrical resistivity method.	<b>3 Hours</b>
<b>UNIT – III</b> <b>SAMPLERS AND SAMPLES:</b> Types of Samplers-Open tube sampler, Standard split spoon sampler, Shell by tubes, Thin walled samplers and Piston sampler, Design features affecting sample disturbance and Types of samples-undisturbed, disturbed, representative and non-representative samples	<b>3 Hours</b>
<b>UNIT – IV</b> <b>FIELD TESTS:</b> Plate load test, Standard penetration test, Static cone penetration, Dynamic cone penetration test and Estimation of depth of ground water table (Hvorslev’s method).	<b>3 Hours</b>
<b>UNIT – V</b> <b>SITE INVESTIGATION REPORT:</b> Introduction, Bore log, Field and laboratory test results, Analysis of data and Recommendations.	<b>3 Hours</b>
<b>Teaching &amp; Learning Process:</b> Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.	

<b>Course Outcomes:</b> The students will be able to	
CO1	Understand the significance of various techniques of subsurface exploration and apply the appropriate technique based on the nature of project and field conditions.
CO2	Choose appropriate methods of obtaining different types of soil samples as per requirement of the project and perform laboratory tests.
CO3	Understand the practical significance of the results obtained from field, laboratory tests and apply those to clearly report the conclusions based on the investigation of subsurface exploration.



**Text Books:**

1	Soil Mechanics and Foundation Engineering, Punmia B C, Laxmi Publications Co., New Delhi.
2	Basic and Applied Soil Mechanics - Gopal Ranjan and Rao A.S.R. (2000), New Age International (P) Ltd., New Delhi.
3	Principles of Soil Mechanics and Foundation Engineering- Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.
4	Bowles J E , Foundation analysis and design, Tata McGraw- Hill Publications

**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓			✓				✓	✓	✓	✓
CO2	✓	✓			✓				✓	✓	✓	✓
CO3	✓	✓		✓					✓	✓		

Course Title	<b>FIRE SAFETY IN BUILDINGS</b>						
Course Code	<b>22CVT308D</b>						
Category	<b>Ability Enhancement Course (AEC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>15</b>	<b>01</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 01 hours</b>		

**Course Learning Objective:** Illustrate the objectives of fire safety in buildings, fire hazard analysis and classification of fire. Understanding of fire prevention, detection and alarm systems including emergency measures for control of fire. Discuss the firefighting arrangements, risk management. Extinguishing principles, agents, appliances and firefighting services in buildings.

<b>UNIT – I</b> <b>FIRE:</b> Introduction, Effects of Fire, Basic concepts of fire protection, Fire as a process of combustion, planning for fire protection, fire resistance Ventilation and fuel controlled fire, process of combustion.	<b>3 Hours</b>
<b>UNIT – II</b> <b>FIRE SAFETY:</b> Urban planning, escape and refuge, internal planning, detection and suppression Introduction to lift design, expected stop and floor of reversal, different cases, simulation, arrangements and escalators	<b>3 Hours</b>
<b>UNIT – III</b> <b>FIRE PREVENTION AND PROTECTION:</b> Fire Triangle, Fire Development and its Severity, Effect of Enclosures, Early detection of Fire, Classification of Fire and Fire Extinguishers, Electrical Safety.	<b>3 Hours</b>
<b>UNIT – IV</b> <b>ELECTRICAL SYSTEMS:</b> Intelligent building, life cycle cost and basics of building maintenance, stages of maintenance management, estimation of repair cycle, lamp replacement, building inspection, planned and Ad-hoc maintenance	<b>3 Hours</b>
<b>UNIT – V</b> <b>HEALTH EVALUATION OF BUILDINGS:</b> Condition survey and health evaluation of buildings, diagnosis of building by visual survey, case studies of visual survey.	<b>3 Hours</b>

**Teaching & Learning Process:**

Chalk and talk, videos, PowerPoint Presentation, animations and the online courses available should be shared with students. Field visit to fire stations and understand various fire accidents.

**Course Outcomes:** The students will be able to

CO1	Understand the definition of fire, fire triangle, combustion process and fire stages. Fire hazard analysis and assessment. Acquire the knowledge of fire prevention, protection and control systems.
CO2	Describe different fire fighting arrangements in the building.
CO3	Illustrate fire risk analysis and management including fire safety signs and notifications.
CO4	Apply Fire Safety Standards and Codes for design of fire fighting devices and components.

**Text Books:**

1	S. C. Sharma & Vineet Kumar, Safety, Occupational Health and Environmental Management in Construction, Khanna Publisher ISBN No. 978-81-7409-270-0, 2nd edition 2019.
2	N. Sesha Prakash, Manual of Fire Safety, CBS Publishers & Distributors Pvt. Ltd, 2020.
3	Charles D Reese, Occupational Safety and Health Fundamental Principles and Philosophies, CRC Press, 2017.

4	V K Jain, Fire Safety in Buildings, New Age International Private Limited; Third edition, 2020.
5	Fire protection, services and maintenance management of building, NPTEL video lecture, IIT, Delhi
6	Bureau of Indian Standards, "Hand Book of Functional Requirements Of Buildings, (SP-41 & SP-32)", BIS 1987 and 1989.
7	Building Services Design - T. W. Mever, Published by RIBA Publications, 1971.
8	Building Engineering & System Design - F. S. Merrit & J. Ambrose, U. S Department of Energy Office of Scientific and Technical Information, 1990.
9	National Building Code of India- Part: 4, Fire and Life safety, Bureau of Indian Standard.
10	Concept of building fire safety - D. Egan, Krieger Publishing Company, 2006.
11	Design of fire resisting structures - H. L. Malhotra. Surrey University Press, 1982.
12	<a href="https://www.ilo.org/wcmsp5/groups/public/ed_dialogue/lab_admin/documents/genericdocument/wcms_828851.pdf">https://www.ilo.org/wcmsp5/groups/public/ed_dialogue/lab_admin/documents/genericdocument/wcms_828851.pdf</a>
13	<a href="https://dgfscdhg.gov.in/national-building-code-india-fire-and-life-safety">https://dgfscdhg.gov.in/national-building-code-india-fire-and-life-safety</a>
14	<a href="https://www.firepedia.in/indian-standards-on-fire-safety">https://www.firepedia.in/indian-standards-on-fire-safety</a>

**Question paper pattern:**

- The question paper will have 50 questions carrying equal marks.
- Each question will be for 01 marks.
- Each question will have four options and one right answer.
- The students will have to answer all 50 questions.

**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓										
CO2	✓											
CO3	✓										✓	
CO4	✓	✓			✓							

Course Title	<b>STRUCTURAL ANALYSIS</b>						
Course Code	<b>22CVT401</b>						
Category	<b>Professional Core Course (PCC)</b>						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>40</b>	<b>03</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 Hours</b>		

**Course Objective:** To understand the concept of determinate structures, indeterminate structures, deflection and strain energy, influence line diagram for beams subjected to rolling loads and analysis of truss, arches and cables and analysis of beams and frames by moment distribution method, slope deflection method & Matrix methods.

<b>UNIT – I</b> <b>STRUCTURAL SYSTEMS:</b> Forms of structures, Conditions of equilibrium, Degree of freedom, Linear and Nonlinear behavior, One, two, three dimensional structural systems, Determinate and indeterminate structures [Static and Kinematics]. <b>ANALYSIS OF TRUSSES:</b> Method of joints and Method of sections.	<b>8 Hours</b>
<b>UNIT – II</b> <b>DEFLECTION OF BEAMS</b> - Moment area method, Conjugate beam method. <b>DEFLECTION OF TRUSS:</b> Unit load method. <b>STRAIN ENERGY :</b> 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, and Principle of virtual work.	<b>8 Hours</b>
<b>UNIT – III</b> <b>ROLLING LOAD AND INFLUENCE LINES:</b> Rolling load analysis for simply supported beams for several point loads and UDL. Influence line diagram for reaction, SF and BM at a given section. <b>ARCHES AND CABLES</b> Three hinged circular and parabolic arches with supports at same levels and different levels, Determination of thrust, shear and bending moment, Analysis of cables under point loads and UDL, length of cables (Supports at same levels and at different levels).	<b>8 Hours</b>
<b>UNIT – IV</b> <b>MOMENT DISTRIBUTION METHOD:</b> Introduction, Definition of terms- Distribution factor, Carry over factor, Analysis of beams and orthogonal rigid jointed plane frames (non-sway) with kinematic indeterminacy less than/equal to three. <b>SLOPE DEFLECTION METHOD:</b> Analysis of continuous beams only. <b>KANI'S METHOD:</b> Analysis of sway frames with kinematic indeterminacy less than/equal to three.	<b>8 Hours</b>
<b>UNIT – V</b> <b>STIFFNESS MATRIX METHOD OF ANALYSIS:</b> Introduction, Development of stiffness matrix for prismatic beam element and plane truss element and Analysis of continuous beams, plane truss and axially rigid plane frames by stiffness method with kinematic indeterminacy less than/equal to three. <b>FLEXIBILITY MATRIX METHOD OF ANALYSIS:</b> Introduction, Development of flexibility matrix for prismatic beam and relationship between stiffness and flexibility matrix, analysis of continuous beams and frames.	<b>8 Hours</b>

<b>Course Outcomes:</b> At the end of the course the student will be able to	
1	Understand the basic structural systems, classification and parameters required for structural analysis.
2	Interpret the concept of strain energy, moving loads, lateral and gravity loads applied in the structural systems.
3	Analyse and solve problems of determinate and indeterminate structures using various approaches.

<b>Teaching-Learning Process</b>	Chalk and talk, videos, PowerPoint Presentation, Animations.
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<b>Suggested Text Book(s):</b>	
1	Basic Structural Analysis, C S Reddy, Tata McGraw Hill Education Pvt. Ltd., 3 <sup>rd</sup> Edition ISBN-13: 978-0070702769.
2	Theory of Structures, S Ramamrutham & R Narayan, Dhanpat Rai & Co., 9 <sup>th</sup> Edition, ISBN – 13: 978-934378103.
3	Structural Analysis Vol-2, S S Bhavikatti, Vikas Publishing House Fourth Edition, ISBN-13-978-9325968806.
4	Structural Analysis, R C Hibbler, Pearson Publication, 8 <sup>th</sup> edition, ISBN-13: 978-0132570534.
5	Elementary Structural Analysis, Norris C H, Wilbur J B, International Student edition, McGraw Hill International Book, ISBN-13: 978-8131721414.
6	Structural Analysis, Devdas Menon, Narosa Publishing House, ISBN: 978-8173197505.
7	Theory of Structures, Volume 2, S P Gupta, G S Pandit & R Gupta, Tata McGraw Hill Publication Company Ltd.

#### CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓											
CO2	✓	✓										
CO3	✓	✓		✓								

Course Title	<b>HIGHWAY ENGINEERING</b>						
Course Code	<b>22CVU402</b>						
Category	<b>Integrated Professional Core Course (IPCC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>3</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>5</b>	<b>50</b>	<b>04</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 hours</b>		

### Course Learning Objective:

To comprehend the knowledge of different modes of transportation systems, history, development of highways and the organizations associated with research and development in INDIA. To understand the Highway planning and development considering the essential criteria's such as Engineering and financial aspects, regulations and policies, socio economic impact and the design consideration for drainage. To illustrate the different aspects of horizontal and vertical geometric elements for safe and efficient movement of vehicles. To evaluate pavement and its components, design aspects and its requirements to evaluate the highway economics by B/C, NPV, IRR methods.

<b>UNIT – I</b>	<b>8 Hours</b>
<b>PRINCIPLES OF TRANSPORTATION ENGINEERING:</b>	
Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport Jayakar committee recommendations, and implementation – Central Road Fund, Indian Roads Congress, Central Road Research Institute.	
<b>HIGHWAY DEVELOPMENT AND PLANNING:</b>	
Road types and classification, road patterns, planning surveys, master plan – saturation system of road planning, phasing road development in India, problems on best alignment among alternate proposals Salient Features of 3rd and 4th twenty year road development plans and Policies, Present scenario of road development in India (NHAI, NHDP & PMGSY) and in Karnataka (KSHIP & KRDC) Road development plan - vision 2021, DPR of roads.	
<b>UNIT – II</b>	<b>8 Hours</b>
<b>HIGHWAY ALIGNMENT AND SURVEYS:</b>	
Ideal Alignment, Factors affecting the alignment, Engineering surveys - Map study, Reconnaissance, Preliminary and Final location & detailed survey, Reports and drawings for new and re-aligned projects.	
<b>HIGHWAY ECONOMICS:</b>	
Highway user benefits, VOC using charts only - Examples, Economic analysis - annual cost method, Benefit Cost Ratio method, NPV-IRR methods with Examples, Highway financing - BOT-BOOT concepts, Tender process.	
<b>UNIT – III</b>	<b>8 Hours</b>
<b>HIGHWAY GEOMETRIC DESIGN:</b>	
Importance, Terrain classification, Design speed, Factors affecting geometric design, Cross sectional elements – Camber, width of pavement, Shoulders, Width of formation, Right of way with Typical cross sections. Sight Distance-Restrictions to sight distance, Stopping sight distance, Overtaking sight distance, overtaking zones- Examples on SSD and OSD with Sight distance at intersections.	
<b>HORIZONTAL ALIGNMENT:</b>	
Radius of Curve, Super elevation, Extra widening, Transition curve and its length, setback distance – Examples on the said above. Vertical alignment - Gradient-summit and valley curves with examples.	
<b>UNIT – IV</b>	<b>8 Hours</b>
<b>PAVEMENT MATERIALS:</b>	
<b>Subgrade soil</b> - desirable properties - HRB soil classification, determination of CBR and modulus of subgrade reaction with Examples on CBR and Modulus of subgrade reaction.	
<b>Aggregates</b> - Desirable properties and list of tests used in laboratory.	
<b>Bituminous materials</b> - bitumen, cutback and emulsion with List of tests on bituminous materials, PQC	

**UNIT – V****8 Hours****HIGHWAY DRAINAGE:**

Significance and requirements, Surface drainage system and design - Examples, sub surface drainage system, design of filter materials with examples.

**PAVEMENT DESIGN:** Pavement types, component parts of flexible and rigid pavements and their functions, design factors, Flexible pavement design as per IRC: 37 – 2018, and Design of rigid pavement as per IRC: 58 – 2015.

<b>Expt . No</b>	<b>LABORATORY EXPERIMENTS:</b>	<b>No. of sessions</b>
1	Tests on Aggregates: Specific Gravity, Crushing Strength Test,	<b>10</b>
2	Hardness & Toughness Test: Los Angeles abrasion test, Impact test,	
3	Shape tests: Combined index and Angularity number	
4	Tests on Bituminous Materials: Specific gravity test, Viscosity test by tar viscometer, Flash and fire point test	
5	Penetration test, Ductility test, Softening point test	
6	Tests on Soil: Wet sieve analysis	
7	Density of Soil: Core Cutter & Sand replacement method	
8	CBR Test on soil	
9	Design of flexible pavement as per IRC 37-2018	
10	Bituminous Mix Design by Marshall Method (Demonstration only)	

**Course Outcomes:** The students will be able to

CO1	Understand the basic principles of transportation engineering and factors affecting highway alignment and economic analysis of various road projects.
CO2	Illustrate the factors which affects geometric design of highway with various properties and Specifications of pavement materials used for road construction.
CO3	Apply the procedural knowledge for design, construction and maintenance of Flexible and pavement layers as per IRC codes.
CO4	Analyze the different types of drainage system in Highway Engineering.

**Teaching & Learning Process:**

Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

**Text Books:**

1	Highway Engineering – S K Khanna and C E G Justo, Nem Chand Bros, 10th Edition, Roorkee, 2011
2	Transportation Engineering, L. R. Kadiyali, Khanna Publishers, 1st edition, 2016
3	Highway Engineering, Karen K. Dixon and Paul H. Wright, Wiley, 7th edition, 2009.
4	Transportation Engineering, C. Jotin Khisty, B. Kent Lall, Pearson; 3rd edition, 2017
5	Highway Engineering, Martin Rogers, Bernard Enright, Wiley, 3rd edition, 2016.
6	Principles of Highway Engineering and Traffic Analysis, Fred L. Mannering, Walter P. Kilareski, Scott S. Washburn, Wiley, 3rd edition, 2007.
7	Pavement Analysis and Design, Yang Huang, Pearson, 2008.
8	Transportation Engineering and Planning, Papacostas, Pearson, Third edition, 2015.
9	A Policy on Geometric Design of Highways and Streets (Green Book), AASHTO, 2011 edition
10	<a href="https://nptel.ac.in/courses/105105107">https://nptel.ac.in/courses/105105107</a> - NPTEL online course Video link
11	<a href="https://nptel.ac.in/courses/105101087">https://nptel.ac.in/courses/105101087</a> - NPTEL online course material link

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓										✓	
CO2	✓	✓										
CO3	✓		✓	✓								✓
CO4		✓		✓								



Course Title	<b>CONCRETE TECHNOLOGY</b>						
Course Code	<b>22CVU403</b>						
Category	<b>Integrated Professional Core Course (IPCC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>3</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>5</b>	<b>50</b>	<b>04</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 hours</b>		

**Course Learning Objective:** To recognize material characterization of ingredients of concrete and its influence on properties of concrete. Understand proportion ingredients of concrete to arrive at most desirable mechanical properties of concrete. To ascertain and measure engineering properties of concrete in fresh and hardened state which meet the requirement of real time structures.

<b>UNIT – I</b>	<b>8 Hours</b>
<b>CEMENT AND AGGREGATES:</b>	
<b>Introduction to Cement:</b> Chemical Composition, Physical and Chemical properties, Hydration of Cement, Factors influencing and affecting hydration of cement & Types of cement.	
<b>Fine Aggregate:</b> Grading, Analysis, Specific Gravity, Bulking, Moisture content.	
<b>Coarse Aggregate:</b> Importance of Size, Shape and Texture. Grading of aggregates - Sieve analysis, Specific gravity, Flakiness and Elongation index, Crushing, Impact and Abrasion tests.	
<b>UNIT – II</b>	<b>10 Hours</b>
<b>PROPERTIES OF FRESH AND HARDENED CONCRETE:</b>	
<b>Manufacturing Process of Concrete:</b> Batching, Mixing, Transporting, Placing, Compaction, Curing & Finishing.	
<b>Fresh Concrete:</b> Workability – Definition and Requirements, Factors affecting workability, Measurement of workability – Slump test, Flow table test, Compaction factor test and Vee-Bee Consistometer tests, Segregation and Bleeding.	
<b>Hardened Concrete:</b> Factors affecting strength, W/C ratio, Gel/Space ratio, Maturity concept, Destructive test on hardened concrete.	
<b>Admixtures:</b> Types of admixtures and their effect on concrete property in fresh and hardened state. Plasticizers and superplasticizers, Retarders, Accelerators & Air-Entraining Admixtures.	
<b>UNIT – III</b>	<b>6 Hours</b>
<b>Elasticity:</b> Relation between modulus of elasticity and strength, Factors affecting modulus of elasticity, Poisson's ratio.	
<b>Shrinkage:</b> Types of shrinkage, Factors affecting shrinkage.	
<b>Creep of Concrete:</b> Measurement of creep, Factors influencing creep, Effects of creep.	
<b>UNIT – IV</b>	<b>8 Hours</b>
<b>DURABILITY &amp; PERMEABILITY OF CONCRETE:</b>	
Definitions, Causes, Short term and Long-term durability, Carbonation, Freezing and Thawing, Alkali – Aggregate reaction, Sulphate attack, Chloride attack, Acid attack, Effect of Sea water.	
<b>Special Concrete:</b> Properties and Application of Self-Compacting Concrete, Light Weight Concrete, High Density Concrete, Fibre-Reinforced Concrete, Geo-Polymer Concrete & Ready Mix Concrete.	
<b>UNIT – V</b>	<b>8 Hours</b>
<b>CONCEPT OF CONCRETE MIX DESIGN:</b>	
<b>Mix Design Procedure:</b> Concept of Concrete Mix design, Variables in proportioning, Exposure conditions, Procedure of mix design as per IS 10262-2019, Numerical examples of Mix Design.	

Sl.NO	Experiments	No. of Sessions
1	Determination of Fineness of cement & Specific Gravity of cement	10
2	Consistency test on cement and Compressive strength of cement	
3	Determination of Setting times of cement	
4	Determination of Soundness of cement	
5	Measurement of workability of concrete by Slump cone test	
6	Measurement of workability of concrete by Compaction factor test	
7	Measurement of workability of concrete by Vee-bee Consistometer test	
8	Tests for determination of Compressive strength of concrete	
9	Tests for determination of Flexural strength of concrete	
10	Tests for determination of Splitting tensile strength of concrete	

#### Teaching & Learning Process:

Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

#### Course Outcomes: The students will be able to

CO1	Assess and infer various properties of cement, fine and coarse aggregate as per Codal provision and specifications.
CO2	Understand the production of concrete, importance of curing, admixtures and properties of concrete in fresh and hardened state.
CO3	Acquires the knowledge about elasticity, durability and properties of special concrete.
CO4	Design the concrete for different grades as per IS: 10262-2019 provisions.
CO5	Examine and Evaluate properties of Cement and Concrete.

#### Text Books:

1	M.S.Shetty, "Concrete Technology" - Theory and Practice, S.Chand and Company, New Delhi, 2002.
2	"Concrete Technology (Trade, Technology & Industry)", George White, Delmar Cengage Learning, 1991.
3	"Concrete: Microstructure, Properties, and Materials", P. Kumar Mehta, Paulo J. M. Monteiro, McGraw-Hill Education, 2017.
4	Neville, A.M., "Properties of Concrete", ELBS, London, Pearson Education India, 2012.
5	A.R.Santakumar, "Concrete Technology". Oxford University Press (2007)'
6	"Advanced Concrete Technology", Zongjin Li, Wiley; 1 edition
7	Gambhir Dhanpat Rai & Sons , "Concrete Manual" -, New Delhi
8	N. Krishna Raju, "Concrete Mix Design" -, Sehgal - publishers
9	IS:10262-2016 , "Recommended guidelines for concrete mix design", Bureau of Indian Standards, New Delhi
10	IS 456-2000, "Plain And Reinforced Concrete", New Delhi.
11	Cement <a href="https://nptel.ac.in/courses/105102012/1">https://nptel.ac.in/courses/105102012/1</a> Aggregates <a href="https://nptel.ac.in/courses/105102012/6">https://nptel.ac.in/courses/105102012/6</a> Mineral admixtures <a href="https://nptel.ac.in/courses/105102012/11">https://nptel.ac.in/courses/105102012/11</a> Chemical admixtures <a href="https://nptel.ac.in/courses/105102012/9">https://nptel.ac.in/courses/105102012/9</a> <a href="https://nptel.ac.in/courses/105102012/10">https://nptel.ac.in/courses/105102012/10</a> Concrete mix design <a href="https://nptel.ac.in/courses/105102012/14">https://nptel.ac.in/courses/105102012/14</a>

Concrete production & fresh concrete <a href="https://nptel.ac.in/courses/105102012/19">https://nptel.ac.in/courses/105102012/19</a>
Engineering properties of concrete <a href="https://nptel.ac.in/courses/105102012/23">https://nptel.ac.in/courses/105102012/23</a>
Dimensional stability & durability <a href="https://nptel.ac.in/courses/105102012/27">https://nptel.ac.in/courses/105102012/27</a>
Durability of concrete <a href="https://nptel.ac.in/courses/105102012/31">https://nptel.ac.in/courses/105102012/31</a>
Special concretes <a href="https://nptel.ac.in/courses/105102012/36">https://nptel.ac.in/courses/105102012/36</a>

**Question paper pattern:**

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

**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓											
CO2	✓	✓	✓									
CO3	✓	✓		✓								
CO4	✓	✓	✓					✓				✓
CO5	✓	✓	✓						✓			✓

Course Title	<b>FLUID MECHANICS &amp; MACHINERY LABORAORY</b>						
Course Code	<b>22CVL404</b>						
Category	<b>Professional Core Course Laboratory (PCCL)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>22</b>	<b>01</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 hours</b>		

**Course Learning Objective:** To study the measurement of flow of fluid in a pipe, notches and weirs, calibration of measuring devices and their applications and study the performance of Pumps and Turbines.

Sl. No.	Syllabus Contents	No. of Hours
1	Verification of Bernoulli's equation.	02
2	Determination of Hydraulic coefficients of a Vertical orifice.	02
3	Calibration of Venturimeter and Orificemeter.	02
4	Calibration of Rectangular and Triangular notch.	02
5	Calibration of Broad- crested and Ogee weir.	02
6	Determination of Darcy's friction factor for a GI and PVC straight pipe.	02
7	Determination of vane coefficients for a flat vane, inclined and semi-circular vane.	02
8	Performance characteristics of Single stage and Multi-stage Centrifugal Pump.	02
9	Performance characteristics of Pelton wheel Turbine.	02
10	Performance characteristics of Francis turbine.	02
11	Performance characteristics of a Kaplan turbine.	02

**Teaching & Learning Process:**

Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

**Course Outcomes:** The students will be able to

CO1	Explain the principles of flow measuring devices by conducting the experiments.
CO2	Illustrate the calibration of velocity and discharge measuring equipments.
CO3	Demonstrate the performance of Hydraulic machines.

**Text Books:**

1	A Text Book of Fluid mechanics & Hydraulic Machines'- R.K. Rajput, S. Chand & Co, New Delhi, 2006 Edition.
2	'Principles of Fluid Mechanics and Fluid Machines'- N. Narayana Pillai, Universities Press (India), Hyderabad, 2009 Edition.
3	'Text Book Of Fluid Mechanics & Hydraulic Machines'- R.K. Bansal, Laxmi Publications, New Delhi, 2008 Edition.
4	Hydraulics and Hydraulic Machines- Dr. P. N. Modi and Seth, McGraw Hill Publications.
5	Fundamentals of Fluid Mechanics – Bruce R. Munson, Donald F. Young, Theodore H. Okiishi, Wiley India, New Delhi, 2009 Edition.
6	'Introduction To Fluid Mechanics' – Edward j. Shaughnessy, Ira m. Katz, James P Schaffer, Oxford University Press, New Delhi, 2005 Edition.
7	Fluid Mechanics' – Streeter, Wylie, Bedford New Delhi, 2008(Ed)
8	Fluid Mechanics and Turbomachines' - Madan Mohan Das, PHI Learning Pvt. Limited, New Delhi. 2009 Edition.

**Question paper pattern:**

The candidate has to conduct one experiment which carries 70 % of the total marks and viva-voce for 30 % of the total marks.

**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓		✓	✓	✓							
CO2	✓		✓	✓	✓							
CO3		✓	✓		✓							

Course Title	<b>ADVANCED SURVEYING</b>						
Course Code	<b>22CVT405A</b>						
Category	<b>Emerging Technology Course (ETC)</b>						
Scheme and Credits	No. of Hours/Week					Total Teaching Hours	Credits
	L	T	P	SS	Total		
	3	0	0	0	3	40	3
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>		<b>Total Max. Marks: 100</b>		<b>Duration of SEE: 03 Hours</b>		

**Course Learning Objectives:** To provide basic knowledge levelling for location, design and construction of civil engineering projects, develop skills for using modern surveying instruments and methods such as Total station, GPS, Photogrammetric and UAV and to familiarize in acquiring surveying data and applying fundamental concepts to eliminate errors and set out the works which are used for abstracting the information of earth Surface.

<b>UNIT-I</b>	<b>08 Hours</b>
<b>TRIGONOMETRIC LEVELLING:</b>	
Determination of elevation of objects when the base is accessible and inaccessible by single plane and double plane method, Distance and difference in elevation between two inaccessible objects by double plane method.	
<b>UNIT-II</b>	<b>08 Hours</b>
<b>TACHEOMETRY:</b>	
Basic principle, Types of tacheometric survey, Tacheometric equation for horizontal line of sight and inclined line of sight in fixed hair method, Anallactic lens in external focusing telescopes, Reducing the constants in internal focusing telescope, Moving hair method and tangential method, Substance bar, Beaman stadia arc.	
<b>UNIT-III</b>	<b>08 Hours</b>
<b>GLOBAL POSITIONING SYSTEM:</b>	
Definition, Principles of GPS, DGPS and its applications.	
<b>PHOTOGRAMMETRIC SURVEYING:</b>	
Principle, Scale, Number of Photographs, Deduction of distance & height, Elements of Astronomical survey, Solution of problems dealing with celestial triangle.	
<b>UNIT-IV</b>	<b>08 Hours</b>
<b>REMOTE SENSING:</b>	
History, advantages and disadvantages, types of remote sensing, application of remote sensing,	
<b>GEOGRAPHIC INFORMATION SYSTEM:</b>	
Definition of GIS, Key Components of GIS, Functions of GIS, Data mode of GIS, application of GIS.	
<b>UNIT-V</b>	<b>08 Hours</b>
<b>UAV SURVEYING:</b>	
Definitions of UAV, RPA, Quad copters -Basic Components and Categories – Applications, Principles of Flight Planning, Mapping and Surveying, Comparison with other aerial vehicles	

<b>Course Outcomes:</b> At the end of the course the student will be able to	
CO1	Understand the different methods of trigonometric levelling
CO2	Find the distance between the points using tachometry for simple field survey.
CO3	Analyze the modern methods of surveying for field application.

<b>Teaching-Learning Process</b>	Chalk and talk, PowerPoint Presentation, animations, YouTube videos.
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<b>Text Book(s) and Nptel Videos</b>	
1	Surveying Vol. 1, 2 & 3. 17 <sup>th</sup> edition, B. C. Punmia, Ashok Kumar Jain, Arun Kuma Jain, lakshmi publication.
2	Surveying and leveling, 3 <sup>rd</sup> edition, T P Kanetkar, Pune Vidyarthi Griha Prakashan, Pune Vidyarthi Griha Prakashan publisher.
3	Surveying and Leveling, 2 <sup>nd</sup> edition – R Subramanian. Oxford University Press (2007) Publisher.
4	Higher Surveying, 3 <sup>rd</sup> edition, A.M. Chandra, New age international (Publisher) Ltd
5	Surveying Vol. I, 5 <sup>th</sup> edition, S.K. Duggal, Tata McGraw Hill - Publishing Co. Ltd., New Delhi.
6	<a href="https://nptel.ac.in/courses/105107122">https://nptel.ac.in/courses/105107122</a>
7	<a href="https://archive.nptel.ac.in/courses/105/104/105104101/">https://archive.nptel.ac.in/courses/105/104/105104101/</a>

<b>CO – PO Mapping</b>												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓					✓						
CO2	✓	✓	✓	✓	✓	✓						
CO3		✓	✓		✓	✓						✓

Course Title	<b>ROAD SAFETY &amp; ENGINEERING</b>						
Course Code	<b>22CVT405B</b>						
Category	<b>Emerging Technology Course (ETC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>40</b>	<b>03</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 hours</b>		

**Course Learning Objective:** To explain the causes of accidents, statistical measures of accident data analysis and computer application in data analysis. Explain different parameters responsible for providing road safety in the construction of new roads. Explain road reconstruction principle and improvement of road considering the different components of road and intersections. Explain road safety and maintenance measures for road in operation considering pedestrian, cyclists and road furniture. Explain road safety audit principle and procedure, various traffic management techniques and their effectiveness.

<b>UNIT – I</b> <b>INTRODUCTION TO SAFETY:</b> Road accidents, Trends, causes, Collision and Condition diagrams, Highway safety, human factors, Vehicle factors Road Safety Management System: Multicausal dynamic systems approach to safety, crash versus accident, road safety improvement strategies, elements of a road safety plan, Safety Data Needs	<b>8 Hours</b>
<b>UNIT – II</b> <b>STATISTICAL INTERPRETATION AND ANALYSIS OF CRASH DATA:</b> Before-after methods in crash analysis, Advanced statistical methods, Black Spot Identification & Investigations, Case Studies.	<b>8 Hours</b>
<b>UNIT – III</b> <b>ROAD SAFETY AUDITS:</b> Key elements of a road safety audit, Road Safety Audits & Investigations, Crash investigation and analysis, Describe methods for identifying hazardous road locations, Case Studies.	<b>8 Hours</b>
<b>UNIT – IV</b> <b>CRASH RECONSTRUCTION:</b> Describe the basic information that can be obtained from the roadway surface, Understand basic physics related to crash reconstruction, speed for various skid, friction, drag, and acceleration scenarios, variables involved in jump and flip crashes, variables involved in pedestrian crashes, Case Studies.	<b>8 Hours</b>
<b>UNIT – V</b> <b>MITIGATION MEASURES:</b> Accident prevention by better planning, Accident prevention by better design of roads, Crash Countermeasures, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety.	<b>8 Hours</b>

**Teaching & Learning Process:**  
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

<b>Course Outcomes:</b> The students will be able to	
CO1	Understand the effect of driver characteristics, roadway characteristics, climatic factors on highway safety.
CO2	Plan and design a road safety improvement program
CO3	Analyze accident data and suggest safety measures
CO4	Conduct road safety audit & Interpret accident data using statistical analysis



<b>Text Books:</b>	
1	Ezra Hauer, <i>Observational Before-After Studies in Road Safety</i> , Pergamon Press, 2015.
2	Institute of Transportation Engineers (ITE), <i>The Traffic Safety Toolbox: A Primer on Traffic Safety</i> , ITE, 2013.
3	J. Stannard Baker, <i>Traffic Collision Investigation</i> , Northwestern University Center for Public Safety, 2014
4	Leonard Evans, <i>Traffic Safety</i> , Science Serving Society, 2004. Lynn B. Fricke, <i>Traffic Accident Reconstruction</i> , Northwestern University Center for Public Safety, 2014.
5	Popkess C.A, <i>Traffic Control and Road Accident Prevention</i> , Chapman and Hall, 1997, Rune Elvik and Truls Vaa, <i>The Handbook of Road Safety Measures</i> , Elsevier, 2004.
6	Simon Washington, Matthew Karlaftis, and Fred Mannering, <i>Statistical and Econometric Methods for Transportation Data Analysis</i> , Chapman & Hall/CRC Press, 2003.
7	<i>Towards Safe Roads in Developing country</i> , TRL – ODA, 2004

- | <b>Question paper pattern:</b>  |
|---|
| <ul style="list-style-type: none"> <li>• The question paper will have ten full questions carrying equal marks.</li> <li>• Each full question will be for 20 marks.</li> <li>• There will be two full questions (with a maximum of three sub - questions) from each unit.</li> <li>• Each full question will have sub - question covering all the topics under a unit.</li> <li>• The students will have to answer five full questions, selecting one full question from each unit.</li> </ul> |

<b>CO-PO Mapping</b>												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2		✓	✓									
CO3	✓	✓		✓	✓							
CO4	✓		✓	✓	✓							✓

Course Title	<b>APPLIED HYDRAULICS</b>						
Course Code	<b>22CVT405C</b>						
Category	<b>Emerging Technology Course (ETC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>40</b>	<b>03</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 hours</b>		

**Course Learning Objectives:** To understand the components of behaviour of fluid under Static Condition, gain knowledge on fluid dynamics and basic design of flow through pipes and channels, to understand the working principles and performance of hydraulic turbines.

<b>Unit: I</b> <b>FLUID STATICS:</b> Total Pressure and Centre of pressure on Horizontally, Vertically, Inclined and Curved immersed surface, Pressure diagrams, Practical Applications of Hydrostatics: Sluice gates and Lock gates.	<b>08 hours</b>
<b>Unit: II</b> <b>FLOW THROUGH COMPOUND PIPES:</b> Pipes in series, Pipes in parallel, Branched pipes and Siphon pipes. Numericals.	<b>08 hours</b>
<b>Unit: III</b> <b>NON-UNIFORM FLOW OVER OPEN CHANNELS:</b> Specific energy of a flowing liquid, Specific energy diagrams, Critical depth, Critical velocity, Types of flows, (Streaming, Critical and Shooting), Hydraulic jump, Depth of hydraulic jump and Loss of head due to hydraulic jump, Afflux, Back water curve, Length of back water curve, equation of non-uniform flow (slope of free water surface), Numericals.	<b>08 hours</b>
<b>Unit: IV</b> <b>HYDRAULIC TURBINES: DESIGN &amp; PROPORTIONS</b> Classification of Turbines, Components, working proportions of impulse turbines (Pelton) and reaction turbines (Francis and Kaplan), Draft tubes, Numericals.	<b>08 hours</b>
<b>Unit: V</b> <b>HYDRAULIC TURBINES: PERFORMANCES</b> Draft tubes, Unit quantities, Specific speed, Numericals. <b>CENTRIFUGAL PUMPS:</b> Components, Working Principles, Minimum starting speed, Priming, Multi-stage Centrifugal Pumps (Pumps in series and parallel), Numericals.	<b>08 hours</b>

**Teaching & Learning Process:**  
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

<b>Course Outcomes:</b> The students will be able to	
CO1	Determine the Static Fluid Pressure.
CO2	Analyse the behaviour of fluid in pipes.
CO3	Analyse the Energy concepts of fluid in open channel, Energy dissipation, water surface profiles at different conditions.
CO4	Analyse the working principles of the hydraulic machines for the given data.

**Text Books:**

1	Text Book Of Fluid Mechanics & Hydraulic Machines- R.K. Bansal, Laxmi Publications, New Delhi, 2019 10 <sup>th</sup> Edition.
2	Hydraulics and Hydraulic Machines- Dr. P. N. Modi and Seth, Standard Book House 2022 22 <sup>nd</sup> Edition.
3	Fundamentals of Fluid Mechanics – Bruce R. Munson, Donald F. Young, Theodore H. Okiishi, Wiley India, New Delhi, 2021 6th Edition.
4	Introduction To Fluid Mechanics – Edward J. Shaughnessy,jr; Ira m. Katz, James P Schaffer, Oxford University Press, New Delhi, 2005 Edition.
5	A Text Book of Fluid mechanics & Hydraulic Machines- R.K. Rajput, S. Chand & Co, New Delhi, 2016 Edition.
6	Principles of Fluid Mechanics and Fluid Machines’- N.Narayana Pillai, Universities Press (India), Hyderabad, 2009 Edition.
7	Fluid Mechanics – Streeter, Wylie, Bedford, McGraw Hill Education; 2017 9th edition.
8	Fluid Mechanics and Turbomachines- Madan Mohan Das, PHI Learning Pvt. Limited, New Delhi. 2009 Edition.

**Question paper pattern:**

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

**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓			✓							✓
CO2	✓	✓	✓									✓
CO3	✓	✓	✓		✓							✓
CO4	✓	✓	✓		✓							✓

Course Title	<b>GROUND IMPROVEMENT TECHNIQUES</b>						
Course Code	<b>22CVT405D</b>						
Category	<b>Emerging Technology Course (ETC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>40</b>	<b>03</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 03 hours</b>		

**Course Learning Objective:** To introduce the concepts, need of ground improvement techniques and apply various alternate ground improvement techniques to suit the field requirements.

<p><b>UNIT-I</b> <span style="float: right;"><b>08 Hours</b></span></p> <p><b>FORMATION OF SOILS:</b> Introduction, Formation of soil and Soil distribution in India.</p> <p><b>GROUND IMPROVEMENT:</b> Historical development, Objectives of soil improvement, Classification of ground improvement techniques and Factors affecting the selection of best ground improvement technique.</p> <p><b>COMPACTION:</b> Introduction, Compaction mechanics, Field procedure, surface compaction, Dynamic Compaction, selection of field compaction procedures, compaction quality control.</p>
<p><b>UNIT-II</b> <span style="float: right;"><b>08 Hours</b></span></p> <p><b>HYDRAULIC MODIFICATION:</b> Introduction, Seepage, filter requirements, ground water and seepage control, methods of dewatering systems, Design of dewatering system including pipe line effects of dewatering. Drains, different types of drains.</p> <p><b>PRE-COMPRESSION AND VERTICAL DRAINS:</b> Importance, Vertical drains, Sand drains, Drainage of slopes, Electro kinetic dewatering, Preloading.</p>
<p><b>UNIT-III</b> <span style="float: right;"><b>08 Hours</b></span></p> <p><b>CHEMICAL MODIFICATIONS:</b> Definition, cement stabilization, sandwich technique, admixtures. Hydration – effect of cement stabilization on permeability, Swelling and shrinkage and strength and deformation characteristics. Criteria for cement stabilization. Stabilization using Fly ash, Lime stabilization – suitability, process, criteria for lime stabilization. Other chemicals like chlorides, hydroxides, lignin and hydrofluoric acid. Properties of chemical components, reactions and effects. Bitumen, tar or asphalt in stabilization.</p>
<p><b>UNIT-IV</b> <span style="float: right;"><b>08 Hours</b></span></p> <p><b>VIBRATION METHODS:</b> Introduction, Vibro compaction – blasting, vibratory probe, Vibro displacement compaction – displacement piles, vibroflotation, sand compaction piles, stone columns, heavy tamping.</p> <p><b>GROUTING AND INJECTION:</b> Introduction, Effect of grouting. Chemicals and materials used. Types of grouting. Grouting procedure, Applications of grouting.</p>
<p><b>UNIT-V</b> <span style="float: right;"><b>08 Hours</b></span></p> <p><b>GEOSYNTHETICS:</b> Introduction, Geosynthetic types, properties of Geosynthetics – materials and fibre properties, Geometrical aspects, mechanical properties, Hydraulic properties, Durability; Applications of Geosynthetics - Separation, Filtration and Fluid Transmission, Reinforcement.</p> <p><b>MISCELLANEOUS METHODS (ONLY CONCEPTS &amp; USES):</b> Ground improvement by confinement – Crib walls, Gabions and Mattresses, Anchors, Rock bolts, concepts of reinforced earth and soil nailing, Concept of thermal methods-Ground freezing and heating.</p> <p><b>Teaching &amp; Learning Process:</b> Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.</p>

<b>Course Outcomes:</b> The students will be able to	
CO1	Know about the formation of soils, soil distributions in India and problems associated with soil with weak geotechnical properties.
CO2	Understand the significance, principles of various ground improvement techniques and factors affecting the ground improvement.
CO3	Choose appropriate ground improvement technique as per the requirement of the site conditions and project.

<b>Text Books:</b>	
1	Purushothama Raj P, “Ground Improvement Techniques”, Laxmi Publications, New Delhi.
2	Koerner R.M, “Construction and Geotechnical Method in Foundation Engineering”, Mc Graw Hill Pub. Co.
3	Manfred Hausmann, “Engineering principles of ground modification”, Mc Graw Hill Pub. Co.,
4	Bell, F.G., “Methods of treatment of unstable ground”, Butterworths, London.
5	Nelson J.D. and Miller D.J, “Expansive soils”, John Wiley and Sons.
6	Ingles. C.G. and Metcalf J.B , “Soil Stabilization; Principles and Practice”, Butterworths

<b>CO-PO Mapping</b>												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓				✓	✓					✓
CO2	✓	✓				✓	✓					✓
CO3	✓	✓	✓	✓	✓				✓	✓	✓	✓

Course Title	<b>CONSTRUCTION METHODS AND EQUIPMENT</b>						
Course Code	<b>22CVT406A</b>						
Category	<b>Ability Enhancement Course (AEC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>15</b>	<b>01</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 01 hours</b>		

**Course Learning Objective:** To learn the basic principles of construction techniques & methods, understand terminologies and units of measurement related to equipment usage in different construction projects and perform cost analysis, selection, application and utilization of equipment.

<b>UNIT – I</b> <b>CONSTRUCTION METHODS:</b> Introduction, Conventional and Modern methods of construction of building elements. Different stages of construction. Types of formworks. Elements of pre-cast and Pre-fabricated construction.	<b>3 Hours</b>
<b>UNIT – II</b> <b>MECHANIZATION:</b> General data on mechanized construction equipment. Construction equipment and their characteristics. Advantages and disadvantages of Mechanization.	<b>3 Hours</b>
<b>UNIT – III</b> <b>EQUIPMENT- I:</b> Excavating and earth moving equipment, Piles and Pile driving equipment.	<b>3 Hours</b>
<b>UNIT – IV</b> <b>EQUIPMENT- II:</b> Lifting equipment, Drilling equipment and Boring equipment.	<b>3 Hours</b>
<b>UNIT – V</b> <b>EQUIPMENT MANAGEMENT:</b> Planning process and estimation of cost of equipment. Cost of owning and operating construction equipment. Equipment life and replacement analysis.	<b>3 Hours</b>

**Teaching & Learning Process:**  
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

<b>Course Outcomes:</b> The students will be able to	
CO1	Learn different methods and techniques of construction.
CO2	Understand the types and purpose of use of equipment.
CO3	Perform cost analysis and selection of equipment.

<b>Text Books:</b>	
1	Sharma, S.C., “Construction equipment and its management”, Khanna Publishers., 6th Edition
2	Peurifoy R L, “Construction Planning, Equipment and Methods”, Mc Graw Hill, 8th Edition.
3	Spence, W.P. and Kultermann, E., “Construction materials, methods and techniques”, Cengage Learning.
4	Illingworth, J.R., “Construction methods and planning”, CRC Press, 2nd Edition.
5	Construction methods and equipment management <a href="https://nptel.ac.in/courses/105103206">https://nptel.ac.in/courses/105103206</a>

**Question paper pattern:**  
• The question paper will have 50 questions carrying equal marks.

- Each question will be for 01 marks.
- Each question will have four options and one right answer.
- The students will have to answer all 50 questions.

**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓										
CO2	✓											
CO3	✓				✓	✓					✓	✓

Course Title	<b>CIVIL ENGINEERING ENTREPRENEURSHIP AND DEVELOPMENT</b>						
Course Code	<b>22CVT406B</b>						
Category	<b>Ability enhancement Course (AEC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>15</b>	<b>01</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 01 hours</b>		

**Course Learning Objective:** To create awareness on entrepreneurship among the students, To Fostering and developing entrepreneurship among the student community, To Enhancing innovative thinking in order to develop new products, To get the innovative product, Provide advisory services to the budding Entrepreneurs, Encourage to set Campus Company / start- up company within the campus.

<b>UNIT – I</b>	<b>3 Hours</b>
<b>INTRODUCTION TO ENTREPRENEURSHIP:</b>	
Definition of Entrepreneur, Entrepreneurial Traits, and Entrepreneur vs. Manager, Entrepreneur vs. Entrepreneur. The Entrepreneurial decision process. Role of Entrepreneurship in Economic Development, Ethics and Social responsibility of Entrepreneurs. Creating and Starting the Venture Sources of new Ideas, Methods of generating ideas, creating problem solving, product planning and development process. Opportunities for Entrepreneurs in India and abroad. Writing Business Plan, Evaluating, and implementing business plans. Marketing plan, financial plan and the organizational plan, Launching formalities, Woman as Entrepreneur	
<b>UNIT – II</b>	<b>3 Hours</b>
<b>SELF-EMPLOYMENT FOR CIVIL ENGINEERS:</b>	
Start-up of Building material supplier, Land surveys, Project management, Bricks Manufacturing. Building material supply. Cement plant business, Start-up of Construction Company. Construction site cleaning business. ...Countertop & bathtub refinishing. ... Interior designing service, Plumbing services, Property development business, Rainwater harvesting services, Ready mix concrete manufacturing, Sand crushing unit, Garbage Chute provision undertaking to apartments. Industrial effluent collection services. Low cost services-Drilling bore hole, Roofing materials supply, haulage services, Lawn Care Service, Paving Consulting.	
<b>UNIT – III</b>	<b>3 Hours</b>
<b>FINANCING AND MANAGING THE NEW VENTURE:</b>	
Sources of capital, Record keeping, recruitment, motivating and leading teams, and financial controls. Marketing and sales controls. Business expenses, Invoicing, Accounting software, E-commerce and Entrepreneurship, Internet usage and advertising related to Civil Engineering Products.	
<b>UNIT – IV</b>	<b>3 Hours</b>
<b>NEW VENTURE EXPANSION STRATEGIES AND ISSUES:</b>	
Features and evaluation of joint ventures, acquisitions, merges, franchising. Public issues, rights issues, bonus issues and stock splits.	
<b>UNIT – V</b>	<b>3 Hours</b>
<b>INSTITUTIONAL SUPPORT TO ENTREPRENEURSHIP:</b>	
Role of Directorate of Industries, District Industries, Centers (DICs), Industrial Development Corporation (IDC), State Financial corporation (SFCs), Commercial banks Small Scale Industries Development Corporations (SSIDCs), Khadi and village Industries Commission (KVIC), National Small Industries Corporation (NSIC), Small Industries Development Bank of India (SIDBI).	

**Teaching & Learning Process:**  
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.

**Course Outcomes:** The students will be able to



CO1	Understand the procedure to evaluate your entrepreneurial traits as a career option for the given product to be manufactured or services to be rendered.
CO2	Explain the salient features of the resources required for starting the specified enterprise.
CO3	Arrive at a business opportunity on the basis of given data/circumstances with justification.
CO4	Describe the market study procedure of the specified enterprise.

**Text Books:**

1	Khanka. S. S., “ Entrepreneurial Development” S. Chand & Co. It., Ram Nagar, New Delhi, 2013
2	Construction Management & Enterprenuership by Dr. Rajendra Prasad ISBN-13, 978-8194781226, Publisher, Swapna Book House
3	Donald F Kuratko, “Enterpreneurship – Theory, Process and Practice”, 9 <sup>th</sup> Edition, Cenage Learning 2014
4	MCED Books links <a href="http://www.mced.nic.in/UdyojakSpecial.aspx?!inktype-Udyojak">http://www.mced.nic.in/UdyojakSpecial.aspx?!inktype-Udyojak</a>
5	MCED Product and Plan Details <a href="http://www.mced.nic.in/allproduct.aspx">http://www.mced.nic.in/allproduct.aspx</a>
6	The National Institute for Entrepreneurship and Small Business Development Publications <a href="http://niesbud.nic.in/Publication.html">http://niesbud.nic.in/Publication.html</a>
7	Entrepreneur.com <a href="https://www.entrepreneur.com/lists">https://www.entrepreneur.com/lists</a>
8	GOVT. SPONSORED SCHEMES <a href="https://www.nabard.org/content1.aspx?id=23andcatid=23andmid=530">https://www.nabard.org/content1.aspx?id=23andcatid=23andmid=530</a>
9	Market Review <a href="http://www.businesstoday.in/markets">http://www.businesstoday.in/markets</a>
10	Business Plans: A Step-by-Step Guide <a href="https://www.entrepreneur.com/article/247574">https://www.entrepreneur.com/article/247574</a>

**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓		✓		✓			✓			✓
CO2	✓	✓	✓	✓		✓			✓			✓
CO3	✓	✓				✓			✓			✓
CO4	✓	✓				✓			✓			✓

Course Title	<b>CODAL PROVISIONS IN CIVIL ENGINEERING</b>						
Course Code	<b>22CVT406C</b>						
Category	<b>Ability Enhancement Course (AEC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>15</b>	<b>01</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 01 hours</b>		

**Course Learning Objective:** To understanding various clauses of IS 456 2000, IS 10262, IS 875 for concrete mix design, computation of loads, RC & Steel structural elements and basic understandings of earthquake Engineering Terms. Understand pavement and its components, pavement construction activities and its requirements Study drinking water quality standards. Comprehend basic Engineering and mechanical properties of different types of soil.

<b>UNIT – I IS codes for Structural Engineering Part -1</b>												
IS 10262: Concrete Mix Design												
IS 875 Part 1, Part 2, Computations of loads												
IS 456 : Slabs, Beams, Columns and footings <b>3 Hours</b>												
<b>UNIT – II IS codes for Structural Engineering-Part-2</b>												
IS 800 Bolted and Welded Connections												
IS 1893 Terminologies in Earthquake Engineering <b>3 Hours</b>												
<b>UNIT – III Transportation Engineering</b>												
IRC 37 : Recommended method of design, Pavement thickness and composition and Drainage measures												
IRC 58 : Design of Pavement slab thickness and Design of Joints <b>3Hours</b>												
<b>UNIT – IV Environmental Engineering</b>												
IS 10500 : Water, Sewage and Air quality Standards <b>3Hours</b>												
<b>UNIT – V Geotechnical Engineering</b>												
IS 1498 - Classification and identification of soils for general engineering purposes <b>3Hours</b>												
<b>Teaching &amp; Learning Process:</b>												
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.												
<b>Text Books:</b>												
1	IS 456 2000 Plain and reinforced concrete code of Practice											
2	IS 1893 (part-1) Criteria for Earthquake Resistant Design of Structures											
3	IS 10262 Guidelines for concrete Mix designs											
4	IS 10500 Drinking water Specification											
5	IS 875 Part 1, 2 and 3 Code of Practice for design loads for buildings and Structures											
6	IS 800 General construction in steel- Code of Practice											
7	IRC 58 Guidelines for the design of plain jointed rigid pavements for Highways											
8	IRC 37 Guidelines for the design of flexible pavements											
<b>CO-PO Mapping</b>												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓							✓				✓
CO2	✓							✓				✓
CO3	✓					✓		✓				✓
CO4	✓			✓				✓				✓

Course Title	<b>METRO AND SEA PORT ENGINEERING</b>						
Course Code	<b>22CVT406D</b>						
Category	<b>Ability Enhancement Course - IV (AEC)</b>						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>15</b>	<b>01</b>
<b>CIE Marks: 50</b>	<b>SEE Marks: 50</b>	<b>Total Max. Marks: 100</b>			<b>Duration of SEE: 01 hours</b>		

**Course Learning Objective:** To understand the fundamental of metro system, basic planning and development. Learning the construction methods and signalling systems for various operations in metro system. Study the characteristics, site selection and surveys to be carried out in planning the seaport.

<b>UNIT – I</b> <b>INTRODUCTION TO METRO SYSTEMS:</b> Overview of Metro Systems; Need for Metro; Routing studies; Basic Planning and Financials	<b>3 Hours</b>
<b>UNIT – II</b> <b>PLANNING AND DEVELOPMENT:</b> Overview and construction methods for: Elevated and underground Stations; Viaduct span and bridges; Underground tunnels; Depots, Initial Surveys & investigations	<b>3 Hours</b>
<b>UNIT – III</b> <b>SIGNALING SYSTEMS:</b> Introduction to Signaling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA and other Control systems; Platform Screen Doors.	<b>3 Hours</b>
<b>UNIT – IV</b> <b>INTRODUCTION TO SEA PORT:</b> Introduction, Characteristics of good seaport and principles of seaport, size of seaport, site selection criteria and layout of seaport.	<b>4 Hours</b>
<b>UNIT – V</b> <b>SEA PORT PLANNING:</b> Surveys to be carried out for seaport planning, regional and intercontinental transportation development	<b>2 Hours</b>

<b>Teaching &amp; Learning Process:</b> Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.
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<b>Course Outcomes:</b> The students will be able to	
CO1	Understand the overview, planning and financial studies of metro system.
CO2	Discuss the planning and development for different construction methods.
CO3	Compare the signalling systems for various operation of metro systems.
CO4	Analyse principles and planning development in sea port engineering.

<b>Reference Books</b>	
1	R. Srinivasan and S. C. Rangwala, Harbour, Dock and Tunnel Engineering, 1995, Charotar Pub.House, Anand
2	S. P. Bindra, A Course in Docks and Harbour Engineering, 1992, DhanpatRai& Sons, NewDelhi
3	Alonzo Def. Quinn, Design and Construction of Ports and Marine Structure, McGraw - Hill Book Company, New York
4	Paul Garbutt, World Metro Systems, Capital Transport Pub; 2nd Edition, 1997.
5	General & Technical information of Hyderabad Metro, Handbook
6.	General & Technical information of Delhi Metro, Handbook
7.	General & Technical information of Bangalore Metro, Handbook

**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓				✓							
CO2	✓										✓	
CO3		✓	✓	✓	✓							
CO4				✓							✓	✓