

III SEMESTER													
S I · N o	Course	Course Code	Course Title	Teaching Department	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self-study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PCC	CVT301	Building Materials & Construction	Civil	3	0	0	-	3	50	50	100	3
2	IPCC	CVU302	Engineering Survey	Civil	3	0	2	-	3	50	50	100	4
3	IPCC	CVU303	Strength of Materials	Civil	3	0	2	-	3	50	50	100	4
4	PCC	CVT304	Fluid Mechanics & Machinery	Civil	3	0	0	-	3	50	50	100	3
5	PCCL	CVL305	Computer Aided Building Planning and Drawing	Civil	0	0	2	-	3	50	50	100	1
6	ETC	CVT306X	ESC / ETC / PLC	Civil	3	0	0	-	3	50	50	100	3
7	UHV	HST307	Social Connect and Responsibility	Civil	0	0	2	-	1	100	-	100	1
8	AEC/ SEC	CVT308X or CVL308X	Ability Enhancement Course / Skill Enhancement Course – III	Civil	If the course is a Theory				1	50	50	100	1
					1	0	0	-					
					If a course is a laboratory				2				
0	0	2	-										
9	HS	CDN309	Aptitude and Verbal Ability Skill - I	Placement Cell	2	0	0	-	-	50	-	50	PP/ NP
10	MC	NSN310	National Service Scheme (NSS)	NSS	0	0	2	-	-	100	-	100	PP/ NP
		PEN310	Physical Education (PE) (Sports and Athletics)	Physical Educatio									

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				n									
		YON310	Yoga	Yoga Teacher									
Total:										600	350	950	20
<p>PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, MC: Mandatory Course (Non-credit), AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, L: Lecture, T: Tutorial, P: Practical, S= Self-Study, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation. K: This letter in the course code indicates common to all the streams of Engineering. ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course</p>													
Emerging Technology Course (ETC) CVT306X													
CVT306A	Green Buildings		CVT306C	Pavement Materials and Construction									
CVT306B	Environmental Protection & Management		CVT306D	Basics of Structural Analysis									
Ability Enhancement Course (AEC) – III CVT308X OR CVL308X													
CVT308A	Engineering Geology		CVT308C	Subsurface Exploration									
CVT308B	Economics for Civil Engineers		CVT308D	Fire safety in Buildings									
<p>Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.</p> <p>National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE) (Sports and Athletics), and Yoga (YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the Degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of Degree.</p>													

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

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.

UNIT – I ROCKS: Classification of rocks, distinction between Igneous, Sedimentary and Metamorphic rocks. Engineering properties of rocks. STONES: Quarrying of stones, Tests on stones, properties and uses, Deterioration and preservation of stone work, TIMBER: Timber, classification, seasoning of timber. Defects in timber, preservation of timber, uses & their properties. Plywood, Block Board, Particle Board, Laminates.	8 Hours
UNIT – II BRICKS: Ingredients of good brick earth, manufacturing of Bricks, classification and qualities of bricks, Test on Bricks. CEMENT: Introduction, Ingredients, Manufacturing, Types. MORTAR: Definition, types, Proportions and Requirements of a good Mortar.	8 Hours
UNIT – III FOUNDATION: 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. MASONRY: 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.	8 Hours
UNIT – IV ARCHES: Elements of an arch, Classification of arches, Stability of arch. LINTELS: Definition and classification of Lintels, Definition and functions of Chejja, Canopy & Balcony. DOORS AND WINDOWS: Doors and windows, Definition of technical terms, Types of Doors, Types of windows, commercially available windows and doors (PVC, CPVC and Aluminium).	8 Hours
UNIT – V STAIRS: 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). PLASTERING, PAINTING AND DAMP PROOFING: 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.	8 Hours

Teaching & Learning Process:

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

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Course Outcomes: The students will be able to	
CO1	Identity 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.

Text Books:	
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

Reference Books:	
1	Jagadish. K.S, "Alternative Building Materials Technology", New Age International, 2007.
2	Varghese, P. G. "A Text Book of Building Materials."
3	Building Materials and Components, CBRI, 1990, India

Process of Assessment (both CIE and SEE):	
50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.	
Continuous Internal Evaluation (CIE):	
<ul style="list-style-type: none">✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.✓ Two assignments each of 05 Marks (taken average at the end).✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.✓ (For each CIE, the portion of the syllabus should not be common / repeated).✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.	
Semester End Examination (SEE):	
<ul style="list-style-type: none">✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.✓ The question paper will have ten questions.	

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- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

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	✓											

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

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

UNIT-I	08
Hours	
INTRODUCTION TO SURVEYING:	
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.	
UNIT-II	08
Hours	
COMPASS SURVEYING:	
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.	
PLANE TABLE SURVEYING:	
Plane table and accessories, Advantages and limitations of plane table survey, Orientation and methods of orientation.	
UNIT-III	08
Hours	
LEVELLING:	
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.	
THEODOLITE:	
Theodolite, Fundamental axes and parts of theodolite, uses of theodolite, Temporary adjustments of theodolite, measurement of horizontal and vertical angles.	
MODERN SURVEYING EQUIPMENT:	
Electronic distance measurement (EDM), Principles of EDM, Salient features of Total Station, Advantages of Total Station over conventional instruments, Application of Total Station.	
UNIT-IV	08

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Hours	AREAS AND VOLUMES: 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.
	CONTOURING: Contours and their characteristics, Methods of contouring, direct and indirect methods, Interpolation techniques, Uses of contours.
UNIT-V	9
Hours	
	CURVE SURVEYING: 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	LABORATORY EXPERIMENTS:	No. of Sessions
1	To set regular geometric figure (Pentagon) using chain, tape and prismatic compass.	10
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	

Course Outcomes: 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.

Teaching-Learning Process

Chalk and talk, videos, PowerPoint Presentation, animations, YouTube videos.

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Text Books:	
1	Surveying Vol. 1, 2 & 3. 17 th edition, B. C. Punmia, Ashok Kumar Jain, Arun Kuma Jain, lakshmi publication.
2	Surveying and leveling, 3 rd edition, T P Kanetkar, Pune Vidyarthi Griha Prakashan, Pune Vidyarthi Griha Prakashan publisher.
3	Fundamentals of Surveying, 3rd edition, - Milton O. Schimidt – Wong, Thomson, Cengage Learning Publishing.

Reference Books:	
1	Surveying and Leveling, 2 nd edition – R Subramanian. Oxford University Press (2007) Publisher.
2	Surveying Vol. I, 5th edition, S.K. Duggal, Tata McGraw Hill - Publishing Co. Ltd., New Delhi.

Process of Ascertaining (both CIE and SEE):	
<u>Continuous Internal Evaluation (CIE):</u>	
The maximum marks prescribed for CIE is 50. CIE includes theory test components (30 Marks) and laboratory components (20 Marks).	
(i) <u>Assessment of CIE theory component: (30 Marks)</u>	
<ul style="list-style-type: none">✓ There shall be two tests (each 25 Marks).✓ Each test includes descriptive questions (20 Marks) and quiz (05 Marks)✓ The sum of two tests performances maximum of 50 Marks scale down to 30 Marks shall be considered for theory component.✓ The minimum marks to be secured in CIE to appear for SEE shall be 12 (40 % of maximum marks) in the theory component.✓ A makeup test shall be conducted with valid reasons acceptable to institute, duly recommended by the Faculty / Mentor and HoD.	
(ii) <u>Assessment of CIE theory component: (20 Marks)</u>	
<ul style="list-style-type: none">✓ On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.✓ 15 Marks are for conducting the experiment and preparation of the laboratory record, other 05 marks shall be test conducted at the end of the semester.✓ Each experiment report can be evaluated for 10 Marks.✓ Marks of all experiments are added and scaled down to 15 Marks.✓ The laboratory test (including viva) after completion of all the experiments shall be conducted for 25 Marks and scaled down to 05 Marks.✓ Scaled down marks of 15 Marks and 05 Marks added will be CIE marks for the laboratory component.✓ The minimum marks to be secured in CIE to appear for SEE shall be 08 Marks in the practical component.	
(iii) <u>Calculation of Final CIE marks for IPCC course:</u>	
<ul style="list-style-type: none">✓ Final CIE marks shall include 30 marks from two CIE tests component and 20 marks from laboratory component.✓ The following formula is used to award final CIE score: $\text{CIE score} = (\text{Test 1} + \text{Test 2}) \times 0.6 + \text{Laboratory Component}$	
<u>Passing standard in CIE:</u>	

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- ✓ The minimum marks to be secured in CIE to appear for SEE shall be **12 marks** (40 % of maximum marks – 30) in the theory component, **08 marks** (40 % of maximum marks – 20) in the laboratory component.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted for 100 Marks (3 Hour duration) by institute as per scheduled time table, with common Question paper for the course.
- ✓ The question paper will have TEN questions. Each question is set for 20 Marks.
- ✓ There will be TWO questions from each unit (with a maximum of THREE sub questions).
- ✓ The students have to answer FIVE full questions, selecting ONE question from each unit.
- ✓ In SEE, the question from the laboratory component shall be included.
- ✓ The maximum of 04 / 05 questions to be set from the practical component of IPCC, the total marks of all questions should not more than 20 Marks.

Passing Standards in SEE:

- ✓ SEE will be conducted for 100 Marks and students shall secure 35 Marks (35 % of maximum marks) to qualify for the SEE.
- ✓ Marks secured will be scale down to 50 Marks.

Weightage of CIE and SEE:

- ✓ The weightage of Continuous Internal Evaluation (CIE) is 50 % and for Semester End Examination (SEE) is 50 %.

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

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.

UNIT – I	08 Hours
SIMPLE STRESS AND STRAIN: 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	
UNIT – II	08 Hours
SIMPLE STRESS AND STRAIN (CONTINUED): 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).	
UNIT – III	08 Hours
BENDING MOMENT AND SHEAR FORCE IN BEAMS: 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.	
UNIT – IV	08 Hours
BENDING STRESS AND SHEAR STRESS IN BEAMS: 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.	
UNIT – V	08 Hours
TORSION OF CIRCULAR SHAFTS: 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. ELASTIC STABILITY OF COLUMNS: 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.	

Expt. No	LABORATORY EXPERIMENTS:	No. of hours
1	Shear Test on Mild steel.	10
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.,6 th Edition 2018
2	Strength of Materials, S Ramamrutham, Dhanpath Rai, Publishing Co.20 th Edition, 2020.
3	Strength of Materials, Bhavikatti S S, Vikas Publishing house (P) Ltd., 4 th Edition 2013.

Reference Books:

1	Elements of Strength of Materials, Timoshenko and Young Affiliated East-West Press.3 rd Edition 2021.
2	Strength of Materials, R Subramanyam, Oxford University Press, 3rd Edition 2016.
3	Strength of Materials, B C Punmia, Ashok Jain, Arun Jain, Lakshmi Publications (P) Ltd.,10 th Edition,2018.

Process of Ascertaining (both CIE and SEE):

Continuous Internal Evaluation (CIE):

The maximum marks prescribed for CIE is 50. CIE includes theory test components (30 Marks) and laboratory components (20 Marks).

(iv) Assessment of CIE theory component: (30 Marks)

- ✓ There shall be two tests (each 25 Marks).
- ✓ Each test includes descriptive questions (20 Marks) and quiz (05 Marks)
- ✓ The sum of two tests performances maximum of 50 Marks scale down to 30 Marks shall be considered for theory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 12 (40 % of maximum marks) in the theory component.
- ✓ A makeup test shall be conducted with valid reasons acceptable to institute, duly recommended by the Faculty / Mentor and HoD.

(v) Assessment of CIE theory component: (20 Marks)

- ✓ On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- ✓ 15 Marks are for conducting the experiment and preparation of the laboratory record, other 05 marks shall be test conducted at the end of the semester.

- ✓ Each experiment report can be evaluated for 10 Marks.
- ✓ Marks of all experiments are added and scaled down to 15 Marks.
- ✓ The laboratory test (including viva) after completion of all the experiments shall be conducted for 25 Marks and scaled down to 05 Marks.
- ✓ Scaled down marks of 15 Marks and 05 Marks added will be CIE marks for the laboratory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 08 Marks in the practical component.

(vi) Calculation of Final CIE marks for IPCC course:

- ✓ Final CIE marks shall include 30 marks from two CIE tests component and 20 marks from laboratory component.
- ✓ The following formula is used to award final CIE score:

$$\text{CIE score} = (\text{Test 1} + \text{Test 2}) \times 0.6 + \text{Laboratory Component}$$

Passing standard in CIE:

- ✓ The minimum marks to be secured in CIE to appear for SEE shall be **12 marks** (40 % of maximum marks – 30) in the theory component, **08 marks** (40 % of maximum marks – 20) in the laboratory component.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted for 100 Marks (3 Hour duration) by institute as per scheduled time table, with common Question paper for the course.
- ✓ The question paper will have TEN questions. Each question is set for 20 Marks.
- ✓ There will be TWO questions from each unit (with a maximum of THREE sub questions).
- ✓ The students have to answer FIVE full questions, selecting ONE question from each unit.
- ✓ In SEE, the question from the laboratory component shall be included.
- ✓ The maximum of 04 / 05 questions to be set from the practical component of IPCC, the total marks of all questions should not more than 20 Marks.

Passing Standards in SEE:

- ✓ SEE will be conducted for 100 Marks and students shall secure 35 Marks (35 % of maximum marks) to qualify for the SEE.
- ✓ Marks secured will be scale down to 50 Marks.

Weightage of CIE and SEE:

- ✓ The weightage of Continuous Internal Evaluation (CIE) is 50 % and for Semester End Examination (SEE) is 50 %.

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

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.

UNIT – I	08 Hours
BASIC PROPERTIES OF FLUIDS: Mass density, Specific weight, Specific gravity, Viscosity, Surface tension, Capillarity, Numericals, Classification of fluids.	
PRESSURE AND ITS MEASUREMENT: Pascal's law, Hydrostatic law, Types of pressure, Measurement of pressure using piezometer, U tube manometers (Simple, inverted & differential), Numericals.	
UNIT – II	08 Hours
DYNAMICS OF FLUID FLOW: 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.	
FLOW THROUGH SIMPLE PIPES: 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.	
UNIT – III	08 Hours
MEASUREMENT OF DISCHARGE:	
ORIFICE: Flow through small orifice, Hydraulic coefficients (Coefficients of contraction, velocity, discharge and resistance), Numericals.	
NOTCHES: Flow over Notches (Rectangular, Triangular, Trapezoidal and Stepped), Error measurement in the head, Numericals.	
WEIRS: Flow over Weirs (Rectangular, Cippoletti, Narrow-crested, Broad-crested, Sharp-crested, Ogee and Submerged), End contraction, Velocity approach, Ventilations, Numericals.	
UNIT – IV	08 Hours
UNIFORM FLOW THROUGH OPEN CHANNELS: Classification of open channels, Chezy's equation, Manning's equation, Discharge through Rectangular, Triangle, Trapezoidal, Circular and composite sections, Most economical open channels, Numericals.	
UNIT – V	08 Hours
IMPACT OF JETS: Force of jet imping on a fixed vanes, moving vanes, unsymmetrical curved vane ($\beta < 90^\circ$, $\beta = 90^\circ$ and $\beta > 90^\circ$), Series of flat and curved vanes fitted on periphery of wheel, Numericals.	
CENTRIFUGAL PUMPS: 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.

Reference Books:	
1	Fundamentals of Fluid Mechanics – Bruce R. Munson, Donald F. Young, Theodore H. Okiishi, Wiley India, New Delhi, 2009 Edition.
2	'Introduction To Fluid Mechanics' – Edward j. Shaughnessy, Ira m. Katz, James P Schaffer, Oxford University Press, New Delhi, 2005 Edition.
3	Fluid Mechanics' – Streeter, Wylie, Bedford New Delhi, 2008(Ed)
4	Fluid Mechanics and Turbomachines'- Madan Mohan Das, PHI Learning Pvt. Limited, New Delhi. 2009 Edition.

Process of Assessment (both CIE and SEE):	
50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.	
Continuous Internal Evaluation (CIE):	
<ul style="list-style-type: none"> ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester. ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester. ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason. ✓ Two assignments each of 05 Marks (taken average at the end). ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester. ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo. ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks. ✓ (For each CIE, the portion of the syllabus should not be common / repeated). ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. 	
Semester End Examination (SEE):	

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

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

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.

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

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.

Text Books:

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.

Reference Books:

1	Malik RS and a Meo GS, “Civil Engineering Drawing”, Asian Publishers/Computech Publication Pvt Ltd
2	Time Saver Standard by Dodge F.W, F.W Dodge Corp.
3	IS: 962-1989 (Code of practice for architectural and building drawing)
4	National Building Code, BIS, New Delhi.

CO-PO Mapping

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

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

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.

UNIT – I GREEN BUILDINGS AND ENVIRONMENT: 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.	8 Hours
UNIT – II TECHNOLOGIES IN GREEN BUILDING: 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.	8 Hours
UNIT – III COMPONENTS OF BUILDING: 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.	8 Hours
UNIT – IV APPLICATION OF RENEWABLE ENERGY IN GREEN BUILDING: 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.	8 Hours
UNIT – V GREEN BUILDING & RATING SYSTEMS: 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.	8 Hours

Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.
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Course Outcomes: 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	HarharaIyer G, Green Building Fundamentals, Notion Press, 2022

Reference Books:

1	Dr. Adv. HarshulSavla, Green Building: Principles & Practices, Notion Press, 2021
2	Hand Book of Green Building Design and Construction, 2017, Second Edition, Sam Kubba.
3	Sustainable Construction, 2016, Charles J.Kibert.
4	Zero Energy Buildings, 2018, Shady Attia.Hibbler R. C.,

Process of Assessment (both CIE and SEE):

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Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
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- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
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- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

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

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.

UNIT – I	8 Hours
ENVIRONMENTAL MANAGEMENT STANDARDS: 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.	
UNIT – II	8 Hours
ENVIRONMENTAL MANAGEMENT OBJECTIVES: 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.	
UNIT – III	8 Hours
ENVIRONMENTAL MANAGEMENT SYSTEM: 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.	
UNIT – IV	8 Hours
ENVIRONMENTAL AUDIT: 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.	
UNIT – V	8 Hours
APPLICATIONS: 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.	

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 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.

Text Books:

1	Christopher Sheldon and Mark Yoxon, "Installing Environmental management Systems – a step by step guide" Earthscan Publications Ltd, London, 1999.
2	Paul L Bishop „Pollution Prevention: Fundamentals and Practice, McGraw- Hill International, Boston, 2000.
3	Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations, Second Edition, NSF International, Ann Arbor, Michigan, January 2001.

Reference Books:

1	ISO 14001/14004: Environmental management systems – Requirements and Guidelines – International Organisation for Standardisation, 2004
2	ISO 19011: 2002, "Guidelines for quality and/or Environmental Management System auditing, Bureau of Indian Standards, New Delhi, 2002

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

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- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
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- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.

- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

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

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).

UNIT – I PAVEMENT MATERIALS AGGREGATES: 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.	8 Hours
UNIT – II BITUMINOUS EMULSION AND CUTBACKS: Preparation, Characteristics, uses and test. Adhesion of bitumen binders to road aggregates, Adhesion failure, Mechanism of stripping, tests and methods of improving adhesion.	8 Hours
UNIT – III BITUMINOUS MIXES: 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.	8 Hours
UNIT – IV EQUIPMENT IN HIGHWAY CONSTRUCTION: 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.	8 Hours
UNIT – V FLEXIBLE PAVEMENTS: 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.	8 Hours

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

Reference Books:	
1	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.
2	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)
3	Relevant IRC codes and MORT& H specifications, 5th revision.

Process of Assessment (both CIE and SEE):	
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Continuous Internal Evaluation (CIE):	
<ul style="list-style-type: none"> ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester. ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester. ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason. ✓ Two assignments each of 05 Marks (taken average at the end). ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester. ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo. ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks. ✓ (For each CIE, the portion of the syllabus should not be common / repeated). ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. 	
Semester End Examination (SEE):	
<ul style="list-style-type: none"> ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours. ✓ The question paper will have ten questions. ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module. 	

- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

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

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.

UNIT – I	8 Hours
INTRODUCTION TO STRUCTURAL ENGINEERING: 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.	
UNIT – II	8 Hours
COMPOUND STRESSES: Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses. Theory Numerical examples.	
UNIT – III	8 Hours
THIN & THICK CYLINDERS: Introduction, Thin cylinders subjected to internal pressure; Hoop stresses, Longitudinal stress and change in volume. Thick cylinders subjected to both internal and external pressure; Lamé's equation, radial and hoop stress distribution. Numerical examples.	
UNIT – IV	8 Hours
DETERMINATE STRUCTURES-SIMPLE TRUSS: Analysis of Simple trusses- Method of Joints & Method of section. Numerical examples.	
UNIT – V	8 Hours
DETERMINATE STRUCTURES- BEAMS & FRAMES: 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.	

Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.
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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	Bhavikatti S S, Engineering Mechanics, 2019, New Age International
5	Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, 2011, BS publication.

Reference Books:	
1	Irving H. Shames, Engineering Mechanics, 2019, Prentice-Hall.
2	Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press.
3	Timoshenko S, Young D. H., Rao J. V., Engineering Mechanics, 5th Edition, 2017, Pearson Press.

Process of Assessment (both CIE and SEE):
<p>50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.</p> <p>Continuous Internal Evaluation (CIE):</p> <ul style="list-style-type: none"> ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester. ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester. ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason. ✓ Two assignments each of 05 Marks (taken average at the end). ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester. ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo. ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks. ✓ (For each CIE, the portion of the syllabus should not be common / repeated). ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. <p>Semester End Examination (SEE):</p> <ul style="list-style-type: none"> ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours. ✓ The question paper will have ten questions. ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module. ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module. ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

Question paper pattern:
<ul style="list-style-type: none"> • 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	ENGINEERING GEOLOGY						
Course Code	CVT308A						
Category	Ability Enhancement Course (AEC)						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	1	0	0	0	1	15	01
CIE Marks: 50	SEE Marks: 50	Total Max. Marks: 100			Duration of SEE: 01 hours		

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.

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

Teaching & Learning Process:

Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: 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.

Text Books:

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.

Refernce Books:

1	Chenna kesavulu N., Text Book of Engineering Geology, Macmilan India Ltd 2009.
2	Banagar K.M., Principles of Engineering Geology, Standard Publishers Distributers, New Delhi 2001.

Process of Assessment (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4th week of the semester
2. Second assignment at the end of 9th week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for 50 marks and shall be scaled for the same.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 02 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

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

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.

UNIT – I	3 Hours
BASIC CONCEPTS OF ENGINEERING ECONOMICS:	
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.	
UNIT – II	3 Hours
METHODS OF ECONOMIC EVALUATION:	
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.	
UNIT – III	3 Hours
COST ENGINEERING:	
Capital Cost, Operational costs, Estimation and Estimation Techniques, Approximate estimates, Unit estimate, Time Value of Money Concept	
UNIT – IV	3 Hours
FINANCING OF PROJECTS:	
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.	
UNIT – V	3 Hours
DEPRECIATION AND REPLACEMENT ANALYSIS:	
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

Reference Books:	
1	Degumo, E.P., Sullivan, W.Grand Canada, I.B. Tagineering Economy, Macuillan New York, Latest Edn
2	Zahid A kian Engineering Economy, "Engineering Feimony", Dorling Kindersley, Latest Edn.
3	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.

Process of Assessment (both CIE and SEE):	
<p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together</p> <p>Continuous internal Examination (CIE) Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour) 1. First test at the end of 5th week of the semester 2. Second test at the end of the 10th week of the semester Two assignments each of 10 Marks 1. First assignment at the end of 4th week of the semester 2. Second assignment at the end of 9th week of the semester Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours) The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for 50 marks and shall be scaled for the same.</p> <p>Semester End Examinations (SEE) SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 02 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.</p>	

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	✓										✓	✓
CO4	✓											✓

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

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

UNIT – I PLANNING AN EXPLORATION PROGRAM: Introduction, Objectives, Site reconnaissance, Number, Disposition of Trial Pits, Borings and Depth of Exploration.	3 Hours
UNIT – II METHODS OF SOIL EXPLORATION: 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.	3 Hours
UNIT – III SAMPLERS AND SAMPLES: 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	3 Hours
UNIT – IV FIELD TESTS: Plate load test, Standard penetration test, Static cone penetration, Dynamic cone penetration test and Estimation of depth of ground water table (Hvorslev’s method).	3 Hours
UNIT – V SITE INVESTIGATION REPORT: Introduction, Bore log, Field and laboratory test results, Analysis of data and Recommendations.	3 Hours
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 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.

Reference Books:

1	Principles of Soil Mechanics and Foundation Engineering- Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.
2	Bowles J E , Foundation analysis and design, Tata McGraw- Hill Publications

Process of Assessment (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4th week of the semester
2. Second assignment at the end of 9th week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for 50 marks and shall be scaled for the same.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 02 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

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

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.

UNIT – I	3 Hours
FIRE: 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.	
UNIT – II	3 Hours
FIRE SAFETY: 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	
UNIT – III	3 Hours
FIRE PREVENTION AND PROTECTION: Fire Triangle, Fire Development and its Severity, Effect of Enclosures, Early detection of Fire, Classification of Fire and Fire Extinguishers, Electrical Safety.	
UNIT – IV	3 Hours
ELECTRICAL SYSTEMS: 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	
UNIT – V	3 Hours
HEALTH EVALUATION OF BUILDINGS: Condition survey and health evaluation of buildings, diagnosis of building by visual survey, case studies of visual survey.	

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. Sessa 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.

Reference Books:	
1	Fire protection, services and maintenance management of building, NPTEL video lecture, IIT, Delhi
2	Bureau of Indian Standards, "Hand Book of Functional Requirements Of Buildings, (SP-41 & SP-32)", BIS 1987 and 1989.
3	Building Services Design - T. W. Mever, Published by RIBA Publications, 1971.
4	Building Engineering & System Design - F. S. Merrit & J. Ambrose, U. S Department of Energy Office of Scientific and Technical Information, 1990.
5	National Building Code of India- Part: 4, Fire and Life safety, Bureau of Indian Standard.
6	Concept of building fire safety - D. Egan, Krieger Publishing Company, 2006.
7	Design of fire resisting structures - H. L. Malhotra. Surrey University Press, 1982.
8	https://www.ilo.org/wcmsp5/groups/public/ed_dialogue/lab_admin/documents/genericdocument/wcms_828851.pdf
9	https://dgfscdhg.gov.in/national-building-code-india-fire-and-life-safety

Process of Assessment (both CIE and SEE):
<p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together</p> <p>Continuous internal Examination (CIE) Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour) 1. First test at the end of 5th week of the semester 2. Second test at the end of the 10th week of the semester Two assignments each of 10 Marks 1. First assignment at the end of 4th week of the semester 2. Second assignment at the end of 9th week of the semester Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours) The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for 50 marks and shall be scaled for the same.</p> <p>Semester End Examinations (SEE) SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 02 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.</p>

Question paper pattern:
<ul style="list-style-type: none"> ✓ 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	✓										✓	

CO4	✓	✓			✓							
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Dr. Ambedkar Institute of Technology, Bengaluru - 560056
Scheme of Teaching and Examination for IV Semester B.E. CBCS, Academic Year: 2025-26
2024 Scheme: CIVIL ENGINEERING

IV SEMESTER													
S l . N o	Course and Course Code		Course Title	Teaching Department & Question Paper Setting Board	Teaching Hours /Week				Examination			Credits	
					Theory Lecture	Tutorial	Practical	Self - Study	Duration in hours	CIE Marks	SEE Marks		Total Marks
					L	T	P	S					
1	PCC	CVT401	Structural Analysis	Civil	3	0	0	-	3	50	50	100	3
2	IPCC	CVU402	Highway Engineering	Civil	3	0	2	-	3	50	50	100	4
3	IPCC	CVU403	Concrete Technology	Civil	3	0	2	-	3	50	50	100	4
4	PCC L	CVL404	Fluid Mechanics and Machinery Laboratory	Civil	0	0	2	-	3	50	50	100	1
5	ETC	CVT405X	ESC / ETC / PLC	Civil	3	0	0	-	3	50	50	100	3
6	AEC/ SEC	CVT406X or CVL406X	Ability Enhancement Course / Skill Enhancement Course - IV	Civil	If the course is Theory				1	50	50	100	1
					1	0	0	-					
					If the course is a lab				2				
					0	0	2	-					
7	BSC	BIT407	Biology for Engineers	TD / PSB: BT, CHE.	3	0	0	-	3	50	50	100	3
8	UHV	HST408	Universal Human Values	Any Department	1	0	0	-	1	50	50	100	1
9	HS	CDN409	Aptitude and Verbal Ability Skill - II	Placement Cell	2	0	0	-	-	50	-	50	PP/NP
10	MC	NSN410	National Service Scheme (NSS)	NSS coordinator	0	0	2	-	-	100	-	100	PP/NP
		PEN410	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		YON410	Yoga	Yoga Teacher									

Total	550	400	950	20
PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, MC: Mandatory Course (Non-credit), AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, L: Lecture, T: Tutorial, P: Practical, S = Self-Study, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation. TD: Teaching Department, PSB: Paper Setting Board.				
<p>Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.</p> <p>National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE) (Sports and Athletics), and Yoga (YOG) with the concerned coordinator of the course during the first Week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the Degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses is mandatory for the award of Degree.</p>				

Emerging Technology Course (ETC) CVT405X OR CVL405X			
CVT405A	Advanced Surveying	CVT405C	Applied Hydraulics
CVT405B	Road Safety & Engineering	CVT405D	Ground Improvement Techniques
Ability Enhancement Course (AEC) - IV 22CVT406X OR 22CVL406X			
CVT406A	Construction Methods and Equipment	CVT406C	Codal Provisions in Civil Engineering
CVT406B	Civil Engineering Entrepreneurship and Development	CVT406D	Metro and Seaport Engineering

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

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.

UNIT – I	8 Hours
STRUCTURAL SYSTEMS: 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].	
ANALYSIS OF TRUSSES: Method of joints and Method of sections.	
UNIT – II	8 Hours
DEFLECTION OF BEAMS - Moment area method, Conjugate beam method.	
DEFLECTION OF TRUSS: Unit load method.	
STRAIN ENERGY : Strain energy and complimentary strain energy, Strain energy due to axial load, bending and shear, Theorem of minimum potential energy, Law of conservation of energy, and Principle of virtual work.	
UNIT – III	8 Hours
ROLLING LOAD AND INFLUENCE LINES: 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.	
ARCHES AND CABLES 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).	
UNIT – IV	8 Hours
MOMENT DISTRIBUTION METHOD: 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.	
SLOPE DEFLECTION METHOD: Analysis of continuous beams only.	
KANI'S METHOD: Analysis of sway frames with kinematic indeterminacy less than/equal to three.	
UNIT – V	8 Hours
STIFFNESS MATRIX METHOD OF ANALYSIS: 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.	
FLEXIBILITY MATRIX METHOD OF ANALYSIS: Introduction, Development of flexibility matrix for prismatic beam and relationship between stiffness and flexibility matrix, analysis of continuous beams and frames.	

Course Outcomes: 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.

Teaching-Learning Process	Chalk and talk, videos, PowerPoint Presentation, Animations.
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Text Books :	
1	Basic Structural Analysis, C S Reddy, Tata McGraw Hill Education Pvt. Ltd., 3 rd Edition ISBN-13: 978-0070702769.
2	Theory of Structures, S Ramamrutham & R Narayan, Dhanpat Rai & Co., 9 th 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 th edition, ISBN-13: 978-0132570534.

Reference Books :	
1	Elementary Structural Analysis, Norris C H, Wilbur J B, International Student edition, McGraw Hill International Book, ISBN-13: 978-8131721414.
2	Structural Analysis, Devdas Menon, Narosa Publishing House, ISBN: 978-8173197505.
3	Theory of Structures, Volume 2, S P Gupta, G S Pandit & R Gupta, Tata McGraw Hill Publication Company Ltd.

Process of Assessment (both CIE and SEE):	
50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.	
Continuous Internal Evaluation (CIE):	
<ul style="list-style-type: none"> ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester. ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester. ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason. ✓ Two assignments each of 05 Marks (taken average at the end). ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester. ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo. ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks. ✓ (For each CIE, the portion of the syllabus should not be common / repeated). 	

- ✓ CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

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

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.

UNIT – I	8 Hours
PRINCIPLES OF TRANSPORTATION ENGINEERING:	
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.	
HIGHWAY DEVELOPMENT AND PLANNING:	
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.	
UNIT – II	8 Hours
HIGHWAY ALIGNMENT AND SURVEYS:	
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.	
HIGHWAY ECONOMICS:	
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.	
UNIT – III	8 Hours
HIGHWAY GEOMETRIC DESIGN:	
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.	
HORIZONTAL ALIGNMENT:	
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.	
UNIT – IV	8 Hours
PAVEMENT MATERIALS:	
Subgrade soil - desirable properties - HRB soil classification, determination of CBR and modulus of subgrade reaction with Examples on CBR and Modulus of subgrade reaction.	
Aggregates - Desirable properties and list of tests used in laboratory.	
Bituminous materials - 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.

Expt . No	LABORATORY EXPERIMENTS:	No. of sessions
1	Tests on Aggregates: Specific Gravity, Crushing Strength Test,	10
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.

Reference Books:

1	Principles of Highway Engineering and Traffic Analysis, Fred L. Mannering, Walter P. Kilareski, Scott S. Washburn, Wiley, 3rd edition, 2007.
2	Pavement Analysis and Design, Yang Huang, Pearson, 2008.
3	Transportation Engineering and Planning, Papacostas, Pearson, Third edition, 2015.

Process of Ascertaining (both CIE and SEE):**Continuous Internal Evaluation (CIE):**

The maximum marks prescribed for CIE is 50. CIE includes theory test components (30 Marks) and laboratory components (20 Marks).

(vii) Assessment of CIE theory component: (30 Marks)

- ✓ There shall be two tests (each 25 Marks).
- ✓ Each test includes descriptive questions (20 Marks) and quiz (05 Marks)
- ✓ The sum of two tests performances maximum of 50 Marks scale down to 30 Marks shall be considered for theory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 12 (40 % of maximum marks) in the theory component.
- ✓ A makeup test shall be conducted with valid reasons acceptable to institute, duly recommended by the Faculty / Mentor and HoD.

(viii) Assessment of CIE theory component: (20 Marks)

- ✓ On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- ✓ 15 Marks are for conducting the experiment and preparation of the laboratory record, other 05 marks shall be test conducted at the end of the semester.
- ✓ Each experiment report can be evaluated for 10 Marks.
- ✓ Marks of all experiments are added and scaled down to 15 Marks.
- ✓ The laboratory test (including viva) after completion of all the experiments shall be conducted for 25 Marks and scaled down to 05 Marks.
- ✓ Scaled down marks of 15 Marks and 05 Marks added will be CIE marks for the laboratory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 08 Marks in the practical component.

(ix) Calculation of Final CIE marks for IPCC course:

- ✓ Final CIE marks shall include 30 marks from two CIE tests component and 20 marks from laboratory component.
- ✓ The following formula is used to award final CIE score:

$$\text{CIE score} = (\text{Test 1} + \text{Test 2}) \times 0.6 + \text{Laboratory Component}$$

Passing standard in CIE:

- ✓ The minimum marks to be secured in CIE to appear for SEE shall be **12 marks** (40 % of maximum marks – 30) in the theory component, **08 marks** (40 % of maximum marks – 20) in the laboratory component.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted for 100 Marks (3 Hour duration) by institute as per scheduled time table, with common Question paper for the course.
- ✓ The question paper will have TEN questions. Each question is set for 20 Marks.
- ✓ There will be TWO questions from each unit (with a maximum of THREE sub questions).
- ✓ The students have to answer FIVE full questions, selecting ONE question from each unit.
- ✓ In SEE, the question from the laboratory component shall be included.
- ✓ The maximum of 04 / 05 questions to be set from the practical component of IPCC, the total marks of all questions should not more than 20 Marks.

Passing Standards in SEE:

- ✓ SEE will be conducted for 100 Marks and students shall secure 35 Marks (35 % of maximum marks) to qualify for the SEE.
- ✓ Marks secured will be scale down to 50 Marks.

Weightage of CIE and SEE:

- ✓ The weightage of Continuous Internal Evaluation (CIE) is 50 % and for Semester End Examination (SEE) is 50 %.

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

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.

UNIT – I	8 Hours
CEMENT AND AGGREGATES:	
Introduction to Cement: Chemical Composition, Physical and Chemical properties, Hydration of Cement, Factors influencing and affecting hydration of cement & Types of cement.	
Fine Aggregate: Grading, Analysis, Specific Gravity, Bulking, Moisture content.	
Coarse Aggregate: Importance of Size, Shape and Texture. Grading of aggregates - Sieve analysis, Specific gravity, Flakiness and Elongation index, Crushing, Impact and Abrasion tests.	
UNIT – II	10 Hours
PROPERTIES OF FRESH AND HARDENED CONCRETE:	
Manufacturing Process of Concrete: Batching, Mixing, Transporting, Placing, Compaction, Curing & Finishing.	
Fresh Concrete: 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.	
Hardened Concrete: Factors affecting strength, W/C ratio, Gel/Space ratio, Maturity concept, Destructive test on hardened concrete.	
Admixtures: Types of admixtures and their effect on concrete property in fresh and hardened state. Plasticizers and superplasticizers, Retarders, Accelerators & Air-Entraining Admixtures.	
UNIT – III	6 Hours
Elasticity: Relation between modulus of elasticity and strength, Factors affecting modulus of elasticity, Poisson's ratio.	
Shrinkage: Types of shrinkage, Factors affecting shrinkage.	
Creep of Concrete: Measurement of creep, Factors influencing creep, Effects of creep.	
UNIT – IV	8 Hours
DURABILITY & PERMEABILITY OF CONCRETE:	
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.	
Special Concrete: Properties and Application of Self-Compacting Concrete, Light Weight Concrete, High Density Concrete, Fibre-Reinforced Concrete, Geo-Polymer Concrete & Ready Mix Concrete.	
UNIT – V	8 Hours
CONCEPT OF CONCRETE MIX DESIGN:	
Mix Design Procedure: 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, 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

Reference Books:

1	"Advanced Concrete Technology", Zongjin Li, Wiley; 1 edition.
2	Gambhir Dhanpat Rai & Sons, "Concrete Manual" -, New Delhi.
3	N. Krishna Raju, "Concrete Mix Design" -, Sehgal - publishers
4	IS:10262-2016, "Recommended guidelines for concrete mix design", Bureau of Indian Standards, New Delhi.
5	IS 456-2000, "Plain And Reinforced Concrete", New Delhi.

Process of Ascertaining (both CIE and SEE):

Continuous Internal Evaluation (CIE):

The maximum marks prescribed for CIE is 50. CIE includes theory test components (30 Marks) and laboratory components (20 Marks).

(x) Assessment of CIE theory component: (30 Marks)

- ✓ There shall be two tests (each 25 Marks).
- ✓ Each test includes descriptive questions (20 Marks) and quiz (05 Marks)
- ✓ The sum of two tests performances maximum of 50 Marks scale down to 30 Marks shall be considered for theory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 12 (40 % of maximum marks) in the theory component.
- ✓ A makeup test shall be conducted with valid reasons acceptable to institute, duly recommended by the Faculty / Mentor and HoD.

(xi) Assessment of CIE theory component: (20 Marks)

- ✓ On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
- ✓ 15 Marks are for conducting the experiment and preparation of the laboratory record, other 05 marks shall be test conducted at the end of the semester.
- ✓ Each experiment report can be evaluated for 10 Marks.
- ✓ Marks of all experiments are added and scaled down to 15 Marks.
- ✓ The laboratory test (including viva) after completion of all the experiments shall be conducted for 25 Marks and scaled down to 05 Marks.
- ✓ Scaled down marks of 15 Marks and 05 Marks added will be CIE marks for the laboratory component.
- ✓ The minimum marks to be secured in CIE to appear for SEE shall be 08 Marks in the practical component.

(xii) Calculation of Final CIE marks for IPCC course:

- ✓ Final CIE marks shall include 30 marks from two CIE tests component and 20 marks from laboratory component.
- ✓ The following formula is used to award final CIE score:

$$\text{CIE score} = (\text{Test 1} + \text{Test 2}) \times 0.6 + \text{Laboratory Component}$$

Passing standard in CIE:

- ✓ The minimum marks to be secured in CIE to appear for SEE shall be **12 marks** (40 % of maximum marks – 30) in the theory component, **08 marks** (40 % of maximum marks – 20) in the laboratory component.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted for 100 Marks (3 Hour duration) by institute as per scheduled time table, with common Question paper for the course.
- ✓ The question paper will have TEN questions. Each question is set for 20 Marks.
- ✓ There will be TWO questions from each unit (with a maximum of THREE sub questions).
- ✓ The students have to answer FIVE full questions, selecting ONE question from each unit.
- ✓ In SEE, the question from the laboratory component shall be included.
- ✓ The maximum of 04 / 05 questions to be set from the practical component of IPCC, the total marks of all questions should not more than 20 Marks.

Passing Standards in SEE:

- ✓ SEE will be conducted for 100 Marks and students shall secure 35 Marks (35 % of maximum marks) to qualify for the SEE.
- ✓ Marks secured will be scale down to 50 Marks.

Weightage of CIE and SEE:

- ✓ The weightage of Continuous Internal Evaluation (CIE) is 50 % and for Semester End

Examination (SEE) is 50 %.

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

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.

Reference Books:

1	Fundamentals of Fluid Mechanics – Bruce R. Munson, Donald F. Young, Theodore H. Okiishi, Wiley India, New Delhi, 2009 Edition.
2	'Introduction To Fluid Mechanics' – Edward j. Shaughnessy, Ira m. Katz, James P Schaffer, Oxford University Press, New Delhi, 2005 Edition.
3	Fluid Mechanics' – Streeter, Wylie, Bedford New Delhi, 2008(Ed)
4	Fluid Mechanics and Turbomachines'- Madan Mohan Das, PHI Learning Pvt. Limited, New Delhi.

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

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.

UNIT-I Hours TRIGONOMETRIC LEVELLING: 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.	08
UNIT-II Hours TACHEOMETRY: 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.	08
UNIT-III Hours GLOBAL POSITIONING SYSTEM: Definition, Principles of GPS, DGPS and its applications. PHOTOGRAMMETRIC SURVEYING: Principle, Scale, Number of Photographs, Deduction of distance & height, Elements of Astronomical survey, Solution of problems dealing with celestial triangle.	08
UNIT-IV Hours REMOTE SENSING: History, advantages and disadvantages, types of remote sensing, application of remote sensing, GEOGRAPHIC INFORMATION SYSTEM: Definition of GIS, Key Components of GIS, Functions of GIS, Data mode of GIS, application of GIS.	08
UNIT-V Hours UAV SURVEYING: Definitions of UAV, RPA, Quad copters -Basic Components and Categories – Applications, Principles of Flight Planning, Mapping and Surveying, Comparison with other aerial vehicles	08

Course Outcomes: 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.

Teaching-Learning Process	Chalk and talk, PowerPoint Presentation, animations, YouTube videos.
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Text Books :	
1	Surveying Vol. 1, 2 & 3. 17 th edition, B. C. Punmia, Ashok Kumar Jain, Arun Kuma Jain, lakshmi publication.
2	Surveying and leveling, 3 rd edition, T P Kanetkar, Pune Vidyarthi Griha Prakashan, Pune Vidyarthi Griha Prakashan publisher.
3	Surveying and Leveling, 2 nd edition – R Subramanian. Oxford University Press (2007) Publisher.

Reference Books	
1	Higher Surveying, 3 rd edition, A.M. Chandra, New age international (Publisher) Ltd
2	Surveying Vol. I, 5 th edition, S.K. Duggal, Tata McGraw Hill - Publishing Co. Ltd., New Delhi.
3	https://nptel.ac.in/courses/105107122
4	https://archive.nptel.ac.in/courses/105/104/105104101/

<p>Process of Assessment (both CIE and SEE):</p> <p>50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.</p> <p>Continuous Internal Evaluation (CIE):</p> <ul style="list-style-type: none"> ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester. ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester. ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason. ✓ Two assignments each of 05 Marks (taken average at the end). ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester. ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo. ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks. ✓ (For each CIE, the portion of the syllabus should not be common / repeated). ✓ CIE methods /question paper is designed to attain the different levels of Bloom’s taxonomy as per the outcome defined for the course. <p>Semester End Examination (SEE):</p> <ul style="list-style-type: none"> ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours. ✓ The question paper will have ten questions. ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.

- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

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

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.

UNIT – I INTRODUCTION TO SAFETY: 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	8 Hours
UNIT – II STATISTICAL INTERPRETATION AND ANALYSIS OF CRASH DATA: Before-after methods in crash analysis, Advanced statistical methods, Black Spot Identification & Investigations, Case Studies.	8 Hours
UNIT – III ROAD SAFETY AUDITS: Key elements of a road safety audit, Road Safety Audits & Investigations, Crash investigation and analysis, Describe methods for identifying hazardous road locations, Case Studies.	8 Hours
UNIT – IV CRASH RECONSTRUCTION: 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.	8 Hours
UNIT – V MITIGATION MEASURES: 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.	8 Hours

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

Text Books:	
1	Ezra Hauer, Observational Before-After Studies in Road Safety, Pergamon Press, 2015.
2	Institute of Transportation Engineers (ITE), The Traffic Safety Toolbox: A Primer on Traffic Safety, ITE, 2013.
3	J. Stannard Baker, Traffic Collision Investigation, Northwestern University Center for Public Safety, 2014

Reference Books:	
1	Leonard Evans, Traffic Safety, Science Serving Society, 2004. Lynn B. Fricke, Traffic Accident Reconstruction, Northwestern University Center for Public Safety, 2014.
2	Popkess C.A, Traffic Control and Road Accident Prevention, Chapman and Hall, 1997, Rune Elvik and Truls Vaa, The Handbook of Road Safety Measures, Elsevier, 2004.
3	Simon Washington, Matthew Karlaftis, and Fred Mannering, Statistical and Econometric Methods for Transportation Data Analysis, Chapman & Hall/CRC Press, 2003.
4	Towards Safe Roads in Developing country, TRL – ODA, 2004

Process of Assessment (both CIE and SEE):	
<p>50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.</p>	
<p>Continuous Internal Evaluation (CIE):</p> <ul style="list-style-type: none"> ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester. ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester. ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason. ✓ Two assignments each of 05 Marks (taken average at the end). ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester. ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo. ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks. ✓ (For each CIE, the portion of the syllabus should not be common / repeated). ✓ CIE methods /question paper is designed to attain the different levels of Bloom’s taxonomy as per the outcome defined for the course. 	
<p>Semester End Examination (SEE):</p> <ul style="list-style-type: none"> ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours. ✓ The question paper will have ten questions. ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module. ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module. ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module. 	

Question paper pattern:	
<ul style="list-style-type: none"> • 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	APPLIED HYDRAULICS						
Course Code	CVT405C						
Category	Emerging Technology Course (ETC)						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	0	0	0	3	40	03
CIE Marks: 50	SEE Marks: 50	Total Max. Marks: 100			Duration of SEE: 03 hours		

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.

Unit: I	08 hours
FLUID STATICS: 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.	
Unit: II	08 hours
FLOW THROUGH COMPOUND PIPES: Pipes in series, Pipes in parallel, Branched pipes and Siphon pipes. Numericals.	
Unit: III	08 hours
NON-UNIFORM FLOW OVER OPEN CHANNELS: 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.	
Unit: IV	08 hours
HYDRAULIC TURBINES: DESIGN & PROPORTIONS Classification of Turbines, Components, working proportions of impulse turbines (Pelton) and reaction turbines (Francis and Kaplan), Draft tubes, Numericals.	
Unit: V	08 hours
HYDRAULIC TURBINES: PERFORMANCES Draft tubes, Unit quantities, Specific speed, Numericals. CENTRIFUGAL PUMPS: Components, Working Principles, Minimum starting speed, Priming, Multi-stage Centrifugal Pumps (Pumps in series and parallel), Numericals.	

Teaching & Learning Process: Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.
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Course Outcomes: 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 th Edition.
2	Hydraulics and Hydraulic Machines- Dr. P. N. Modi and Seth, Standard Book House 2022 22 nd 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.

Reference Books:	
1	A Text Book of Fluid mechanics & Hydraulic Machines- R.K. Rajput, S. Chand & Co, New Delhi, and 2016 Edition.
2	Principles of Fluid Mechanics and Fluid Machines’- N.Narayana Pillai, Universities Press (India), Hyderabad, 2009 Edition.
3	Fluid Mechanics – Streeter, Wylie, Bedford, McGraw Hill Education; 2017 9th edition.
4	Fluid Mechanics and Turbomachines- Madan Mohan Das, PHI Learning Pvt. Limited, New Delhi. 2009 Edition.

Process of Assessment (both CIE and SEE):	
<p>50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.</p>	
Continuous Internal Evaluation (CIE):	
<ul style="list-style-type: none"> ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester. ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester. ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason. ✓ Two assignments each of 05 Marks (taken average at the end). ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester. ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo. ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks. ✓ (For each CIE, the portion of the syllabus should not be common / repeated). ✓ CIE methods /question paper is designed to attain the different levels of Bloom’s taxonomy as per the outcome defined for the course. 	
Semester End Examination (SEE):	
<ul style="list-style-type: none"> ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours. ✓ The question paper will have ten questions. ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module. ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module. ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module. 	

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

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>UNIT-I 08</p> <p>Hours</p> <p>FORMATION OF SOILS: Introduction, Formation of soil and Soil distribution in India.</p> <p>GROUND IMPROVEMENT: Historical development, Objectives of soil improvement, Classification of ground improvement techniques and Factors affecting the selection of best ground improvement technique.</p> <p>COMPACTION: Introduction, Compaction mechanics, Field procedure, surface compaction, Dynamic Compaction, selection of field compaction procedures, compaction quality control.</p>
<p>UNIT-II 08</p> <p>Hours</p> <p>HYDRAULIC MODIFICATION: 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>PRE-COMPRESSION AND VERTICAL DRAINS: Importance, Vertical drains, Sand drains, Drainage of slopes, Electro kinetic dewatering, Preloading.</p>
<p>UNIT-III 08</p> <p>Hours</p> <p>CHEMICAL MODIFICATIONS: 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>UNIT-IV 08</p> <p>Hours</p> <p>VIBRATION METHODS: Introduction, Vibro compaction – blasting, vibratory probe, Vibro displacement compaction – displacement piles, vibroflotation, sand compaction piles, stone columns, heavy tamping.</p> <p>GROUTING AND INJECTION: Introduction, Effect of grouting. Chemicals and materials used. Types of grouting. Grouting procedure, Applications of grouting.</p>
<p>UNIT-V 08</p> <p>Hours</p> <p>GEOSYNTHETICS: Introduction, Geosynthetic types, properties of Geosynthetics – materials and fibre properties, Geometrical aspects, mechanical properties, Hydraulic properties, Durability; Applications of Geosynthetics - Separation,</p>

Filtration and Fluid Transmission, Reinforcement.

MISCELLANEOUS METHODS (ONLY CONCEPTS & USES):

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.

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	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.

Text Books:

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.,

Reference Books:

1	Bell, F.G., “Methods of treatment of unstable ground”, Butterworths, London.
2	Nelson J.D. and Miller D.J, “Expansive soils”, John Wiley and Sons.
3	Ingles. C.G. and Metcalf J.B , “Soil Stabilization; Principles and Practice”, Butterworths

Process of Assessment (both CIE and SEE):

50% weightage given for each Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). A student shall be considered to have fulfilled the academic requirements and earned the credits allotted to each subject /course by securing not less than 35% (36 Marks out of 100) in the Semester End Examination (SEE), and a minimum of 40% (20 marks out of 50) in the sum total of the Continuous Internal Evaluation (CIE) taken together.

Continuous Internal Evaluation (CIE):

- ✓ Two Tests each of 20 Marks (duration 01 hour) has been conducted in each semester.
- ✓ First test at the end of 5th week of the semester and Second test at the end of the 10th week of the semester.
- ✓ The makeup test at the end of the 15th week of the semester given for the students for whom are not attended the test One and Two due to genuine (medical, participating in academic or extracurricular activities, sports etc.) reason.
- ✓ Two assignments each of 05 Marks (taken average at the end).
- ✓ First assignment at the end of 4th week and Second assignment at the end of 9th week of the semester.
- ✓ Group discussion /Activities / Seminar / Quiz will be planned suitably to attain the Cos and POs and PSo.
- ✓ At the end of the 13th week of the semester the sum of two tests, two assignments and Group discussion / Activities / Seminar / Quiz will be scaled out of 50 marks.
- ✓ (For each CIE, the portion of the syllabus should not be common / repeated).
- ✓ CIE methods /question paper is designed to attain the different levels of Bloom’s taxonomy as

per the outcome defined for the course.

Semester End Examination (SEE):

- ✓ Theory SEE will be conducted by institute as per the scheduled timetable, with common question papers for the subject of duration 03 hours.
- ✓ The question paper will have ten questions.
- ✓ Each question is set for 20 marks and there will be 2 questions from each unit / module.
- ✓ Each of the two questions under a unit / module should have a maximum of 3 sub-questions, should have a mix of topics under the Unit/module.
- ✓ The students have to answer 5 full questions. Selecting one full question from each unit / module.

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

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.

UNIT – I	3 Hours
CONSTRUCTION METHODS: 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.	
UNIT – II	3 Hours
MECHANIZATION: General data on mechanized construction equipment. Construction equipment and their characteristics. Advantages and disadvantages of Mechanization.	
UNIT – III	3 Hours
EQUIPMENT- I: Excavating and earth moving equipment, Piles and Pile driving equipment.	
UNIT – IV	3 Hours
EQUIPMENT- II: Lifting equipment, Drilling equipment and Boring equipment.	
UNIT – V	3 Hours
EQUIPMENT MANAGEMENT: Planning process and estimation of cost of equipment. Cost of owning and operating construction equipment. Equipment life and replacement analysis.	

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	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.

Text Books:	
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.

Reference Books:	
1	Spence, W.P. and Kultermann, E., “Construction materials, methods and techniques”, Cengage Learning.
2	Illingworth, J.R., “Construction methods and planning”, CRC Press, 2nd Edition.
3	Construction methods and equipment management https://nptel.ac.in/courses/105103206

Process of Assessment (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4th week of the semester
2. Second assignment at the end of 9th week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for 50 marks and shall be scaled for the same.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 02 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

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

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.

UNIT – I	3 Hours
INTRODUCTION TO ENTREPRENEURSHIP:	
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	
UNIT – II	3 Hours
SELF-EMPLOYMENT FOR CIVIL ENGINEERS:	
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 cervices-Drilling bore hole, Roofing materials supply, haulage services, Lawn Care Service, Paving Consulting.	
UNIT – III	3 Hours
FINANCING AND MANAGING THE NEW VENTURE:	
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.	
UNIT – IV	3 Hours
NEW VENTURE EXPANSION STRATEGIES AND ISSUES:	
Features and evaluation of joint ventures, acquisitions, merges, franchising. Public issues, rights issues, bonus issues and stock splits.	
UNIT – V	3 Hours
INSTITUTIONAL SUPPORT TO ENTREPRENEURSHIP:	
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 th Edition, Cenage Learning 2014

Reference Books:

1	MCED Books links http://www.mced.nic.in/UdyojakSpecial.aspx?inktype-Udyojak
2	MCED Product and Plan Details http://www.mced.nic.in/allproduct.aspx
3	The National Institute for Entrepreneurship and Small Business Development Publications http://niesbud.nic.in/Publication.html
4	Entrepreneur.com https://www.entrepreneur.com/lists
5	GOVT. SPONSORED SCHEMES https://www.nabard.org/content1.aspx?id=23andcatid=23andmid=530
6	Market Review http://www.businesstoday.in/markets
7	Business Plans: A Step-by-Step Guide https://www.entrepreneur.com/article/247574

Process of Assessment (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

Two Tests (preferably in MCQ’S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4th week of the semester
2. Second assignment at the end of 9th week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for 50 marks and shall be scaled for the same.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 02 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

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

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.

UNIT – I IS codes for Structural Engineering Part -1	
IS 10262: Concrete Mix Design	
IS 875 Part 1, Part 2, Computations of loads	
IS 456 : Slabs, Beams, Columns and footings	3 Hours
UNIT – II IS codes for Structural Engineering-Part-2	
IS 800 Bolted and Welded Connections	
IS 1893 Terminologies in Earthquake Engineering	3 Hours
UNIT – III Transportation Engineering	
IRC 37 : Recommended method of design, Pavement thickness and composition and Drainage measures	
IRC 58 : Design of Pavement slab thickness and Design of Joints	
3Hours	
UNIT – IV Environmental Engineering	
IS 10500 : Water, Sewage and Air quality Standards	3Hours
UNIT – V Geotechnical Engineering	
IS 1498 - Classification and identification of soils for general engineering purposes	3Hours
Teaching & Learning Process:	
Chalk and talk, Power point presentations, Animations and Videos and experimental learning in Laboratory.	
Reference (IS Code) books:	
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

Process of Assessment (both CIE and SEE):
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

Two Tests (preferably in MCQ'S pattern with 20 questions) each of 20 Marks (duration 02 hour)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester

Two assignments each of 10 Marks

1. First assignment at the end of 4th week of the semester
2. Second assignment at the end of 9th week of the semester

Group discussion / Activities /Seminar/ Quiz 05 Marks (duration 01 hours), and it is suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for 50 marks and shall be scaled for the same.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 02 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

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

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.

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

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

Text Books	
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

Reference Books

1	Paul Garbutt, World Metro Systems, Capital Transport Pub; 2nd Edition, 1997.
2	General & Technical information of Hyderabad Metro, Handbook
3	General & Technical information of Delhi Metro, Handbook
4	General & Technical information of Bangalore Metro, Handbook

Process of Assessment (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

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1. First test at the end of 5th week of the semester
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The sum of total marks of two tests, two assignments, and Group discussion / Activities /Seminar/ Quiz will be for 50 marks and shall be scaled for the same.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of 01 mark. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 02 hour. The student has to secure minimum of 35% of the maximum marks meant for SEE.

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CO2	✓										✓	
CO3		✓	✓	✓	✓							
CO4				✓							✓	✓