

PROBABILITY AND STATISTICS			
Course Code	25MATV31	Scheme	2025
Type of Course	Applied Science Course (ASC)	Semester	III
Teaching Hours/Week (L: T: P)	56(3:2:0)	CIE Marks	50
Total Hours of Pedagogy per semester CI(L/T):LI(P):SL&TW:	120 (42:28:0:50)	SEE Marks	50
Credits	4	Total Marks	100
Examination type (SEE)	Theory	Exam Hours	03
Course outcome (Course Skill Set): At the end of the course, the student will be able to: CO1: Understand and explain basic statistical concepts, descriptive measures, and data visualization. CO2: Apply probability rules, random variables, and common probability distributions to engineering problems. CO3: Use sampling distributions, estimation, and hypothesis testing to draw statistical inferences. CO4: Interpret statistical results, discuss assumptions and limitations, and relate them to engineering practice. CO5: Analyze relationships between variables using correlation and regression models.			
Module-1			
DESCRIPTIVE STATISTICS: Role of statistics in engineering; types of data, scales of measurement, collection and presentation of data. Frequency distribution, histograms, bar diagrams, pie charts, and box plots. Measures of central tendency: mean, median, and mode for grouped and ungrouped data. Measures of dispersion: range, variance, standard deviation, and coefficient of variation. Concept of skewness and kurtosis. (RBT Levels: LI, L2 and L3)			
			Number of Hours: 14
Module-2			
PROBABILITY AND RANDOM VARIABLES: Review on sample space, events, axioms of probability, conditional probability, independence of events, total probability theorem, and Bayes theorem. Random variables, discrete and continuous types, probability mass function, probability density function, cumulative distribution function. Expectation and variance. Joint distributions for two discrete variables. (RBT Levels: LI, L2 and L3)			
			Number of Hours: 14
Module-3			
PROBABILITY DISTRIBUTIONS: Discrete distributions: Binomial, Geometric, and Poisson - definitions, mean, and variance. Continuous distributions: Uniform, exponential, and normal - definitions, mean, and variance and related problems. (RBT Levels: LI, L2 and L3)			
			Number of Hours: 14
Module-4			
SAMPLING AND ESTIMATION: Sampling concepts: population, sample, parameter, statistic, random sampling, bias, and standard error. Sampling distributions and central limit theorem. Point estimation and interval estimation. Confidence intervals for mean and proportion.			

Hypothesis testing: null and alternative hypotheses, type I and type II errors, one-tailed and two-tailed tests. Basic tests for mean and proportion for large sample; student's t-distribution, chi-square test for goodness of fit.

(RBT Levels: LI, L2 and L3)

Number of Hours: 14

Module-5

CORRELATION, REGRESSION

Statistics: Principles of least squares, Curve fitting by the method of least squares in the form: $y = a + bx$, $y = a + bx + cx^2$, $y = ax^b$ and $y = ae^{bx}$. Correlation, Coefficient of correlation, Lines of regression, Angle between regression lines, rank correlation. Introduction to multiple regression.

(RBT Levels: LI, L2 and L3)

Number of Hours: 14

Suggested Learning Resources

Textbooks:

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, S. Chand Publishing.
2. V.K. Rohatgi and A.K. Md. Ehsanes Saleh, An Introduction to Probability and Statistics, Wiley.
3. S. Ross, A First Course in Probability, Pearson India.
4. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

Reference Books:

1. M.R. Spiegel, J. Schiller, and R.A. Srinivasan, Schaum's Outline of Probability and Statistics, McGraw Hill.
2. A.M. Mood, F.A. Graybill, and D.C. Boes, Introduction to the Theory of Statistics, McGraw Hill.
3. S. C. Gupta, Statistical Methods, S. Chand Publishing.
4. R. Ramakrishnan, Statistics for Engineers and Scientists, Tata McGraw Hill.

Web links and e-Resources:

NPTEL (National Programme on Technology Enhanced Learning) - Probability and Statistics courses for Engineers: <https://nptel.ac.in/>.

SWAYAM learning modules on statistics and data analysis.

Coursera(Empower employability with online learning for universities) Understanding statistics requires building foundational skills in descriptive statistics: <https://www.coursera.org/>

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students to learn groups to improve their creative and analytical skills.
6. Show short-related video lectures in the following ways:
 - As an introduction to new topics (pre-lecture activity).

- As a revision of topics (post-lecture activity).
- As additional examples (post-lecture activity).
- As an additional material of challenging topics (pre-and post-lecture activity).
- As a model solution of some exercises (post-lecture activity).

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

The CIE Theory component consists of average of TWO IA tests for 25 marks and Continuous Comprehensive Assessments (CCA) for 25 marks.

To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least **40% of 50 marks, i.e., 20 marks**.

To pass the **SEE**, a student must score at least **35% of 50 marks, i.e., 18 marks**.

Notwithstanding the above, a student is considered to have **passed the course**, provided the combined total of **CIE and SEE is at least 40 out of 100 marks**.

Continuous Comprehensive Assessments (CCA)+ Internal Assessment Test (IA) = Continuous Internal Evaluation CIE [25+25=50 marks]

A minimum of **two Internal Assessment Tests (IA)** shall be conducted, carrying a total of **25 marks**.

In addition, **Continuous Comprehensive Assessment (CCA)** shall be conducted for a total of **25 marks**.

It is recommended to include **a maximum of three learning activities** as part of the CCA to foster the **holistic development of students**. These activities shall be:

Learning Activity – 1 : Tutorial: Practicing problems (Two objective type assessments for 5 marks each, total 10 marks) or Conduction of CIA(Continuous Internal Assessment) for 10 marks.

Learning Activity – 2 : Assignments: Assigning two assignments each for 5 marks, total 10 marks.

Learning Activity – 3 : Choose either Seminar or Project based learning activity with report for 5 marks.

STRENGTH OF MATERIALS			
Course Code	25CV32	CIE Marks	50
Teaching Hours/Week (L: T: P)	2:2:0	SEE Marks	50
Credits	03	Total Marks	100
Contact Hours	42	Exam Hours	3 Hrs.
Examination type (SEE)	Theory		
Prerequisites: The students should have knowledge on: - Engineering Mechanics (Statics, Friction and properties of areas and volumes) - Basic Mathematics (Calculus, Algebra and Trigonometry)			
Course objectives: - Understand the simple stresses, strains, and compound stresses in various structural components. - Understand the bending moments and shear forces in different types of beams under various loading conditions - Know the bending stress, shear stress, and torsional stress in beams and shafts with different cross sections - Understand the deflection in beams and the stability of columns under different loading conditions. Understand the behaviour and strength of structural elements subjected to compound stresses and stresses in thin and thick cylinders.			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. - Chalk and Talk with Black Board - ICT based Teaching Demonstration based Teaching			
Module-1			
Simple Stresses and Strains: Introduction, Properties of Materials, Stress, Strain, Hooke's law, Poisson's Ratio, Stress – Strain Diagram for structural steel, Principles of superposition, Total elongation of tapering bars of circular and rectangular cross sections. Composite section, Volumetric strain, expression for volumetric strain, Elastic constants, relationship among elastic constants. Thermal stresses and strains, Compound bars subjected to thermal stresses, state of simple shear. (L1, L2, L3)			
Text Book: Chapter 1: 1.1 to 1.10, Chapter 2: 2.1 to 2.24, Chapter 3: 3.1 to 3.15			

Module-2
Bending moment and shear force diagrams in beams: Introduction to types of beams, supports and loadings. Definition of shear force and bending moment, sign convention, Relationship between loading, shear force and bending moment, Shear force and bending moment equations, development of Shear Force Diagram(SFD) and Bending Moment Diagram (BMD) with salient values for cantilever, simply supported and overhanging beams for point loads, UDL (Uniformly Distributed Load), UVL (Uniformly Varying Load), Couple and their combinations (L1, L2, L3) Text Book: Chapter 9: 9.1 to 9.11
Module-3
Bending and Shear Stresses in Beams: Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity. Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, ‘I’, and ‘T’ sections. Torsion in Circular Shaft: Introduction, pure torsion, Assumptions, derivation of torsion equation for circular shafts, torsional rigidity and polar modulus Power transmitted by a shaft. (L1, L2, L3) Text Book: Chapter 10: 10.1 to 10.14
Module-4
Deflection of Beams: Definition of slope, Deflection and curvature, Sign conventions, Derivation of moment- curvature equation. Double integration method and Macaulay’s method: Slope and deflection for standard loading cases and for determinate prismatic beams subjected to point loads, UDL, UVL and couple. Columns and Struts: Introduction, short and long columns. Euler’s theory; Assumptions, Derivation for Euler’s Buckling load for different end conditions, Limitations of Euler’s theory. Rankine-Gordon’s formula for columns. (L1, L2, L3) Text Book: Chapter 12: 12.1 to 12.12
Module-5
Compound Stresses: Introduction, state of stress at a point, General two-dimensional stress system, Principal stresses and principal planes. Mohr’s circle of stresses Thin and Thick Cylinders: Introduction, Thin cylinders subjected to internal pressure; Hoop stresses, Longitudinal stress and change in volume. Thick cylinders subjected to both internal and external pressure; Lamé’s equation, radial and hoop stress distribution. (L1,L2,L3) Text Book: Chapter 23: 23.1 to 23.11, Chapter 24: 24.1 to 24.13

Course outcome (Course Skill Set)

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

1. Evaluate the simple stresses, strains and compound stresses (PO – 1,3,6 PSO – 1,2)
2. Calculate the Bending moments, shear force and draw BMD, SFD for various types of beams and loadings ((PO – 1,2,7,10 PSO – 1,2)
3. Analyse the bending stress, shear stress and torsional stress in beams and shafts with different cross sections (PO – 2,6,8,9 PSO – 1,2)
4. Evaluate the deflection in beams and determine the stability of the columns. (PO – 2,4,5,7,11 PSO – 1,2)
5. Evaluate the behaviour and strength of structural elements under the action of compound stresses and stresses in thin and thick cylinders. (PO – 3,6,7,8,10 PSO – 1,2)

Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures 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 Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:**Text Books**

- B.C Punmia Ashok Jain, Arun Jain, “Strength of Materials”, Laxmi - 2018-22 Publications, 10th Edition-2018

Reference Books

- R K Bansal, “A Textbook of Strength of Materials”, 4th Edition, Laxmi Publications, 2010
- S.S. Rattan “Strength of Materials” McGraw Hill Education (India) Pvt. Ltd., 2nd Edition (Sixth reprint 2013).
- Vazirani, V N, Ratwani M M. and S K Duggal "Analysis of Structures Vol. I", 17th Edition, Khanna Publishers, New Delhi.
- R.K. Rajput, “Strength of materials” S. Chand Publishing (6th Edition)
- S S Bhavikatti, “Strength of Materials” Vikas Publishing (5th Edition)
- B.S. Basavarajaiah, P. Mahadevappa “Strength of Materials” in SI Units, University Press (India) Pvt. Ltd., 3rd Edition, 2010

Web links and Video Lectures (e-Resources):

1. Strength of Materials web course by IIT Roorkee <https://nptel.ac.in/courses/112107146/>
2. Strength of Materials video course by IIT Kharagpur <https://nptel.ac.in/courses/105105108/>
3. Strength of Materials video course by IIT Roorkee <https://nptel.ac.in/courses/112107147/18>
4. All contents organized <http://www.nptelvideos.in/2012/11/strengthof-materials-prof.html>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quiz (To assist in GATE Preparations)
- Demonstrations in Lab
- Virtual Lab Experiments

CO & PSO - PO Mapping (Individual Teacher has to fill)

Mapping of Course Outcomes and Program specific outcomes to Program Outcomes														
Course outcomes	Program outcomes											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11		PSO 1	PSO 2
CO1														
CO2														
CO3														
CO4														
CO5														
Total														
Average														

Level 0: Not Mapped, 1: Low Mapped, 2: Moderately Mapped 3: Highly Mapped

Note: Depending on the Assessment tool used, higher order POs Can be identified by the concerned course instructor.

WATER SUPPLY AND WASTEWATER ENGINEERING			
Course Code	25CV33	CIE Marks	50
Teaching Hours/Week (L: T: P)	3:0:0	SEE Marks	50
Credits	03	Total Marks	100
Contact Hours	42	Exam Hours	3
Examination type (SEE)	Theory		
Prerequisites: The students should have knowledge on 1. Basic Environmental Engineering Concepts 2. Applied Chemistry 3. Awareness of Public Health and Environmental Issues 4. Mathematical Skills			
Course objectives: This Course will enable the students to • Analyze the variation of water demand and to estimate water requirement for a community. • Study drinking water quality standards and to illustrate qualitative analysis of water. • Analysis of physical and chemical characteristics of water and wastewater. • Understand and design of different unit operations and unit process involved in water and wastewater treatment process • Design various oxidation processes.			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. 1. Chalk and Talk with Black Board 2. ICT based Teaching 3. Integration of Industry Examples			
Module-1			
Introduction: Water: Need for protected water supply, Demand of Water: Types of water demands - domestic demand, industrial, institutional and commercial demand, public use and fire demand estimation, factors affecting per capita demand, Variations in demand of water, Peak factor. Design period and factors governing design period. Methods of population forecasting and numerical problems. Physico chemical characteristics of water Sampling. L1, L2, L3 Text Book 1: Chapter-5,6			
Module-2			
Water Treatment: Objectives, Unit flow diagrams – Significance of each unit, Aeration process Limitations and types. Sedimentation - Theory, settling tanks, types and design with numerical, Coagulation and flocculation, types of coagulants. Filtration: Mechanism, theory of filtration, types of filters: slow sand, rapid sand and pressure filters. Operation and cleaning. Design of slow and rapid sand filter without under drainage system, Numerical. Disinfection: Methods of disinfection with merits and demerits. Breakpoint chlorination, Softening: Lime soda and Zeolite process. L1, L2, L3 Text Book 1: Chapter-7.1-7.7,8,.9.1-9.16,10.1-10.11			

Module-3	
Wastewater: Introduction: Need for sanitation, methods of sewage disposal, types of sewerage systems, Treatment of municipal waste water: Waste water characteristics sampling, significance and techniques, physical, chemical and biological characteristics, Numerical on BOD. Disposal of effluents: Dilution, self-purification phenomenon, oxygen sag curve, zones of purification, sewage farming, sewage sickness, numerical problems on disposal of effluents.	L1, L2
Text Book 2: Chapter-2,8,9	
Module-4	
Treatment Process: Flow diagram for municipal waste water Treatment unit operations and process Screens: types, disposal. Grit chamber, oil and grease removal. Design of Primary and secondary settling tanks, Numerical. Suspended growth system - Conventional activated sludge process and its modifications, Numerical.	L1, L2, L3
Text Book 2: Chapter- 10,11,12,14	
Module-5	
Attached growth system – Trickling filter, Numerical on Trickling filters, bio-towers and rotating biological contactors. Principle of stabilization ponds, oxidation ditch. Sludge digesters (aerobic and anaerobic), Equalization. Thickeners and drying beds. Advanced waste water treatment- Membrane Filtration, Advanced Oxidation Processes (AOP), Membrane Bioreactor (MBR), Biological Nutrient Removal (BNR) Rural sanitation: Low-cost treatment process, Working principal and design of septic tanks for small community in rural and urban areas	L1, L2, L3
Text Book Chapter-13,16,17.1-17.4	
Course outcome (Course Skill Set) At the end of the course, the student will be able to: CO1: Estimate the average and peak water demand for a community. (PO – 1,2 PSO – 1,2) CO2: Evaluate water quality and environmental significance of various parameters and plan suitable treatment system. (PO – 1,2,3,7 PSO – 1,2) CO3: Design the different units of water treatment plant. (PO – 1,2,3, PSO – 1,2) CO4: Design the various units of wastewater treatment plant. (PO – 1,2,3, PSO – 1,2) CO5: Design of various AOPs and low-cost treatment units. (PO – 1,2,3, PSO – 1,2)	

- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Text books

1. B.C. Punmia and Ashok Jain, Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi 2010.
2. B C Punmia, Waste Water Engineering", Laxmi Publications 2nd, 2016

Reference Books

- Howard S. Peavy, Donald R. Rowe, George T, "Environmental Engineering" - Tata McGraw Hill, New York, Indian Edition, 2013
- S. K. Garg, Environmental Engineering Volume-I, Water supply Engineering – M/s Khanna Publishers, New Delhi 2010
- Karia G.L., and Christian R.A, "Wastewater Treatment Concepts and Design Approach", Prentice Hall of India Pvt. Ltd., New Delhi. 3rd, Edition, 2017
- S.K.Garg, "Environmental Engineering vol-II, Water supply Engineering", Khanna Publishers, – New Delhi, 28th edition and 2017
- CPHEEO Manual on water supply and treatment engineering, Ministry of Urban Development, Government of India, New Delhi.

Web links and Video Lectures (e-Resources):

- <http://nptel.ac.in>
- <https://elearning.vtu.ac.in/>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- <https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham>
- Quiz/Assignments/Open book test to develop skills
- Flip Classroom
- Industry visit

CO & PSO - PO Mapping (Individual Teacher has to fill)**Mapping of Course Outcomes and Program specific outcomes to Program Outcomes**

Course outcomes	Program outcomes											Program Specific Outcomes	
	PO 01	PO 02	P 03	P 04	P 05	P 06	P 07	P 08	P 09	PO 10	PO 11	PSO 1	PSO 2
CO1													
CO2													
CO3													
CO4													
CO5													
Total													
Average													

Level 0: Not Mapped,1: Low Mapped,2: Moderately Mapped3: Highly Mapped

Note: Depending on the Assessment tool used, higher order POs Can be identified by the concerned course instructor.

ENGINEERING SURVEY			
Course Code	25CV34	CIE Marks	50
Teaching Hours/Week (L: T: P)	3:0:2	SEE Marks	50
Credits	04	Total Marks	100
Contact Hours	42 hours Theory + 14 Lab slots	Exam Hours	3
Examination type (SEE)	Theory		
Prerequisites: The students should have knowledge on • Introduction to Civil Engineering • Basic Mathematics • Fundamentals of Physics • Drawing and Mapping Skills			
Course Objectives: • Ability to understand principles of both traditional and modern surveying applying knowledge of mathematics. • Ability to handle surveying equipment's and software tools to carry out field surveying, plot topographical Drawings and construction drawing • Ability to use Total station for data capture, data storage, data transfer. • Ability to prepare construction drawing and setting out			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. 1. Chalk and Talk with Black Board 2. ICT based Teaching 3. Demonstration based Teaching 4. Hands-On Practice and Field Exposure			
MODULE-1			
Engineering surveying – Importance of surveying in Civil Engineering, Concepts of plane and geodetic surveying Principles of surveying –Plans and maps, Types of Surveying. Measurement of Distance- Various types of tapes, Laser distance meter, Distance measuring wheel, Electronic Distance measurement. Compass surveying: Prismatic and surveyor's compasses, temporary adjustments. Meridians, Bearings, Dip, Declination, Local attraction, Calculation of bearings and included angles Plane Table Surveying: plane table and accessories, advantages and disadvantages of plane table survey, method of plotting - radiation, intersection, traversing, resection.			
L1, L2, L3 Text Book 1: Chapter 1: 1.1 to 1.10, Chapter 4: 4.1 to 4.5, Chapter 5: 5.1 to 5.8, Chapter 11: 11.1 to 11.4, Chapter 24: 24.1 to 24.4			

MODULE-2

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 (Numerical)

Theodolite Surveying – Terms used in Theodolite surveying. Setting up a Theodolite. Measurement of horizontal and vertical angles with Theodolite.

Trigonometric levelling: Single plane for finding elevation of objects.

L1, L2, L3

Text Book 1: Chapter 9: 1.1 to 9.8, Chapter 6: 6.1 to 6.6, Chapter 12: 12.1 to 12.2, Chapter 13: 13.1.1 to 13.4,

MODULE-3

Curves –Types of Curves- Application of curves in civil engineering. Setting out of Horizontal curve by Theodolite (Rankine's method) and using Total Station. Components of Compound, Reverse curve. Transition Curve and Combined curve. Various types of vertical curves and its applications.

Areas and Volumes- Methods of determining areas by trapezoidal and Simpsons' rule. Measurement of volume by prismoidal and trapezoidal formula. Earthwork volume calculations from spot levels and from contour maps; Earthwork calculation in Embankments.

L1, L2, L3, L4

Text Book 1: Chapter 12: 12.1 to 12.7, Chapter 13: 13.1.1 to 13.8

Text Book 2: Chapter 1: 1.1 to 1.6, Chapter 2: 2.1 to 2.5

MODULE-4

Total Station Surveying – Features, parts, accessories and advantages of Total Station. Surveying with total station – Measurement of Horizontal angle, vertical angle, distance, slope, vertical distance, multiple angles with Total station. Using Total station for Area measurement and Volume calculation.

Contours - Definition, terms used, characteristics of contours and applications of contours in civil engineering practice. Contouring using level, theodolite and total station. Plotting of contours in CAD.

Longitudinal and cross sectioning – Definition, importance of L/S & C/S. L/S & C/S using level, theodolite and Total station. Plotting of L/S & C/S in CAD.

Coordinate survey with Total station - Measurement of coordinates using total station. Creating Job files, importance of back sight data, coordinate data recording. Data transferring, data refinement and plotting in CAD.

Construction Surveying - Setting out works using Total Station, Setting out buildings by Centre line method.

L1, L2, L3

Text Book 1: Chapter 10: 10.1 to 10.7, Chapter 9: 9.14 to 9.15 Chapter 24: 24.1 to 24.8

MODULE-5	
GPS Surveying – Introduction. Overview of GPS system- space, control and user segments. Reference co- ordinate systems. Absolute and Differential positioning with GPS. Gagan system in India. Types of GPS Receivers. Engineering survey using Differential GPS. Surveying with Drone – Introduction, applications and advantages. Features of photogrammetric mapping method. Drone surveying requirements- Drone platform, Flight planning software, Sensor DGPS equipment and Image processing software. Types of drones and sensors. Process of drone surveying – flight planning, DGPS markers, capturing images, post processing of images using photogrammetry software and output maps. Application and uses of Remote sensing and GIS in engineering surveying. L1, L2, L3, L4 Text Book 3: Chapter 5: 5.1 to 5.11	
PRACTICAL COMPONENT OF IPCC	
Sl.NO	Experiments
1	Study of various instruments used for surveying, namely chain, tape, Compass, Plane table
2	To set regular geometric figures using prismatic compass, given the bearing of one line.
3	Differential levelling by Dumpy level by plane of collimation method
4	Profile levelling by Dumpy level
5	Measurement of horizontal and vertical angles by Theodolite. Method of Repetition
6	Measurement of horizontal and vertical angles by Theodolite. Reiteration method.
7	Setting out simple curve using Rankine's method using Theodolite
8	Setting out central line of a small residential building.
9	Setting up of Total station. Features and components of Total station, Coordinate measurement with Total station
10	Measurement of Distance, slope, vertical distance, horizontal and vertical angles using Total station
11	Longitudinal sectioning and cross sectioning using Total station
12	Contouring and plotting with Total station
13	Visit to railway station/ large construction site to understand the importance of datum and benchmark.

Course outcomes (Course Skill Set):

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

CO1: Summarize various types of surveying and carry out distance measurement using various equipment's (PO – 1,2,5 PSO – 1,2)

CO2: Illustrate the use and applications of levelling and theodolite (PO – 1,2,5,6 PSO – 1,2)

CO3: Plot contours, longitudinal and cross sections for construction projects. (PO – 1,2,3, 5,6 PSO – 1,2)

CO4: Set curves for construction works and carry out estimation of areas and volumes. (PO –1,2,5,6 PSO – 1,2)

CO5: Demonstrate the necessary skills to carry out GPS and DRONE Surveying (PO-1,2,5, PSO-1,2)

Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks**).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test (**duration 02/03 hours**) after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks**.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:**Textbook:**

1. Punmia BC, & Jain Ashok Kumar. (2016). *Surveying* (Vol. 1). Laxmi Publications.
2. Punmia BC, & Jain Ashok Kumar. (2016). *Surveying* (Vol. II). Laxmi Publications.
3. Punmia BC, & Jain Ashok Kumar. (2016). *Surveying* (Vol. III). Laxmi Publications.

Reference Books:

1. Dr. K.R. Arora. (2019). *Surveying* (17th ed., Vol. 1). Standard Book House.
2. Charles D Ghilani (2012) (13th ed.). Prentice Hall

Web links and Video Lectures (e-Resources):

1. <https://enterprise.dji.com/surveying/land-surveying>
2. <https://www.gps.gov/applications/survey/>
3. <https://www.constructionplacements.com/total-station-in-surveying-types-uses-and-applications/>
4. <https://www.youtube.com/watch?v=bbs5AEPstl4>
5. https://www.youtube.com/watch?v=KH14TEeexuM&list=PLLy_2iUCG87DwNVc3Mz1yYIRA42jSQ1tB&index=28
6. https://www.youtube.com/watch?v=lu9vrE48_I4&list=PLLy_2iUCG87DwNVc3Mz1yYIRA42jSQ1tB&index=30
7. <https://www.youtube.com/watch?v=RXUi2cX4CkU>
8. <https://www.youtube.com/watch?v=SVa66vO08So>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. Hand on use of various surveying instruments
2. Surveying Civil engineering block and plotting with instruments of student's choice
3. Setting out a single bedroom house plan in field

CO & PSO - PO Mapping (Individual Teacher has to fill)

Mapping of Course Outcomes and Program specific outcomes to Program Outcomes														
Course outcomes	Program outcomes												Program Specific Outcomes	
	PO 1	PO 2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11		PSO 1	PSO 2
CO1														
CO2														
CO3														
CO4														
CO5														
Total														
Average														

Level 0: Not Mapped, 1: Low Mapped, 2: Moderately Mapped 3: Highly Mapped

Note: Depending on the Assessment tool used, higher order POs Can be identified by the concerned course instructor.

COMPUTER AIDED BUILDING PLANNING AND DRAWING			
Course Code	25CVL35	CIE Marks	50
Teaching Hours/Week (L: T: P)	0:0:2	SEE Marks	50
Credits	01	Total Marks	100
Contact Hours	14		
Examination type (SEE)	Practical		
Prerequisites: The students should have knowledge on • Basic Knowledge of Building Components • Fundamentals of Building Planning • Basic Computer Skills • Engineering Drawing • Introduction to CAD Software (e.g., AutoCAD)			
Course objectives: • Gain skill set to prepare Computer Aided Engineering Drawings using a software • Understanding the details of construction of different building elements • Visualize the completed form of the building and the intricacies of construction based on the engineering drawings • Get familiarization of practices used in Industry.			
Sl.NO	Experiments		
1	Drawing Basics: Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS:962.		
2	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,		
3	Using Text: Single line text, Multiline text, Spelling, Edit text		
4	Special Features: View tools, Layers concept, Dimension tools, Hatching, Customizing Toolbars, Working with multiple drawings.		
5	Drawings of Different Building Elements: Refer NBC before practice - a> Footing/ Foundation – Foundation dimension for Isolated, combined footing, Standard dimension and cross section of footing - b> Size stone Masonry – Size of single and double bond stone, Sections at wall foundation - c> Brick Masonry – Size of standard Burnt Brick, Solid Cement Block, Hollow Cement block, Other bricks used in current practice		

6	Principles of planning, Planning regulations and building bye-laws, factors affecting site selection, Functional planning of residential and public buildings, design aspects for different public buildings. Recommendations of NBC.
7	Draw a building plan for single and double bed room accommodation for a given site dimension. Students have to go through Building Bye Laws and regulations
8	Prepare the centre line drawing for marking the single and double bedroom house as in exercise 6
9	Prepare a complete sanction plan for the exercise 6 as per the bye law. Also study the requirements to plan Residential Building, School building, Hospital Building, Offices
10	Drawing of plan with electrical, plumbing and sanitary services using CAD software
11	Drawing standard sections for Lintel and chajja, RCC Slabs, Columns and beams.
12	Drawing different types of staircases – Dog legged, Open well – plan and section
Course outcomes (Course Skill Set): CO1: Prepare, read and interpret the drawings in a professional set up. (PO – 1,2,5 PSO – 1,2) CO2: Know the procedures of submission of drawings and Develop working and submission drawings for building. (PO – 1,2,5 PSO – 1,2) CO3: Plan of residential or public building as per the given requirements. (PO – 1,2,5 PSO – 1,2)	

Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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 Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted

between the schedule mentioned in the academic calendar of the University.

- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- MG Shah, CM Kale, SY Patki, “Building drawing with an integrated approach to Built Environment Drawing”, Tata McGraw Hill Publishing co. Ltd, New Delhi.
- Gurucharan Singh, “Building Construction”, Standard Publishers, & distributors, New Delhi.
- Malik RS and a Meo GS, “Civil Engineering Drawing”, Asian Publishers/Computech Publication Pvt Ltd

ENGINEERING GEOLOGY			
Course Code	25CV36A	CIE Marks	50
Teaching Hours/Week (L: T: P)	3:0:0	SEE Marks	50
Credits	03	Total Marks	100
Contact Hours	42	Exam Hours	3
Examination type (SEE)	Theory		
Prerequisites: The students should have knowledge on: ● Basic divisions of Earth’s Interior ● Different Minerals and Rocks available on Earth ● Basics of Weathering and Origin of Rocks ● Mechanical attributes of rock strata and soil layers			
Course objectives: ● To inculcate the importance of earth's interior and application of Geology in civil engineering in Geo Hazard mitigation and management ● To create awareness among Civil engineers regarding the resources of earth ● To provide knowledge on dynamic Geology and its importance in modifying the physical character of rocks which cause rocks suitable or unsuitable in different civil engineering projects such as Dams, bridges, tunnels and highways. ● To educate the ground water management regarding diversified geological formations, . To highlight the concept of rain water harvesting. ● To understand the application of Remote Sensing and GIS, Natural disaster and management and environmental awareness. To understand the subsurface using geospatial data ● To provide decision support on the nature of the basic raw materials used in construction. To provide decision support on Lithological characters and subsurface conditions ● To describe various geological maps and interpretation of geological data for mining and subsurface investigations.			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. 1. Chalk and Talk with Black Board 2. ICT based Teaching 3. Demonstration based Teaching			

Module-1	7 hrs
Introduction, the scope of earth science in Engineering. Earth's internal structure and composition, internal dynamics and Plate tectonics, Earthquakes - types, causes, so-seismic lines, seismic zonation, seismic proof structures. Volcanic eruption - types, causes. Landslides-causes types, preventive measures; Tsunami – causes, consequences, mitigation. Cyclones - causes and management. L1, L2 Text Book: Chapter 2: 2.3 to 2.5	
Module-2	5 hrs
Earth Materials in Construction Minerals -Industrial, rock-forming and ore minerals. Physical properties, composition. Rocks Types, structure/Texture, mineral composition occurrence, properties. Decorative (facing/polishing), railway ballast, rocks for masonry work, monumental/architecture, Dressing of stones, Requirement of good building stones. L1, L2 Text Book: Chapter 9: 9.1 to 9.3, Chapter 11: 11.1 to 11.14, Chapter 12: 12.1 to 12.10, Chapter 13: 13.1 to 13.9, Chapter 14: 14.1 to 14.12	
Module-3	7hrs
Earth Surface process and Resources Weathering, type, causes, soil insitu, drifted soil, soil profile, soil mineralogy, structure, types of soil, Black cotton soil v/s Lateritic soil; effects of weathering on monumental rocks. Soil Horizon, Soil Classification by Grain Size. L1, L2 Text Book: Chapter 3: 3.1 to 3.2	
Module-4	7 hrs
Surface and sub investigation for deep foundation Dip and strike, and outcrop problems (numerical problem geometrical/ simple trigonometry based), Borehole data (and problems), Faults, folds, unconformity, joints, types, recognition and their significance in Civil engineering projects like tunnel project, dam project, Reservoir site. L1, L2, L3 Text Book: Chapter 6: 6.1 to 6.9 Chapter 7: 7.1 to 7.14	
Module-5	5 hrs
Modern Tools and geophysical methods Rocks as aquifers, water-bearing properties igneous, sedimentary and metamorphic rocks, coefficient of permeability, factors affecting permeability, Electrical Resistivity meter, depth of water table, (numerical problems), seismic studies. L1, L2,L3 Text Book: Chapter 18: 18.1 to 18.13, Chapter 22: 22.1 to 22.8	

Course outcomes (Course Skill Set):

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

CO1: Apply geological knowledge in different civil engineering practice. (PO – 1,2,3,4,6,7 PSO – 1,2)

CO2: Acquire knowledge on durability and competence of foundation rocks, and will be able to use the best building materials. (PO – 1,2,3,4,6,7 PSO – 1,2)

CO3: Students will become competent enough for the safety, stability, economy and life of the structures that they construct (PO – 1,2,3,4,5,6,7 PSO – 1,2)

CO4: Able to solve various issues related to ground water exploration, build up dams, bridges, tunnels which are often confronted with ground water problems (PO – 1,2,3,4,5,6,7 PSO – 1,2)

CO5: Students will become Intelligent enough to apply GIS, GPS and remote sensing as a latest tool in different civil engineering for safe and solid construction. (PO – 1,2,3,4,5,6,7 PSO – 1,2)

Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures 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 Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

4. The question paper will have ten questions. Each question is set for 20 marks.
5. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
6. The students have to answer 5 full questions, selecting one full question from each module. Marks scored shall be proportionally reduced to 50 marks

Note: Subject to be taught by Geologist with qualification M. Sc Geology/MPhil/ Ph. D in Geology

Suggested Learning Resources:

Text Book:

1. Parbin Singh, A text book of Engineering and General Geology, 7th Edition, S K Kataria and Sons, 2004

Reference Books

1. Principles of Engineering Geology, by KVGK Gokhale, BS Publications
2. A textbook of Engineering Geology by Chenna Kesavulu, Mac Millan India Ltd
3. Principle of Engineering Geology, by K.M. Bangar, Standard publishers

- <https://www.youtube.com/watch?v=aTVDiRtRook&list=PLDF5162B475DD915F>
- <https://www.youtube.com/watch?v=EBiLLjAxBuU&index=2&list=PLDF5162B475DD915F>
- <https://www.youtube.com/watch?v=sTY-ao4RZck&list=PLDF5162B475DD915F&index=3>
- <https://nptel.ac.in/courses>
- <https://youtu.be/fvoYHzAhvVM>
- https://serc.carleton.edu/NAGTWorkshops/hazards/events/12262004.html?serc_source=recommendation
- <https://serc.carleton.edu/NAGTWorkshops/coursedesign/goalsdb/14712.html>
- <https://www.earthsciweek.org/classroom-activities>
- NPTEL materials

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Field Visits
- Quiz/Assignments/Open book test to develop skills
- Encourage collaborative learning in the class
- Demonstration of Geological models and animations
- Hands on experiments with Rock and Minerals

CO & PSO - PO Mapping (Individual Teacher has to fill)

Mapping of Course Outcomes and Program specific outcomes to Program Outcomes														
Course outcomes	Program outcomes											Program Specific Outcomes		
	PO 01	PO 02	P 03	P 04	P 05	P 06	P 07	P 08	P 09	PO 10	PO 11		PSO 1	PSO 2
CO1														
CO2														
CO3														
CO4														
CO5														
Total														
Average														

Level 0: Not Mapped, 1: Low Mapped, 2: Moderately Mapped 3: Highly Mapped

Note: Depending on the Assessment tool used, higher order POs Can be identified by the concerned course instructor.

RURAL, URBAN PLANNING AND ARCHITECTURE			
Course Code	25CV36B	CIE Marks	50
Teaching Hours/Week (L: T: P)	3:0:0	SEE Marks	50
Credits	03	Total Marks	100
Contact Hours	42	Exam Hours	03
Examination type (SEE)	Theory		
Prerequisites: The students should have knowledge on • Understanding of fundamental civil engineering concepts • Familiarity with topographical maps and land use patterns • Exposure to environmental and socio-economic aspects of development • Awareness of sustainable development and infrastructure planning principles			
Course objectives: • To make the student understand about the past and present architecture of different parts of the world • Rural and urban planning and growth and circulation of patterns and effect of increase in urbanization • The basic planning required for urban and rural centres with respect to physical and social aspects • Student s to visit the different place of architecture monuments to understand the concept • To understand different types of architecture and planning			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. 1. Chalk and Talk with Black Board 2. ICT based Teaching 3. Demonstration based Teaching			
Module-1		8 Hours	
Introduction: Aim and importance of Architecture, Architecture as a fine art. Role of an architect and an engineer. Essential principles and qualities of architecture with examples Factors of architecture: Mass, Form, Colour, Solids, and Voids, Uniformity, Balance and Symmetry, Painting with examples. L1, L2			
Module-2		8 Hours	

Architectural influence of the following: Association, Tradition, Climate, Materials, Topography, Religion social customs and aspiration of time. Architectural characteristics of the following architecture with examples. 1. Egyptian, 2. Greek, 3. Roman, 4. Buddhist, 5. Hindu, 6. Jain, 7. Chalukyan, 8. Modern architecture Factors that have influence present day Modern Architecture, Aesthetic difference between the past and present Architecture. Students are advised for a technical tour related Architecture and town planning to gain additional knowledge in this subject		L1, L2
Module-3		8 Hours
Human settlements, Rural and urban pattern of growth, Factors that promote growth and development of Rural and urban areas Ancient Town Planning in India: Principles of town planning and circulation pattern with examples		L1, L2
Module-4		8 Hours
Industrialization: Impact on town planning, Urbanization causes, its effect on town and cities, remedial measures both in urban and rural planning. Circulation pattern in cities: Urban roads and streets, their functional classification, traffic survey data and its use in town planning		L1, L2
Module-5		8 Hours
Contemporary objectives and methods of planning of town: Development plans for cities, objectives and stages involved in their preparation and implementation, space standards for planning.		L1, L2
Course outcome (Course Skill Set) At the end of the course, the student will be able to: CO1: Understand importance of architecture in rural and urban planning (PO – 1,2,6 PSO – 1,2) CO2: Understand Influence of architecture (PO – 1,2, PSO – 1,2) CO3: Design infrastructure for rural and urban region (PO – 1,2,3,6 PSO – 1,2) CO4: Plan and design rural and urban roads (PO – 1,2,3 PSO – 1,2)		

Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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 Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module. Marks scored shall be proportionally reduced to 50 marks

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

FIRE SAFETY IN BUILDINGS			
Course Code	25CV36C	CIE Marks	50
Teaching Hours/Week (L: T: P)	3:0:0	SEE Marks	50
Credits	03	Total Marks	100
Contact Hours	42	Exam Hours	03
Examination type (SEE)	Theory		
Prerequisites: The students should have knowledge on • Basic understanding of building construction and structural systems • Knowledge of building materials and their fire-resistance properties • Familiarity with architectural design and building layout concepts • Awareness of fundamental safety regulations and building codes • Exposure to mechanical, electrical, and plumbing (MEP) systems			
Course objectives: • To understand the importance fire safety • To learn various techniques involved in fire safety • To design fire resistant buildings using proper materials and methods			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. 1. Chalk and Talk with Black Board 2. ICT based Teaching 3. Demonstration based Teaching			
Module-1		8 Hours	
Fire: Introduction, 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: flashover condition, effect of fire on construction material, design of fire resistance steel structure, concrete structure		L1, L2	
Module-2		8 Hours	
Fire safety: urban planning, escape and refuge, internal planning, detection and suppression Introduction to lift design, design of lift system, expected stop and floor of reversal, different cases, simulation, arrangements and escalators		L1, L2	
Module-3		8 Hours	
Introduction to flow system: water supply, constant demand, variable demand and diversity factor, control systems Flow in pipe networks and fixture units, design of water supply distribution system, flow in waste water pipes		L1, L2	

Module-4	8 Hours
Introduction to HVAC: governing equations to HVAC process, numerical problem on HVAC system, psychometric chart, equation based approach Electrical systems: design of electrical systems, intelligent building, life cycle cost and basics of building maintenance, stages of maintenance management, planning for building maintenance, periodicity of maintenance management, estimation of repair cycle, cost profile of maintenance, lamp replacement, building inspection, planned and Ad-hoc maintenance	
L1, L2	
Module-5	8 Hours
Condition survey and health evaluation of buildings, diagnosis of building by visual survey, case studies of visual survey, effect of corrosion and alkali aggregate reaction, sampling and choice of test location Non-destructive testing, core strength test, carbonation and chloride measurement, electrical method of progress measurement Repair, rehabilitation, retrofit, periodicity and economics of condition survey, interpretation of test results	
L1, L2	
Course outcome (Course Skill Set) At the end of the course, the student will be able to: CO1: Understand types of fire, combustion process and fire resistance (PO – 1,2 PSO – 1,2) CO2: Plan for fire safety and design of lifts (PO – 1,2,3 PSO – 1,2) CO3: Design flow network in buildings (PO – 1,2,3 PSO – 1,2) CO4: Design of electrical systems and maintenance (PO – 1,2,3 PSO – 1,2) CO5: Perform health evaluation of buildings and suggest remedies (PO – 1,2,3 PSO – 1,2)	
Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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 Evaluation: - For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks. - The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered - Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. - For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment. Internal Assessment Test question paper is designed to attain the different levels of Bloom's	

taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
 2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
 3. The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. J A Purkiss, Fire Safety Engineering: Design of Structures, ISBN 13 978-8131220085, Elsevier, 2009
 2. V K Jain, Fire Safety in Buildings, ISBN-13 978-938980219, New Age International Private Limited; Third edition, 2020
 3. Fire protection, services and maintenance management of building, NPTEL video lecture, IIT, Delhi
 4. Bureau of Indian Standards, "Hand Book of Functional Requirements of Buildings, (SP-41 & SP- 32)", BIS 1987 and 1989.
 5. Markus, T.A. & Morris, E.N., "Building Climate and Energy" Pitman publishing limited. 1980.
 6. Croome, J.D. & Roberts, B.M., "Air Conditioning and Ventilation of Buildings, Vol-1". Pergamon press.
 7. SP-35 (1987): Handbook of Water supply & drainage-BIS
- N.B.C.-2007 BIS

List of reference materials/books/

1. An introduction to fire dynamics -D.Drysdale
2. Structural fire protection Edt by T.T.LIE
3. Elevator technology - G.C.Barney
4. Heating Ventilating and Air Conditioning Analysis and Design - Faye C. McQuiston and Jerald D. Parker.
5. Concrete Structures: materials, Maintenance and Repair D.Campbell, Allen & H.Roper

Web links and Video Lectures (e-Resources):

- ☐ <https://archive.nptel.ac.in/courses/105/102/105102176/>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Assignment students: A case study of fire hazard in building and restoration procedure adopted

ENGINEERING GEOLOGY AND SOIL IDENTIFICATIONS LAB			
Course Code	25CV36A		
Type of Course	ESC/PCC (Laboratory)	Semester	III
Teaching Hours/Week (L :T : P)	28 (0:0:2)	CIE Marks	50
Total Hours of Pedagogy CI (L :T):LI(P):SL:TW	28(0:0:26:2)	SEE Marks	50
Credits	1	Total Marks	100
Type of Examination	Practical	Exam Hours	03
Course outcome (Course Skill Set) At the end of the course, the student will be able to: - CO1 (L3 – Apply): Identify and classify common rock-forming minerals and rocks based on physical properties, textures, and structures relevant to civil engineering applications. - CO2 (L3 – Apply): Perform standard laboratory tests to determine physical and index properties of soils including moisture content, specific gravity, grain size distribution, and Atterberg limits. - CO3 (L4 – Analyze): Analyze soil classification using Unified Soil Classification System (USCS) and Indian Standard Classification (IS) based on laboratory test results and plasticity characteristics. - CO4 (L3 – Apply): Use geological instruments (clinometer compass, Brunton compass) to measure dip and strike of geological formations and interpret geological maps and cross-sections. - CO5 (L4 – Analyze): Evaluate engineering properties of rocks (specific gravity, porosity, water absorption) and assess their suitability for construction materials and infrastructure projects. - CO6 (L5 – Evaluate): Assess geological and geotechnical site conditions, relate laboratory findings to field observations, and recommend suitable foundation types and construction practices aligned with SDG 9 (Industry, Innovation and Infrastructure) and SDG 11 (Sustainable Cities and Communities).			
SET OF EXPERIMENTS (LI =28 hours)			
- Study of geological maps and symbols. - Identification of common rock-forming minerals by physical properties. - Identification and description of igneous rocks/sedimentary rocks/metamorphic rocks. - Study of structural features of rocks such as folds, faults, joints, and bedding planes. - Study of topographical maps and contour interpretation. - Interpretation of geological sections and rock strata. - Study of aerial photographs / stereoscopic photo interpretation. - Study of engineering geological conditions for site selection. - Visual manual identification and description of soil samples. - Field identification of coarse and fine -grained soils. - Geophysical survey to determine subsurface strata characteristics for foundations. - Field exposure to identify topography, rocks, minerals and soil and suitable dam selection area.			

Suggested Learning Resources Text**books:**

1. Parbin Singh. Engineering and General Geology. Katson Publishing House.
2. Venkat Reddy, D. Engineering Geology for Civil Engineers. Oxford & IBH Publishing.
3. Murthy, V. N. S. Soil Mechanics and Foundation Engineering (7th Edition). CBS Publishers.
4. Punmia, B. C., Jain, A. K., & Jain, A. K. Soil Mechanics and Foundations (17th Edition). Laxmi Publications. Reference Books:

Reference books:

1. Krynine, D. P., & Judd, W. R. Principles of Engineering Geology and Geotechnics. McGraw-Hill.
2. Goodman, R. E. Engineering Geology – Rock in Engineering Construction. Wiley.
3. IS 2720 (Parts I to XXII) – Methods of Test for Soils – Indian Standard Code of Practice.

Web links and Video Lectures (e-Resources):

1. NPTEL courses on Engineering Geology (IIT Roorkee, IIT Kharagpur).
2. NPTEL courses on Soil Mechanics and Foundation Engineering (IIT Delhi, IIT Bombay).
3. Virtual Labs – Geotechnical Engineering Virtual Lab (IIT Kanpur): <https://vlab.co.in>
4. Geological Survey of India (GSI) – Maps, reports, and publications: <https://www.gsi.gov.in>
5. YouTube channels: Civil Engineering Essentials, The Engineering Classroom (soil mechanics experiments).

Assessment Structure:

The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying **50% weightage** (i.e., 50 marks each). The CIE marks awarded shall be based on the continuous evaluation of the laboratory report using a defined set of rubrics. Each experiment report can be evaluated for 30 marks. Total marks for the all report shall be scaled down to 30 marks. The laboratory test (duration 03 hours) at the end of the last week of the semester

/after completion of all the experiments (whichever is early) shall be conducted for 50 marks and Marks scored shall be scaled down to 20 marks. Final average marks for report and test shall be out of 50 marks.

Eligibility for SEE:

- To qualify and become eligible to appear for SEE, in the **CIE component**, a student must secure a **minimum of 40% of 50 marks, i.e., 20 marks.**
- To pass the **SEE component**, a student must secure a **minimum of 35% of 50 marks, i.e., 18 marks.**
- A student is deemed to have **successfully completed the course** if the **combined total of CIE and SEE is at least 40 out of 100 marks.**

Rubrics suggested for Practical continuous assessment

Performance Indicators	Excellent	Very Good	Good	Satisfactory
Fundamental Knowledge (4) (PO1)	The student has well depth knowledge of the topics related to the course (4)	Student has good knowledge of some of the topics related to course (3)	Student is capable of narrating the answer but not capable to show in depth knowledge (2)	Student has not understood the concepts clearly (1)

Design of Experiment (5) (PO2 & PO3)	Student is capable of discussing more than one design for his/her problem statement and capable of proving the best suitable	Student is capable of discussing few designs for his/her problem statement but not capable of selecting best (4)	Student is capable of discussing single design with its merits and demerits (3)	Student is capable of explaining the design (1-2)
	design with proper reason (5)			
Implementation (8) (PO3 & PO8)	Student is capable of implementing the design with best suitable algorithm considering optimal solution. (7-8)	Student is capable of implementing the design with best suitable algorithm and should be capable of explaining it (5-6)	Student is capable of implementing the design with proper explanation. (3-4)	Student is capable of implementing the design. (1-2)
Result & Analysis (5) (PO4)	Student is able to run the program on various cases and compare the result with proper analysis. (5)	Student will be able to run the program for all the cases. (4)	Student will be able to run the code for few cases and analyze the output. (3)	Student will be able to run the program but not able to analyze the output. (1-2)
Demonstration (8) (PO9)	The lab record is well-organized, with clear sections (e.g., Introduction, Method, Results, Conclusion). Transitions between sections are smooth. (7-8)	The lab record is organized, with clear sections, but some sections are not well-defined. (5-6)	The lab record lacks clear organization or structure. Some sections are unclear or incomplete. (3-4)	The lab record is poorly organized, with missing or unclear sections. (1-2)

SMART URBAN INFRASTRUCTURE			
Course Code	25CV37B	CIE Marks	50
Teaching Hours/Week (L: T: P)	1:0:0	SEE Marks	50
Credits	01	Total Marks	100
Contact Hours	14	Exam Hours	1
Examination type (SEE)	Theory		
Prerequisites: The students should have knowledge on • Basic Knowledge of Urban Planning • Fundamentals of Civil and Transportation Engineering • Environmental and Sustainability Concepts			
Course objectives: • Knowing about Urban Infrastructure Systems & their Management • Knowing about Smart Cities Key Concepts • Understand the Transport and Energy Smart Urban Infrastructure and Services • Developing Feasibility Studies for Smart City Services • Understand the Global Context of Smart Cities			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. 1. Chalk and Talk with Black Board 2. ICT based Teaching 3. Demonstration based Teaching			
Module-1		3Hours	
Introduction to Smart Urban Infrastructures and Smart Cities: Introduction to smart city, Basic concept of developing smart city, Global standards to create smart city. Different conceptual approaches to Smart Cities and discussing the pros and cons of each approach. Smart urban Infrastructure: List of infrastructure facilities, advantages and disadvantages.			
		L1, L2	
Module-2		3Hours	
Smart Urban Energy Systems: Introduction to Smart Energy Systems, Government policy and technology. Energy sector to explore some of the most important managerial considerations in the transition phase and operation of Smart Urban Energy Systems.			
		L1, L2	

Module-3	3Hours
Smart Transportation Technologies: Introduction to smart transportation system, Mode of transport systems for smart city, data collection to arrive at best transport facility. Significant opportunities and threads for legacy urban transportation systems. Managerial considerations to facilitate the transition phase, and operation of Smart Urban Transportation Systems L1, L2	
Module-4	3 Hours
Towards Smart Cities: Important factors in the transition phase of legacy cities to Smart cities and their managerial implications.	
Module-5	3 Hours
Towards Smart Cities: Management of Smart Cities calls for different approaches from conventional urban management approaches. The role of city government in the network of actors who play an important role in management of Smart Cities.	
Course outcome (Course Skill Set) At the end of the course the student will be able to: CO1: Understand the concept of smart city (PO – 1,2,6 PSO – 1,2) CO2: Play the role of a civil engineer in providing smart infrastructure (PO – 1,2 ,6 PSO – 1,2) CO3: Efficient energy system for smart city (PO – 1,2,6 PSO – 1,2) CO4: Analyse and design efficient transport system (PO – 1,2,3,6 PSO – 1,2)	
Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course if the student secures 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)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

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

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

1. The question paper will have ten questions. Each question is set for 10 marks.
2. There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:**Text Book**

1. Infrastructure for Smart Cities, Dr. R P Rathaliya, Shree Hari Publications, 2021

Reference Books

1. Building Smart Cities, ISBN-13 978-1032340128, by Carol L. Stimmel, 2022
2. Smart Cities for Sustainable Development, Ram Kumar Mishra, Ch Lakshmi Kumari, Sandeep Chachra, P.S. Janaki Krishna, Springer, ISBN-13 978-9811674099, 2022

Web links and Video Lectures (e-Resources):

- <https://www.coursera.org/learn/smart-cities>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

PROBLEM SOLVING WITH PYTHON			
Course Code	25CV37C	CIE Marks	50
Teaching Hours/Week (L: T: P)	0:2:0	SEE Marks	50
Credits	01	Total Marks	100
Contact Hours	14	Exam Hours	1
Examination type (SEE)	Theory		
Prerequisites: The students should have knowledge on • Basic Programming Skills • Basic Mathematics • Problem-Solving Skills			
Course objectives: • To understand why Python is a useful scripting language for developers. • To read and write simple Python programs • To learn how to identify Python object types. • To learn how to write functions and pass arguments in Python.			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. 1. Chalk and Talk with Black Board 2. ICT based Teaching 3. Demonstration based Teaching			
Module-1		3Hours	
Introduction to Python: Installing Python and Python packages, Managing virtual environments with venv module Introduction to NumPy arrays: Array creation, indexing, data types, broadcasting, copies and views, universal functions, I/O with NumPy			
Module-2		3Hours	
Introduction to NumPy and SciPy:NumPy subpackages– linalg, fft, random, polynomials, SciPy subpackages– linalg, fftpack, integrate, interpolate, optimize Introduction to Matplotlib: Plotting 2D graphs with Matplotlib, annotations, legend, saving plots to file, bar and pie charts, line plots.			
Module-3		3Hours	
Linear algebra using NumPy and SciPy:Solving linear simultaneous equations using NumPy and SciPy using numpy.linalg and scipy.linalg – solve, inverse, determinant, least square solution, Linear algebra using NumPy and SciPy (continued): Decomposition using lu and cholesky. Solving eigenvalue problems using NumPy and SciPy:Using numpy.linalg and scipy.linalg – eig, eigvals.			

Module-4	3Hours
Solving initial value problems for ODE systems using scipy.integrate subpackage – solve_ivp, RK45, LSODA. Numerical integration of functions using SciPy:Using scipy.integrate subpackage– Definite integral using Gaussian quadrature – quad and quadrature Numerical integration of fixed samples using scipy. integrate subpackage– Trapezoidal rule trapezoid, Simpson’s 1/3 rule using Simpson, Romberg integration romb.	
Module-5	3Hours
Determining roots of equations using SciPyusing scipy. optimize sub package– Bisection method bisect, Brent’s method brentq, Newton-Raphson method newton. Symbolic computing using SymPy and solving civil engineering problems using SymPy: Introduction, defining symbols, derivatives, integrals, limits, expression evaluation, expression simplification, solving equations, solving differential equations.	
Course outcome (Course Skill Set) At the end of the course the student will be able to: CO1: Understand Python syntax and semantics and be fluent in the use of Python flow control and functions. (PO – 1,2,3, PSO – 1,2) CO2: Demonstrate proficiency in handling Strings and File Systems. (PO – 1,2, PSO – 1,2) CO3: Represent compound data using Python lists, tuples, Strings, dictionaries. (PO – 1,2, PSO – 1,3) CO4: Read and write data from/to files in Python Programs (PO – 1,2, PSO – 1,3)	
Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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) • For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks. • The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered • Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. • For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.	

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

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

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

1. The question paper will have ten questions. Each question is set for 10 marks.
2. There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Text Books

1. R. Nageswara Rao, "Core Python Programming", dreamtech

Reference Books

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Python Programming, Reema theraja, OXFORD publication

Web links and Video Lectures (e-Resources):

- NumPy documentation at <https://numpy.org/doc/>
- SciPy documentation at <https://docs.scipy.org/doc/scipy/>
- Matplotlib documentation at <https://matplotlib.org/stable/users/index>
- SymPy documentation at <https://docs.sympy.org/latest/index.html>.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Real world problem solving: Demonstration of projects developed using python language

Skill Lab -1 DATA ANALYTICS WITH EXCEL			
Course Code	25CVSK311	CIE Marks	50
Teaching Hours/Week (L: T: P)	0:0:2	SEE Marks	50
Credits	01	Total Marks	100
Contact Hours	14	Exam Hours	3
Examination type (SEE)	Practical		
Prerequisites: The students should have knowledge on • Basic Computer Skills • Basic Mathematical and Statistical Concepts • Fundamentals of Microsoft Excel • Analytical Thinking			
Course objectives: • Understand the use of Spreadsheet for data collection and analysis. • Evaluate the equations using Excel functions • Learn the data quality and consistency of data			
Sl.NO	Experiments		
1	Introduction to Data Analysis Using Spreadsheets: Fundamentals of spreadsheet applications, Excel interface, and learn how to navigate around a worksheet and workbook.		
2	Using Excel Spreadsheets: Perform basic spreadsheet tasks, such as viewing, entering and editing data, and moving, copying and filling data. Learn about the fundamentals of formulas, and learn about the most common functions used by a data analyst. Finally, you will learn how to reference data in formulas.		
3	Cleaning & Wrangling Data Using Spreadsheets: Importance of data quality, how to import file data in to Excel, fundamentals of data privacy, remove duplicate and inaccurate data, and how to remove empty rows in your data..		
4	How to deal with inconsistencies in your data and how to use the Flash Fill and Text to Columns features to help you manipulate and standardize your data		
5	Analyzing Data Using Spreadsheets: Fundamentals of analyzing data using a spreadsheet, and learn how to filter and sort data. Learn how to use some of the most useful functions for a data analyst		
6	How to use the VLOOKUP and HLOOKUP reference functions. In addition, learn how to create pivot tables in Excel, and use several pivot table features		
7	Final Project: In this final module, you will be introduced to a hands-on lab where you will complete a graded assignment for cleaning and preparing data, and then analyzing data using an Excel spreadsheet.		

Course outcomes (Course Skill Set):

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

CO1: Prepare the data sets and perform the analysis. (PO – 1,2,5 PSO – 1,2)

CO2: Analyze and perform repetitive calculations using several functions (PO – 1,2,5 PSO – 1,2)

CO3: Design and apply solutions to verify the data sets (PO – 1,2,5 PSO – 1,2)

Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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 Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- <https://www.coursera.org/learn/excel-basics-data-analysis-ibm>
- Any online platform with the above course content like YouTube videos and NPTEL courses

Course Title:	Additional Mathematics -I (Common to all Branches)		
Course Code:	25MATDIP310	CIE Marks	50
Course Type (Theory/ Practical/Integrated):	NCMC	MCQ online exam Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:0:0:0	Exam Hours	-
Total Hours of Pedagogy	42 hours Theory	Credits	00 (PP)
Course objectives (COS): The goal of the course Additional Mathematics -I (Common to all Branches) 25MATDIP310 is to CO1: Apply the knowledge of the co-ordinate system to analyze the polar co-ordinate system. CO2: Familiarize the importance of calculus associated with one variable and multivariable for all branches of the engineering. CO3: Analyze the importance of the integral calculus and their application to real-world problems. CO4: Emphasize the knowledge of the vector calculus to all branches of engineering. CO5: Develop the knowledge of Linear Algebra to solve the system of equations.			
Module-1: Polar Curves and Curvature (8 hours)			
Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Indeterminate forms: L'Hospital's rule ($\frac{\infty}{\infty}, \frac{\infty - \infty}{\infty}, 0^0, 1^\infty$). (RBT Levels: L1, L2 and L3)			
Module-2: Partial Differentiation (9 hours)			
Introduction: Partial derivatives, total derivative - differentiation of composite functions, Jacobian and problems. Taylor's and Maclaurin's series expansion for one variable (Statement only) – problems (RBT Levels: L1, L2 and L3)			
Module-3: Integral Calculus (9 hours)			
Statement of reduction formulae for $\sin^n(x)$, $\cos^n(x)$ and $\sin^m(x)\cos^n(x)$ and illustrative problems. Evaluation of double integrals and triple integrals-Simple examples. Applications: Area of the region. (RBT Levels: L1, L2 and L3)			
Module-4: Vector Calculus (8 hours)			
Differentiation of vector functions: Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence and Curl, Solenoidal and irrotational vector fields-Problems. (RBT Levels: L1, L2 and L3)			

Module-5: Linear Algebra (8 hours)

Introduction to linear algebra:

Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations - Gauss-elimination method, Gauss Siedel method. Eigenvalues and Eigenvectors (2×2).

(RBT Levels: L1, L2 and L3).

Suggested Learning Resources

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021
2. Gilbert Strang, Linear Algebra and its Applications, Cengage Publications, 4th Ed., 2022.
3. Erwin Kreyszig . Advanced Engineering Mathematics, wiley

Reference Books:

1. H K Das and Rajaneesh Varma, Higher Engineering Mathematics, S. Chand.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill.
3. Mangey Ram, Mathematics in Engineering Sciences, CRC Press
4. N. P. Bali, Manish Goyal - A Textbook of Engineering Mathematics, Laxmi Publications
5. David Poole, Linear Algebra, Cengage Learning India Pvt Ltd.

Web links and e-Resources:

- NPTEL (National Programme on Technology Enhanced Learning) – Mathematics:
<https://nptel.ac.in/>.
- SWAYAM learning modules on Engineering mathematics.
- <https://www.coursera.org/> Mathematics for Engineering Specialization

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- ICT-Enabled Teaching.

Assessment Structure:

For courses offered by the Department of Mathematics, the Continuous Internal Evaluation (CIE) shall be conducted by the concerned course teacher. The CIE may comprise tests, assignments, quizzes, seminars, or other academic activities, as decided by the concerned teacher. The distribution of marks among these activities shall be determined by the course teacher. The total marks awarded for all CIE activities shall be 100 marks.

BUILDING MATERIALS AND CONSTRUCTION			
Course Code	25CV41	CIE Marks	50
Teaching Hours/Week (L: T: P)	3:0:0	SEE Marks	50
Credits	03	Total Marks	100
Contact Hours	42	Exam Hours	3
Examination type (SEE)	Theory		
Prerequisites: The students should have knowledge on • Basic knowledge in fundamental engineering principles. • Basic understanding the properties of different materials.			
Course Objectives: • To recognize good construction materials based on properties. • To investigate soil properties and design suitable foundation. • To understand the types and properties of masonry materials and supervise masonry construction. • To gain knowledge of structural components like lintels, arches, staircase and roofs. • To understand the finishes in construction like flooring, plastering, painting.			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. 1. Chalk and Talk with Black Board 2. ICT based Teaching 3. Demonstration based Teaching			
Module-1		8 Hours	
Building Materials: Stone as building material; Requirement of good building stones, Dressing of stones, Deterioration and Preservation of stone work. Bricks; Classification, Manufacturing of clay bricks, Requirement of good bricks. Field and laboratory tests on bricks; compressive strength, water absorption, efflorescence, dimension and warpage. Cement Concrete blocks, Autoclaved Aerated Concrete Blocks, Sizes, requirement of good blocks. Timber as construction material. Fine aggregate: Natural and manufactured: Sieve analysis, zoning, specify gravity, bulking, moisture content. Deleterious materials. Coarse aggregate: Natural and manufactured: Importance of size, shape and texture. Grading of aggregates, Sieve analysis, specific gravity, Flakiness and elongation index, crushing, impact and abrasion tests. L1, L2 Text Book: 1: Chapter-1, 2, 3, 5, 7, 8			

Module-2	8 Hours
Foundation: Preliminary investigation of soil, safe bearing capacity of soil, Function and requirements of good foundation, types of foundation, introduction to spread, combined, strap, mat and pile foundation Masonry: Definition and terms used in masonry. Brick masonry, characteristics and requirements of good brick masonry, Bonds in brick work, Header, Stretcher, English, Flemish bond, Stone masonry, Requirements of good stone masonry, Classification, characteristics of different stone masonry, Joint in stone masonry. Types of walls; load bearing, partition walls, cavity walls. L1, L2 Text Book: 2 Chapter-2: 2.1, 2.2, 2.7, 3.7, 3.8, 3.9, 5, 6.	
Module-3	8 Hours
Lintels and Arches: Definition, function and classification of lintels, Balconies, chejja and canopy. Arches; Elements and Stability of an Arch. Floors and roofs: Floors; Requirement of good floor, Components of ground floor, Selection of flooring material Procedure for laying of Concrete (VDF), Mosaic, Kota, Slate, Marble, Granite, Tile flooring, Cladding of tiles. Roof: Requirement of good roof, Types of roofs, Elements of a pitched roof, Trussed roof, King post Truss, Queen Post Truss, Steel Truss, Different roofing materials, R.C.C. Roof. L1, L2 Text Book: 2 Chapter-13.1 to 13.15, Chapter 11, 12.	
Module-4	8 Hours
Doors, Windows and Ventilators: Location of doors and windows, technical terms, Materials for doors and windows: PVC, CPVC and Aluminium. Types of Doors and Windows: Panelled, Flush, Collapsible, rolling shutter, Panelled and glazed Window, Bay Window, French window. Steel windows, Ventilators. Sizes as per IS recommendations. Stairs: Definitions, technical terms and types of stairs: Wood, RCC, Metal. Requirements of good stairs. Geometrical design of RCC doglegged and open-well stairs. Formwork: Introduction to form work, scaffolding, shoring, under pinning. L1, L2 Text Book: 2 Chapter-17, 14, 26	
Module-5	8 Hours
Plastering and Pointing: Mortar and its types. Purpose, materials and methods of plastering and pointing: Sand faced plastering, Stucco plastering, lathe plastering, defects in plastering. Water proofing with various thicknesses.	

Damp proofing: Causes, effects and methods. **Paints:** Purpose, types, technical terms, ingredients and defects, Preparation and applications of paints to new and old plastered surfaces, wooden and steel surfaces.

L1, L2

Text Book : 2 Chapter-19, 20, 21

Course outcomes (Course Skill Set):

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

CO1: Select suitable materials for buildings and adopt suitable construction techniques. (PO– 1,2,7, PSO – 1,2)

CO2: Decide suitable type of foundation based on soil parameters. (PO – 1,2, PSO – 1,2)

CO3: Supervise the construction of different building elements based on suitability. (PO–1,2,6,7, PSO – 1,2)

CO4: Exhibit the knowledge of building finishes and form work requirements. (PO – 1,2,6,7, PSO – 1,2)

Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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 Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (duration 03 hours).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:**Textbook:**

1. Rangawala S. C. "Engineering Materials", Charter Publishing House, Anand, India.
2. Dr. B. C. Punmia, Ashok kumar Jain, Arun Kumar Jain, "Building Construction, Laxmi Publications (P) Ltd., New Delhi.

Reference Books:

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

Web links and Video Lectures(e-Resources):

<https://archive.nptel.ac.in/courses/105/102/105102088/>

<https://www.youtube.com/watch?v=ULt4aEst4mM>

<http://www.digimat.in/nptel/courses/video/105102088/L09.html>

<http://www.digimat.in/nptel/courses/video/105102088/L20.html>

<https://www.classcentral.com/course/youtube-civil-building-materials-and-construction-47666>

Activity Based Learning (Suggested Activities in Class)/Practical Based Learning

- Assessment Methods for 25 Marks (opt two Learning Activities)
 - Case Study
 - Assignment
 - Gate Based Aptitude Test
 - MOOC Assignment for selected Module
 -

ANALYSIS OF STRUCTURES			
Course Code	25CV42	CIE Marks	50
Teaching Hours/Week (L: T: P)	3:0:0	SEE Marks	50
Credits	03	Total Marks	100
Contact Hours	42	Exam Hours	03
Examination type (SEE)	Theory		
Prerequisites: The students should have knowledge on • Structural forms and stability • Basic Structural analysis • Strength of Materials (SOM) • Problem Solving Approach • Basic Drawing and Interpretation			
Course Learning objectives: This course will enable students to • Understand the Different Forms of Structural Systems. • Determine the Strain Energy and Slope and Deflection of Beams, Trusses and Frames. • Analyse arches and cable structures. • Analyse different types of beams and frames using slope deflection method. • Analyse different types of beams and frames using moment distribution method.			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. 1. Chalk and Talk with Black Board 2. ICT based Teaching 3. Demonstration based Teaching			
Module-1			8 Hours
Introduction and Analysis of Plane Trusses: Structural forms, Conditions of equilibrium, Compatibility conditions, Degree of freedom, Linear and nonlinear analysis, Static and kinematic indeterminacies of structural systems, Types of trusses, Assumptions in analysis, Analysis of determinate trusses by method of joints and method of sections. L1, L2, L3			

Text Book:1 Chapter 1: 1.1 to 1.7 Chapter 3 : 3.1. to 3.6

Module-2		8Hours
DEFLECTION OF BEAMS: Moment area method: Derivation, Mohr's theorems, sign convention; Application of moment area method to determinate prismatic beams, beams of varying cross section; Use of moment diagram by parts. Strain Energy: Principle of virtual displacements, Principle of virtual forces, Strain energy and complimentary energy, Strain energy due to axial force, bending, shear and torsion (No numerical). Castigliano's theorems, application of Castigliano's theorems to calculate deflection of beams, trusses and frames (No numerical on unit load method). L1, L2, L3 Text Book:1 Chapter 5: 5.1 to 5.4 Chapter 6: 6.1 to 6.9		
Module-3		8Hours
Arches and Cable Structures: Three hinged parabolic arches with supports at the same and different levels. Determination of normal thrust, radial shear and bending moment. Analysis of cables under point loads and UDL. Length of cables for supports at same and at different levels- Stiffening trusses for suspension cables. L1, L2, L3 Text Book:1 Chapter 8.1 to 8.6		
Module-4		8 Hours
Slope Deflection Method: Introduction, sign convention, development of slope deflection equation; Analysis of continuous beams including settlement of supports; Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy up to 3 L1, L2, L3, L4 Text Book:1 Chapter 11: 11.1 to 11.6		
Module-5		8 Hours
Moment Distribution Method: Introduction, Definition of terms, Development of method, Analysis of continuous beams with support yielding, Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy up to 3 L1, L2, L3, L4 Text Book: 1 Chapter 12: 12.1 to 12.7		

Course outcome (Course Skill Set):

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

- CO1:** Identify the different forms of structural systems and analyse the trusses. (PO – 1,2 3, PSO -1,2)
- CO2:** Evaluate the slope and deflections in beams, frames and trusses by using moment area method and energy principle. (PO – 1,2,3 PSO -1,2)
- CO3:** Analyse and determine the stress resultants in arches and cables. (PO – 1,2,3 PSO -1,2)
- CO4:** Analyse the indeterminate structures and construct BMD AND SFD using slope deflection methods. (PO – 1,2,3 PSO -1,2)
- CO5:** Analyse the indeterminate structures and construct BMD AND SFD using Moment Distribution Method. (PO – 1,2,3 PSO -1,2)

Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures 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 Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:**Textbook:**

1. Reddy, C.S., Basic Structural Analysis, 3 rd. ed., Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2011.

Reference Books:

1. Hibbeler, R.C., Structural Analysis, 9 th edition., Pearson publications., New Delhi, 2012.
2. Thandavamoorthy, T.S., Structural Analysis, 6 th edition., Oxford University press., New

Delhi,2015.

3. L S Negi and R S Jangid, “Structural Analysis”, Tata McGraw-Hill Publishing Company Ltd.
4. D S Prakash Rao, “Structural Analysis: A Unified Approach”, Universities Press 4
5. K.U. Muthu and H. Narendra, “Indeterminate Structural Analysis”, IK International Publishing Pvt. Ltd.
6. Gupta S P, G S Pundit and R Gupta, “Theory of Structures”, Vol II, Tata McGraw Hill Publications company Ltd.
7. V N Vazirani and M M Ratwani, “Analysis of Structures”, Vol. 2, Khanna Publishers
8. Wang C K, “Intermediate Structural Analysis”, McGraw Hill, International Students Edition.
S. Rajashekhara and G. Sankarasubramanian, “Computational Structural Mechanics”, PHI Learning Pvt. Ltd.,
9. S S Bhavikatti, structural analysis, vikas publishing house pvt.ltd., new Delhi
10. S Ramamrutham and R Narayanan, Theory of structures, Dhanpat Rai Publishing Company.

Web links and Video Lectures (e-Resources):

- <https://nptel.ac.in/courses/105105166>
- <https://nptel.ac.in/courses/105105166>
- <https://nptel.ac.in/courses/105105166>
- <https://nptel.ac.in/courses/105105109>
- <https://nptel.ac.in/courses/105105109>
- <https://nptel.ac.in/courses/105105109>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Seminars /Quiz (to assist in GATE preparations)
- Demonstrations in using Softwares
- Self-Study on simple topics
- Simple problems solving by Etabs/Staad pro.

CO & PSO - PO Mapping (Individual Teacher has to fill)

Mapping of Course Outcomes and Program specific outcomes to Program Outcomes													
Course outcomes	Program outcomes											Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1													
CO2													
CO3													
CO4													
CO5													
Total													
Average													

Level 0: Not Mapped,1: Low Mapped, 2: Moderately Mapped3: Highly Mapped

Note: Depending on the Assessment tool used, higher order POs Can be identified by the concerned course instructor.

TRANSPORTATION ENGINEERING			
Course Code	25CV43	CIE Marks	50
Teaching Hours/Week (L: T: P)	3:0:0	SEE Marks	50
Credits	03	Total Marks	100
Contact Hours	42	Exam Hours	3
Examination type (SEE)	Theory		
Prerequisites: The students should have knowledge on • Understanding of Civil Engineering fundamentals. • Basics of land measurements and map reading. • Understanding of highway materials, aggregates, bitumen and concrete used in roads. • Basic knowledge of types of transportation systems.			
Course Learning objectives: This course will enable students to • Gain knowledge of different modes of transportation systems and to learn the introductory concepts on Highway Engineering. • Get insight to different highway materials and pavement design elements of a highway network. • Realize the significance of road safety by incorporating the concepts of Traffic Engineering. • Understand to different aspects of geometric elements of railway system and evaluate the material quantity required for track laying • Gain knowledge about various components of an Airport and its runway design.			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. 1. Chalk and Talk with Black Board 2. ICT based Teaching 3. Demonstration based Teaching			
MODULE-1		8Hours	
TRANSPORTATION ENGINEERING: Introduction, Different Modes of Transportation, M R Jayakar Committee recommendations, Road Classifications and Road Patterns. Highway Alignment: Factors affecting highway alignment, Engineering surveys for alignment-conventional and modern methods. Highway Geometric Design: Factors affecting geometric design of roads, Cross Sectional Elements, Sight distances, Horizontal alignment- Transition curve, superelevation, Extra widening, Vertical			

alignment–gradients, summit and valley curves. <i>(No derivations)</i> Problems on Sight distance, Super elevation, extra widening of curves, Length of transition curve, Length of summit and valley curve. L1, L2 Text Book :1 Chapter1:1.1,1.2,1.3, Chapter 2:2.4, Chapter 3:3.1,3.2, Chapter 4:4.2,4.3,4.4,4.5	
MODULE-2	8Hours
HIGHWAY MATERIALS AND PAVEMENTS: Desirable properties of aggregates, soil subgrade & Bitumen, Application of bituminous emulsion, Desirable properties of Bituminous Mixes Pavement Design: Factors Controlling design of highway pavements, Pavement types, component parts of pavements and their functions; types of joints used in rigid pavement. Critical stresses in flexible and rigid pavement. Highway Drainage: Significance and requirements, Surface drainage system and design-Examples, sub surface drainage system, Types of cross drainage structures their choice and location. Problems on design of Longitudinal drain. L2, L3 Text book :1 Chapter 6:6.1,6.2,6.3,6.4,6.5,6.6, Chapter11:11.1,11.2,11.3,11.6,	
MODULE-3	8Hours
TRAFFIC ENGINEERING: Objectives and scope of Traffic Engineering. Traffic Characteristics: Road user characteristics, vehicular characteristics – static and dynamic characteristics, Reaction time of driver and PIEV theory, Types of traffic engineering studies-volume, spot speed, speed and delay, parking, accident, origin & destination, objectives of studies and data collection, method of study, analysis. PCU concept, factors affecting and PCU at different locations and applications. Traffic signs, Signal design by IRC method; Types of intersections. Problems on Spot speed studies, Speed and delay studies, accident studies, Signal design by IRC method. L2, L3 Text Book: 1, Chapter 5:5.1,5.2,5.3,5.4,5.5,5.6,5.9,5.10	
MODULE-4	8Hours
RAILWAY ENGINEERING: Permanent way and its requirements, Gauges and types, Typical cross sections single and double-line BG track, Coning of wheels and tilting of rails, Rails-Functions-requirements, types and defects of rails. Sleepers and Ballast: Functions, requirements, Track fitting and fasteners, Calculation of quantity of materials required for laying a track, Points & crossings, Railway Station and Yards. Metro train & high- speed train- Design factors considered. Problem on Quantity calculation for laying railway track. Super-elevation L1, L2 Text Book :2, Chapter1: 1.1,1.2, Chapter 4,5,6,7,11,13,15,17	

MODULE-5	8Hours
AIRPORT ENGINEERING: Layout of an airport with component parts and functions, Site selection for airport, Aircraft characteristics affecting the design and planning of airport, Airport classification, Runway orientation using wind rose with examples. RUNWAY-Basic runway length-Corrections and examples, Runway geometrics, Taxiway-Factors affecting the layout - geometrics of taxiway-Comparison between Runway and Highway, Design of exit taxiway with examples. Problems on Runway orientation, Basic Runway length, Exit taxiway design. Text Book :3 Chapter 1:1.1 to 1.5, Chapter 3: 3.1to 3.5, Chapter 4,5,6,7	
Course outcomes (Course Skill Set): At the end of the course, the student will be able to: CO1: Explain the basic principles of geometric design in the context of transportation engineering and planning. (PO:1,2,3,12, PSO: 1,2) CO2: Select the appropriate pavement materials for construction and design the pavement as per standard practices. (PO:1,2,3,8,12, PSO: 1,2) CO3: Conduct traffic studies and analyze traffic data for practical applications. (PO 1,2,3,4,12, PSO:1,2,3) CO4: Identify the Components parts of Railway Track and design the suitable runway for an Airport. (PO:1,2,3,7,12, PSO:1,2) CO5: Able to interpret the experimental results of highway materials based on laboratory tests and design the pavement as per IRC guidelines. (PO:1,2,3,4,5,12, PSO: 1,3)	
Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures 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 Evaluation: • There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component. • Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks • Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)	

Mapping of Course Outcomes and Program specific outcomes to Program Outcomes														
Course outcomes	Program outcomes											Program Specific Outcome s		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11		PSO 1	PSO 2
CO1														
CO2														
CO3														
CO4														
CO5														
Total														
Average														

FLUID MECHANICS AND HYDRAULICS			
Course Code	25CV44	CIE Marks	50
Teaching Hours/Week (L: T: P)	3:0:2	SEE Marks	50
Credits	04	Total Marks	100
Contact Hours	42 + 14 Lab slots	Exam Hours	3
Examination type (SEE)	Theory/Practical		
Prerequisites: The students should have knowledge on • Basic Physics Knowledge • Engineering Mechanics • Units and Dimensions • Basic Problem-Solving Skills			
Course Learning objectives: This course will enable students to • Understand the Fundamentals of properties of fluids, fluid pressure measurement and hydrostatic law • Learn the Principles of kinematics, hydrodynamics and its applications • Study the Flow measurements and design of pipes • Understand the design of open channels and energy concepts • Understand the Working principles of hydraulic turbines and pumps			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. 1. Chalk and Talk with Black Board 2. ICT based Teaching 3. Demonstration based Teaching			
MODULE-1		8 Hours	
Fluids and their properties – compressibility, surface tension, capillarity, Pascal’s law, hydrostatic law, fluid pressure measurement using simple and differential manometers, Total pressure and center of pressure on vertical and inclined plane surfaces. L2, L3			
Text Book :1, Chapter1: 1.1 to 1.7 Chapter 2 2.1 to 2.7			
MODULE-2		8 Hours	
Kinematics- Types of flow, continuity equation in Cartesian coordinates, velocity potential, stream function, flow nets, Dynamics-Euler’s equation of motion, Bernoulli’s equation, Application- Venturi meter, Orifice meter, Pitot tube. L2, L4			
Text Book :1, Chapter 5: 5.1 to 5.8 Chapter 6 6.1 to 6.7			

MODULE-3	8 Hours
Classification of orifice and mouthpiece, hydraulic coefficients, discharge over rectangular, triangular and Cipoletti notch, Flow through pipes- major and minor losses, pipes in series and parallel, equivalent pipe, concept of water hammer and surge tanks.	L2, L4
Text Book :1 , Chapter 7: 7.1 to 7.6 Chapter 11 ,11.1 to 11.5	
MODULE-4	8 Hours
Open channel hydraulics- classification of flow, Most economical channel sections-rectangular, triangular, trapezoidal, circular, Uniform flow, specific energy-rectangular channels, on-uniform flow, hydraulic jump-equation and applications, GVF equation-types.	L2, L4
Text Book :1 , Chapter16: 16.1 to 16.9	
MODULE-5	8 Hours
Momentum equation, impact of jet on stationary and moving curved vanes Turbines-types, Pelton wheel-working proportions, velocity triangles Francis turbine- working proportions, velocity triangles Centrifugal pumps-work done, efficiency, multi-stage pumps.	L2, L4
Text Book :1 , Chapter17: 17.1 to 17.4 Chapter18 ,18.1 to 18.9 Chapter19: 19.1 to 19.7	

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments	
1	Verification of Bernoulli's equation	L1, L2
2	Calibration of Venturi meter/Orifice meter	L1, L2
3	Determination of hydraulic coefficients of small vertical orifice	L1, L2
4	Calibration of triangular notch	L1, L2
5	Determination of Cd for Cipoletti notch	L1, L2
6	Determination of major losses in pipes	L1, L2
7	Determination of Cd for ogee/broad crested weir	L1, L2
8	Determination of efficiency of jet on flat and curved vanes	L1, L2
9	Determination of Cd of Venturi flume	L1, L2
10	Demo of determination of efficiency of centrifugal pump	L1, L2
11	Demo of determination of efficiency of Francis/Kaplan turbine	L1, L2
12	Demo of determination of efficiency of Pelton wheel	L1, L2
Course outcomes (Course Skill Set): At the end of the course, the student will be able to: • Explain the fundamental properties of fluids and solve problems on fluid pressure and hydrostatics. • Apply the principles of kinematics and dynamics of fluid flow to solve problems on velocity and pressure. • Compute the discharge through pipes, notches and weirs. • Design the turbines and open channels of different sections and to estimate the energy loss in hydraulic jump. • Able to interpret the experimental results of discharge, efficiency based on the test conducted in the laboratory.		

Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.

- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks**).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test (**duration 02/03 hours**) after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks**.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:**Text Books:**

1. R.K. Bansal- A text book of Fluid Mechanics and Hydraulic Machines- Laxmi Publications, New Delhi

Reference Books:

1. P.N. Modi and S.M. Seth-Hydraulics and Fluid Mechanics, including Hydraulic machines, standard Book House, New Delhi
2. K Subramanya- Fluid Mechanics and Hydraulic Machines, Tata McGraw-Hill, New Delhi
3. Victor L. Streeter, Benjamin Wylie E and Keith W. Bedford- Fluid Mechanics, Tata McGraw Hill publishing Co Ltd, New Delhi
4. J.F. Douglas. M. Gastric, John Warfield, Lynne Jack – Fluid Mechanics, Pearson, Fifth edition.
5. K. Subramanya- Fluid Mechanics and Hydraulic Machines, Problems and Solutions, Tata McGrawhill, New Delhi.
6. S K SOM and G.Bis was – Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill, New Delhi.

Web links and Video Lectures (e-Resources):

- YouTube Videos

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning:

- Visit to hydro- electric power plant
- Visit to sites to visualize the flow measuring devices, viz., weirs, spillways, etc.

CO & PSO - PO Mapping (Individual Teacher has to fill)

Mapping of Course Outcomes and Program specific outcomes to Program Outcomes														
Course outcomes	Program outcomes												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11		PSO 1	PSO 2
CO1														
CO2														
CO3														
CO4														
CO5														
Total														
Average														

Level 0: Not Mapped, 1: Low Mapped, 2: Moderately Mapped 3: Highly Mapped

Note: Depending on the Assessment tool used, higher order POs Can be identified by the concerned course instructor.

BUILDING MATERIALS TESTING LABORATORY			
Course Code	25CVL45	CIE Marks	50
Teaching Hours/Week (L: T: P)	0:0:2	SEE Marks	50
Credits	01	Total Marks	100
Contact Hours	14	Exam Hours	02
Examination type (SEE)	Practical		
Prerequisites:			
The students should have knowledge on			
• Understanding of mechanics of materials • Basic ideas of construction materials • Basic testing procedures.			
Course objectives:			
• Ability to apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials. • Ability to function on multi-disciplinary teams in the area of material testing. • Ability to use the techniques, skills and modern engineering tools necessary for engineering. • Understanding of professional and ethical responsibility in the areas of material testing. • Ability to communicate effectively the mechanical properties of materials.			
Sl.NO	Experiments		
1	Tests on Bricks, Cement Concrete blocks (Weight & Dimensionality, Water absorption, Strength) L1, L2, L3, L4		
2	Tests on Tiles (Weight & Dimensionality, Water Absorption, Strength) L1, L2, L3, L4		
3	Tests on Fine aggregates - Sieve Analysis, Moisture content, Specific gravity, Bulk density, Bulking and Silt Content L1, L2, L3, L4		
4	Tests on Coarse aggregates- Sieve Analysis, Water absorption, Moisture content, specific gravity and Bulk density L1, L2, L3, L4		
5	Compression test on mild steel, cast iron and wood. L1, L2, L3, L4		
6	Tension test on mild steel and HYSD bars L2, L3, L4		
7	Torsion test on mild steel circular sections. L1, L2, L3, L4		
8	Bending Test on Wood Under two-point loading. L1, L2, L3, L4		
9	Shear Test on Mild steel- single and double shear. L1, L2, L3, L4		
10	Impact test on Mild Steel (Charpy & Izod). L1, L2, L3, L4		
11	Hardness tests on ferrous and non-ferrous metals- Brinell's, Rockwell and Vicker's. L1, L2, L3, L4		

12	Demonstration of Strain gauges and Strain indicators.	L1, L2, L3, L4
NOTE: All tests to be carried out as per relevant latest BIS Codes		
Course outcomes (Course Skill Set): At the end of the course the student will be able to: • CO1: Analyze the physical characteristics, and behavior of common building materials. • CO2: Reproduce the basic knowledge of mathematics and engineering in finding the strength intension, compression, shear and torsion for steel • CO3: Evaluate the impact of engineering solutions on the society and also will be aware of contemporary issues regarding failure of structures due to unsuitable materials. • CO4: Recognize the importance of ethical conduct, integrity, and accuracy in materials testing and reporting		
Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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 Evaluation (CIE): CIE marks for the practical course are 50 Marks. The split-up of CIE marks for record/ journal and test are in the ratio 60:40. • Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session. • Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks. • Total marks scored by the students are scaled down to 30 marks (60% of maximum marks). • Weightage to be given for neatness and submission of record/write-up on time. • Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus. • In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce. • The suitable rubrics can be designed to evaluate each student's performance and learning ability. • The marks scored shall be scaled down to 20 marks (40% of the maximum marks). The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.		

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours.

Suggested Learning Resources:

- Davis, Troxell and Hawk, "Testing of Engineering Materials", International Student Edition – McGraw Hill Book Co. New Delhi.
- M L Gambhir and Neha Jamwal, "Building and construction materials-Testing and quality control", McGraw Hill education (India) Pvt. Ltd., 2014.
- Fenner, "Mechanical Testing of Materials", George Newnes Ltd. London.
- Relevant latest IS Codes.

CO & PSO - PO Mapping (Individual Teacher has to fill)**Mapping of Course Outcomes and Program specific outcomes to Program Outcomes**

Course outcomes	Program outcomes											Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1													
CO2													
CO3													
CO4													
CO5													
Total													
Average													

Level 0: Not Mapped, 1: Low Mapped, 2: Moderately Mapped 3: Highly Mapped Note:

Depending on the Assessment tool used, higher order POs Can be identified by the concerned course instructor.

CONSTRUCTION EQUIPMENT, PLANTS AND MACHINERY			
Course Code	25CV46A	CIE Marks	50
Teaching Hours/Week (L: T: P)	2:2:0	SEE Marks	50
Credits	03	Total Marks	100
Contact Hours	42	Exam Hours	3
Examination type (SEE)	Theory		
Prerequisites: The students should have knowledge on • Basic Knowledge of Construction Practices • Building Materials and Construction Technology • Site Safety and Operations Awareness			
Course objectives: • To provide insight on the different functions and operations of different equipment and techniques during construction • To impart knowledge on the various maintenance and safety to be considered during construction • To acquire knowledge on the life cycle of a construction equipment • To adopt mechanization in the Construction industry			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. 1. Chalk and Talk with Black Board 2. ICT based Teaching 3. Demonstration based Teaching			
Module-1		8 Hours	
Basics and Hydraulics of Construction Equipment: Introduction to Construction Equipment- Functions, Operations of Construction Equipment Introduction to Four & Two Stroke Engine and their components- Introduction and Components to Automobiles. Introduction to Principles of Hydraulic- Calculation of Pressure, Force & Flow- Components of a Hydraulic System- Basic layout of Hydraulic System Applications of Hydraulics- Strand Jack Operation			
L1, L2			
Module-2		8 Hours	
Concreting, Earth Moving, Road Making and Quarry/Mining Equipment: Operations of a Batching Plant - Introduction and Components of Concrete Pump & Placer- Concrete Pipeline- Laying and Cleaning- Bulldozer- Classification and Components- Classification, Components and Attachments of Excavator- Backhoe Loader- Classification & components- Introduction and classification to Hot mix Plant Process of Asphalt Paver-PQC Paver- Classification & Components- Motor Grader Classification & Components- Horizontal Movement Vehicles- Quarry/Mining			
L1, L2			

Module-3	8 Hours
Equipment Life Cycle Management: Life Cycle of an Equipment- Equipment Performance Parameters - Introduction to Maintenance- Types of Maintenance- Maintenance Practices	L1, L2
Module-4	8 Hours
Tunnelling Equipment / Piling Equipment: Introduction to Tunnel Boring Machines- Details and Operation of a Hard-Rock TBM Details of Earth Pressure Balance (EPB) TBM- Details and operation of Slurry TBM & Components- Hydraulic Grabs- Piling Rig	L1, L2
Module-5	8 Hours
Mechanization and Digitalization in Construction and Safety in Construction Equipment: Importance of Digital Analytics- Digital Solution in Construction Projects- Importance of Mechanization - Railway Track Construction- Rebar Processing Machine- Operation of Mechanized Equipment-Introduction to 3D Concrete Printer- Importance of Safety- Various PPE & Purpose- Safety of Men & Machines at Work- Safety During Construction Activities Safety with Tools & Tackles.	L1, L2
Course outcome (Course Skill Set) At the end of the course, the student will be able to : CO1: Evaluate equipment and techniques required during construction CO2: Understand the operation of a batching plant. CO3: Analyze the equipment life cycle management. CO4: Comprehend mechanization and digitalization in construction	
Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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 Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:**Text Books**

1. Velumani. P, "Construction Techniques and Practices", SIA Publishers & Distributers Pvt Ltd, 2020.

Reference Books:

1. Dr. Manoranjan Samal, "Advanced Construction Techniques and Equipment" S.K. Kataria & Sons
2. S.C.Sharma, "Construction Equipment and management" E-Book .2019

Web links and Video Lectures (e-Resources):

E-learning content on L&T EduTech Platform.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Visit to construction site to understand construction equipment

SUSTAINABLE DESIGN CONCEPT FOR BUILDING SERVICES			
Course Code	25CV46B	CIE Marks	50
Teaching Hours/Week (L: T: P)	3:0:0	SEE Marks	50
Credits	03	Total Marks	100
Contact Hours	42	Exam Hours	3
Examination type (SEE)	Theory		
Prerequisites: The students should have knowledge on - Basics of Building Services - Environmental Science & Climate Change Basics - Green Building Standards and Certifications - Sustainable Materials and Technologies			
Course objectives: - To facilitate learners to understand sustainable building designs and its parameters such as energy and water efficiency, Comfort in buildings, and waste management. - To expose the learners to shading systems, thermal and visual comfort. - To impart fundamental knowledge on Life cycle assessment and Green ratings and certifications.			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. - Chalk and Talk with Black Board - ICT based Teaching - Demonstration based Teaching			
Module-1		8 Hours	
Introduction to Sustainability and Climatology: Overview of Sustainability – Global energy scenario, carbon footprint and climate action, Net zero in carbon offsetting, Water neutral, Sustainable construction and resource management. Green buildings - Selection of site – preservation and planning, Influence of climate on buildings, Basics of climatology, Earth – Sun relationship, Solar angles and sun path diagram, Design of shading systems. Text Book: 1 Chapter-1:1.1 Chapter-5: 5			
Module-2		8 Hours	
Comfort in Buildings: Thermal comfort – Basics of Thermodynamics, Convection/radiation heat transfer, Heat gain through various elements of a building, Thermal comfort models and case studies Acoustics – Building acoustics, measures, defects and prevention of sound transmission Indoor Air Quality – Effects, design consideration and integrated approach for IAQ management Visual comfort – Enhancement strategies for Daylighting and Artificial Text Book: 1 Chapter-2: 2.1 Chapter-9: 9			
		L1, L2	

Module-3	8 Hours
Energy, water efficiency and waste management in buildings: Energy efficiency – Energy efficiency in building envelope and energy efficient HVAC and Lighting as per Energy conservation building code (ECBC) 2017, Energy simulation, Energy management system – Renewable energy and Energy Audit. Water Efficiency – Planning and design of water management system, Rain water harvesting, Water efficient design and fixtures, Treatment and reuse and Water efficient landscape system. Waste management – Types of waste and its treatment methods, Construction and demolition waste management, Waste management in residential, commercial buildings, healthcare facilities. Text Book:1 Chapter-10:10 Chapter-12: 12.1 & 12.3 L1, L2, L3	
Module-4	8 Hours
Life Cycle Assessment of Buildings and Green project management: Materials – Green product certifications, features of sustainable building materials and sustainable alternatives for structural, envelope and finishing materials. Low carbon cement, Zero emission bricks and lean construction practices. Life cycle assessment and its types – Modelling and Analysis, Greenhouse gas emission. Different phases of green building project management. Text Book:1 Chapter-2:2.2; 2.3 L1, L2, L3	
Module-5	8 Hours
Sustainable rating systems: Green building rating systems- LEED, BREEAM and others, Indian Green building rating systems – IGBC & GRIHA. IGBC criteria for certification -site selection credits, pre-design credits, detailed design credits, pre-construction credits, construction credits, post construction credits. Greenhouse gas emission. Different phases of green building project management. Text Book:1 Chapter-3:3.1 to 3.7 L1, L2,L3	
Course outcomes (Course Skill Set): At the end of the course, the student will be able to: CO1: Comprehend sustainable design, climatology, shading system and analyze heat transfer mechanism in buildings. (PO – 3,7 PSO – 1,2) CO2: Assess the design considerations and parameters for thermal comfort, visual comfort, indoor air quality and acoustics. (PO – 3,7 PSO – 1,2) CO3: Develop solutions for energy efficiency, water efficiency and waste management in buildings. (PO – 3,7 PSO – 1,2) CO4: Adopt green project management methodology and evaluate building life cycle assessment. (PO – 3,7 PSO – 1,2) CO5: Implement green practices during construction and operation phase of the buildings for achieving green rating. (PO – 3,7 PSO – 1,2)	

Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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 Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:**Textbook:**

1. Dr. Adv. HarshulSavla, Green Building: Principles & Practices

Reference Books:

1. Harharalyer G, Green Building Fundamentals, Notion Press
2. IGBC Green new building rating system - version 3.0 - Abridged reference guide
3. The Sustainable Habitat Handbook (6 Volume Set), GRIHA Version 2019
4. National Building Code – 2016, Volume 1&2, Bureau of Indian Standards
5. Energy Conservation Building Code – 2017 (with amendments up to 2020), Bureau of Energy Efficiency

Web links and Video Lectures (e-Resources):
• E-learning content on L&T EduTech Platform.
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • ECO – NIWAS by Ministry of Power, Free Web tool to practice energy conservation • Roof top solar energy calculator, Free Web tool to calculate solar power available.

WATERSHED MANAGEMENT			
Course Code	25CV46C	CIE Marks	50
Teaching Hours/Week (L: T: P)	3:0:0	SEE Marks	50
Credits	03	Total Marks	100
Contact Hours	42	Exam Hours	3
Examination type (SEE)	Theory		
Prerequisites: The students should have knowledge on • Basic Knowledge of Hydrology • Fundamentals of Soil Science • Environmental Science Awareness			
Course objectives: • To understand Watershed Hydrology • To estimate water demand and learn, water conservation methods • To understand application of Remote Sensing and GIS in watershed management • Sustainable measures for watershed management			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. • Chalk and Talk with Black Board • ICT based Teaching • Demonstration based Teaching			
Module-1		8Hours	
Principles of Watershed Management: Basics concepts, hydrology and water availability, surface water, ground water, conjunctive use, human influences in the water resources system. L1, L2			
Module-2		8 Hours	
Water resources systems: Integrated water resources system, river basins- morphometric analysis of watersheds for watershed management, watershed management practices in arid and semi-arid regions, watershed management through wells, management of water supply, short term and long-term strategic planning. L1, L2, L3			
Module-3		8 Hours	
Conservation of Water: Perspective on recycle and reuse, wastewater reclamation, social aspects of watershed management and community participation, private sector participation, institutional issues, socio-economy, integrated development, water legislation and implementations, case studies			

Water Harvesting: Rainwater management, conservation, storage and effective utilization of rainwater, structures for rainwater harvesting, roof catchments system, check dams, aquifer storage.

L1, L2, L3

Module-4

Sustainable Watershed Approach: Sustainable integrated watershed management, natural resources management, agricultural practices, integrated farming, soil erosion and conservation.

L1, L2, L3

Module-5

Applications of RS and GIS in Watershed management: Role of decision support system in watershed management, watershed characteristics of coastal regions, coastal aquifer management, uniqueness of coastal water resources.

L1, L2, L3

Course outcome (Course Skill Set)

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

CO1: Discuss surface and ground water resources system and, human influences. (PO-1,2,6,7 PSO 1,2)

CO2: Integrate water resources system in arid and semi-arid regions and explain watershed aquifer for management. (PO-1,2,6,7 PSO1,2)

CO3: Analyse water resources related issues for conservation and synthesize augmentation of water resources. (PO-1,2,6,7 PSO1,2)

CO4: Integrated watershed management system. (PO-1,2,6,7 PSO1,2)

CO5: Apply modern tools in watershed management. (PO-1,2,6,7 PSO1,2)

Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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 Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:**Text Book**

1. Singh Vir, Raj., "Watershed Planning and Management", Yash Publishing House, Bikaner. 3rd Revised Edition, 2016.

Reference Books

2. Murthy, J. V. S., "Watershed Management in India", New Age Publishers, New Delhi. 2nd Edition, 2017.
3. "Decision Support System for Integrated Watershed Management", Colorado State University. 2012.

Web links and Video Lectures (e-Resources):

- <https://www.youtube.com/watch?v=wkPu4LwRKro>
- <https://youtu.be/wkPu4LwRKro>
- <https://youtu.be/wkPu4LwRKro>
- <https://youtu.be/wkPu4LwRKro>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Seminars/Quiz (To assist in GATE Preparations)
- Self-Study on simple topics
- Discussion of case studies
- Field visits to construction sites

Quality Control and Quality Assurance			
Course Code	25CV47A	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0:0	SEE Marks	50
Credits	1	Total Marks	100
Total Hours of Pedagogy	14	Exam Hours	1
Course objectives: Enable the students to 1. Appreciate the concept of Quality 2. Articulate the Implication of Quality in construction 3. Implement QA & QC Programs 4. Realise the importance of QMS in Civil Engineering.			
Teaching-Learning Process (General Instructions) These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. 1. Chalk and talk 2. Power point Presentation, video 3. Site Visit 4. Industry interaction			
Module-1			
Overview of Quality: Quality History, Quality Definition, Quality Inspection, Quality Control, Quality Assurance, Quality Engineering, Quality Management, Quality Gurus: Philip B. Crosby, W. Edwards Deming etc, PDCA Cycle, Costs associated with Quality, Reasons for Poor Quality			
Teaching-Learning Process	Chalk and talk, PowerPoint Presentation		
Module-2			
Quality Management: Management Practices: TQM, Vision and Quality policy, Quality Function Deployment, Bench marking and performance evaluation, ISO 9000 Quality Management System, ISO 14000 Environmental Management System			
Teaching-Learning Process	Chalk and talk, PowerPoint Presentation.		
Module-3			
Statistical Quality Control: Importance of SQC in construction, Statistical parameters: sampling, population and sampling, measure of variability, measure of central tendency, Recommendations of IS 456:2000 on sampling, testing and acceptance criteria for concrete.			
Teaching-Learning Process	Chalk and talk, Demonstration.		
Module-4			
QA and QC in Construction: Errors in concrete construction; Frequency of material testing and reporting of basic construction materials (cement, sand, coarse aggregate, bricks, steel), Norms for accepting and rejecting criteria of basic construction materials as per relevant IS codes.			
Teaching-Learning Process	Chalk and talk, Enacting, Site Visit		
Module-5			
On-Site Quality: Achieving quality at different stages of construction: Conceptual Design, Preliminary Design, Detailed Design, Construction, Testing, Commissioning, and Handover. Quality assessment of concrete through NDT: rebound hammer and USPV tests and guidelines for accepting and rejecting.			

Teaching-Learning Process	Chalk and talk, PowerPoint Presentation, Industry Interaction
Course outcome (Course Skill Set) At the end of the course the student will be able to: 1. Realize the importance of quality in construction 2. Apply SQC techniques in different aspects of construction 3. Implement QMS programs at different levels of construction	
Assessment Details (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). 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 Evaluation: Three Unit Tests each of 20 Marks (duration 01 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 3. Third test at the end of the 15th week of the semester Two assignments each of 10 Marks 4. First assignment at the end of 4th week of the semester 5. Second assignment at the end of 9th week of the semester Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours) 6. At the end of the 13th week of the semester The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks (to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). 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 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 01 hour . The student has to secure minimum of 35% of the maximum marks meant for SEE.	
Suggested Learning Resources: Books 1. Juran J M and Gryna F M, Quality Planning and Analysis 2. Hutchins G, John L Ashford, The Management of Quality in Construction 3. Mohamed A. El-Reedy, “Concrete and Steel Construction, Quality Control and Assurance”, CRC Press, Taylor and Francis Group 4. M. S. Shetty, Concrete Technology, S Chand Publications 5. Relevant IS Codes	

Web links and Video Lectures (e-Resources):	
	• Online study material • You Tube videos
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning	
	• Demonstrations of Videos • Industrial visit – preparation of checklists for different activities in construction • Collection of typical reports on testing of basic construction materials

GIS WITH QUANTUM GIS			
Course Code	25CV47B	CIE Marks	50
Teaching Hours/Week (L: T: P)	0:2:0	SEE Marks	50
Credits	01	Total Marks	100
Contact Hours	14	Exam Hours	1
Examination type (SEE)	Theory (MCQ)		
Prerequisites: The students should have knowledge on • Basic Computer Skills • Fundamentals of Geography and Cartography • Introduction to Geographic Information Systems (GIS)			
Course objectives: • Learning the open source QGIS software for Civil Engineering applications • Understand raster and vector data • Creation of base map and thematic maps for specific application			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. 1. Chalk and Talk with Black Board 2. ICT based Teaching 3. Demonstration based Teaching			
Module-1		3Hours	
QGIS Introduction: Definition of GIS and its use. Introduction to a free and open source desktop geographic information system software. Types of data (vector and raster formats), web services, useful commands and utilities for geo-processing, extending its capabilities to digital satellite image processing and analysis		L1, L2, L3, L4.	
Module-2		3Hours	
INTRODUCTION IN QGIS About QGIS Characteristics of QGIS Start using QGIS. QGIS TOOLS QGIS Configuration, General tools, Working with projections QGIS Browser. WORKING WITH RASTER DATA Introduction, Display raster data, Raster calculator, Working with images, Practical exercises: Working with raster data and operations		L1, L2, L3, L4, L5	
Module-3		3Hours	
QGIS PLUGINS Additional modules of QGIS or “plugins” Description of Plugins incorporated in QGIS Operations through “plugins” Practical exercises: Different QGIS “plugins” and their applications: GDAL library tool, georeferencing, coordinate capture, format converter.		L1, L2, L3, L4, L5	

Module-4	3Hours
CREATE MAPS AND RELATED PRODUCTS: Creation tools, Graphic elements, Atlases generation, and Graphic output creations. Practical exercises: Map creation with QGIS.	
	L3, L4,
Module-5	3Hours
RELATIONAL DATABASE MANAGEMENT SYSTEMS AND SPATIAL DATA. Database design, Database connections, Table joins Spatial joins, generate new statistics and new data using table and spatial data information. Practical exercises: Creation of thematic maps like population data of taluk, Watershed map with drainage and water bodies, Highway with other 2 road intersection details	
	L3, L4, L5
Course outcome (Course Skill Set)	
At the end of the course the student will be able to:	
CO1: Use opensource software for civil engineering applications (PO-1,2,5, PSO 1 ,2)	
CO2: Various tools in QGIS software (PO-1,2,5, PSO 1 ,2)	
CO3: Create thematic layers with attribute data (PO-1,2,3.5, PSO 1 ,2)	
CO4: Generate maps for decision making (PO-1,2,3,5, PSO 1 ,2)	

Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

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

Suggested Learning Resources:

Books

1. Geographic Information System-An Introduction, Tor Bernharadsen, 2009, 3rd Edition, Wiley India Pvt. Ltd. New Delhi, ISBN - 9788126511389.
2. Principles of Remote sensing and Image Interpretation, Lillesand and Kiefer, 2011, 6th Edition, John Wiley Publishers, New Delhi, ISBN – 8126532238.

Web links and Video Lectures (e-Resources):

- YouTube videos
- <https://docs.qgis.org/3.16/pdf/en/QGIS-3.16-DesktopUserGuide-en.pdf> for QGIS manual
- NPTEL Lectures.

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning

- Prepare the thematic maps using google earth images for various applications

ELECTRONIC WASTE MANAGEMENT - ISSUES AND CHALLENGES			
Course Code	25CV47C	CIE Marks	50
Teaching Hours/Week (L: T: P)	0:2:0	SEE Marks	50
Credits	01	Total Marks	100
Contact Hours	14	Exam Hours	1
Examination type (SEE)	Theory		
Prerequisites: The students should have knowledge on • Environmental Science • Electronic Waste • Recycling • Environmental issues			
Course objectives: • To provide students with a comprehensive understanding of e-waste and its impact on the environment. • To familiarize students with the generation, composition, and hazardous components of e-waste. • To highlight the health and environmental risks associated with improper e-waste management. • To introduce students to various methods of e-waste collection, recycling, and disposal. • To develop an understanding of the relevant policies and regulations governing e-waste management in India.			
Teaching-Learning Process (General Instructions) These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes. 1. Blackboard teaching 2. Power point Presentation 3. Videos, NPTEL materials			
Module-1		3 Hours	
Introduction to E-Waste Management, Overview of e-waste and its impact on the environment, Text Book: Chapter 1: 1		L1, L2	
Module-2		3 Hours	
E-Waste Generation and Composition, Types of e-waste and their components Text Book: Chapter 2:2		L1, L2	
Module-3		3 Hours	
E-Waste Hazards and Environmental Impacts, Health and environmental risks associated with e-waste Text Book: Chapter 3: 3		L1, L2	

Module-4	3 Hours
E-Waste Collection and Recycling, Methods of e-waste collection, recycling, and disposal	
Text Book: Chapter 4: 4	L1, L2
Module-5	3 Hours
E-Waste Management Policies and Regulations, Relevant laws, policies, and regulations in India	
Text Book: Chapter 5: 5, Chapter 6: 6	L1, L2
Course outcome (Course Skill Set) At the end of the course the student will be able to: CO1: Explain the concept of e-waste and its significance in the context of environmental sustainability. (PO – 1,2,3,4,5,7, PSO – 1,2) CO2: Identify and classify different types of e-waste and describe their components. (PO – 1,2,3,4,5,7,8 PSO – 1,2) CO3: Recognize the potential health and environmental hazards associated with improper e-waste management. (PO – 1,2,3,4,5,7,8 PSO – 1,2) CO4: Evaluate and apply appropriate methods for the collection, recycling, and disposal of e-waste. (PO – 1,2,3,4,5,7,8 PSO – 1,2) CO5: Demonstrate knowledge of the existing policies, regulations, and frameworks for e-waste management in India (PO – 1,2,3,4,5,7,8 PSO – 1,2)	

Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

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

Suggested Learning Resources:**Text Books:**

1. Varsha Bhagath Ganguly, E Waste management – Challenges and Opportunities in India, Routledge (2021), Taylor and Francis Group, 2021

Reference Books

1. “E-Waste Management: From Waste to Resource” by R. K. Rathore and H. N. Chanakya, TERI Press, 2019
2. “E-Waste in India: An Emerging Crisis” by Sangeeta Sharma, Cambridge Scholars Publishing, 2019
3. “E-Waste Management: Research, Technology, and Applications”, Majeti Narasimha Vara Prasad, CRC Press, 2016
4. “Electronic Waste Management and Treatment Technology” by Rezaul Begg, R. M. Sarcar, and R. V. R. Singh, Springer, 2018
5. “E-Waste Management: From Waste to Resource” by Florin-Constantin Mihai, Academic Press, 2018

Web links and Video Lectures (e-Resources):

- NPTEL video Lectures.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Visit to an E-waste management industry

CO & PSO - PO Mapping (Individual Teacher has to fill)

Mapping of Course Outcomes and Program specific outcomes to Program Outcomes														
Course outcomes	Program outcomes												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11		PSO 1	PSO 2
CO1														
CO2														
CO3														
CO4														
CO5														
Total														
Average														

Level 0: Not Mapped, 1: Low Mapped, 2: Moderately Mapped 3: Highly Mapped

Note: Depending on the Assessment tool used, higher order POs Can be identified by the concerned course instructor.

UNIVERSAL HUMAN VALUES			
Course Code	25UH48	CIE Marks	50
Teaching Hours/Week (L: T: P)	1:0:0	SEE Marks	50
Credits	01	Total Marks	100
Contact Hours	14	Exam Hours	2
Examination type (SEE)	Theory		
Prerequisites: NIL			
Course Objectives:			
This course is intended to:			
• To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings. • To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way. • To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature. • This course is intended to provide a much-needed orientation input in value education to the young enquiring minds.			
Teaching-Learning Process (General Instructions):			
These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.			
1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence. 2. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the activities will develop students' theoretical and applied skills. 3. State the need for UHV activities and its present relevance in the society and provide real-life examples. 4. Support and guide the students for self-study activities. 5. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress in real activities in the field. 6. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student in every activity, leading to continuous self-evolution. 7. Encourage the students for group work to improve their creative and analytical skills.			

Module- 1	5 Hours
Introduction to Value Education: Understanding the need, Basic Guidelines, Content and process for Value Education; Self-Exploration: What is it? - its content and process, Natural Acceptance and Experiential Validation- as the mechanism for self-exploration; Continuous Happiness and Prosperity: A look at basic Human Aspirations; Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority; Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario; Method to fulfill the above human aspirations: understanding and living in harmony at various levels.	
Module- 2	5 Hours
Understanding Harmony in the Human Being: Understanding Human being as the Co-existence of the Self and the Body, Understanding the needs of Sukh and Suvidha; Understanding the Body as an Instrument of the Self, Understanding the characteristics and activities of self and harmony in self; Understanding the harmony of the Self with the Body, Programs to ensure self-regulation and Health	
Module- 3	5 Hours
Understanding Harmony in the Family and Society: Harmony in the Family – the Basic Unit of Human Interaction; Understanding values in human-human relationship - meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; 'Trust' – the Foundational Value of Relationship, Understanding the meaning of Vishwas - difference between intention and competence; Understanding the meaning of Samman - difference between respect and differentiation, the other salient values in relationship; Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals; Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family!	
Module- 4	5 Hours
Understanding Harmony in the Nature/Existence: Understanding the harmony in the Nature; Interconnectedness and mutual fulfillment among the four orders of nature - recyclability and self-regulation in nature; Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space; Holistic perception of harmony at all levels of existence.	
Module- 5	5 Hours
Implications of the Holistic Understanding – a Look at Professional Ethics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct; A Basis for Humanistic Education; Humanistic Constitution and Universal Human Order; Competence in Professional Ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems; Case studies of typical holistic technologies, management models and production systems; Strategy for transition	

from the present state to Universal Human Order: At the level of individual: as socially and ecologically responsible engineers, technologists and managers, At the level of society: as mutually enriching institutions and organizations.

Course outcomes (Course Skill Set):

At the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature):

CO1: Apprehend the need of Value Education over Human aspirations (PO-6)

CO2: Assimilate Harmony over the physical needs and to overcome the self- needs for a prosperous life. (PO-6)

CO3: Recognize the need of Harmony in the Family and Society for a better World. (PO-6)

CO4: Explain the need of mutual understanding for Holistic Harmony in all the Levels of Human Existence. (PO-6)

CO5: Explain the Holistic understanding of Harmony and Professional Ethics at Individual Level and Society. (PO-6, PO-7)

Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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 Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (duration 03 hours).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Text Books:

1. "The Textbook: A Foundation Course in Human Values and Professional Ethics", R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2010. ISBN 978- 8-174-46781-2

Reference Books:

1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Romes Report, Universe Books.
6. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

Web links and Video Lectures (e-Resources):

1. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
2. <https://www.youtube.com/watch?v=P4vjfE-YnVk&list=PLWDeKF97v9SP7wSlapZcQRrT7OH0ZIGC4>
3. **Course handouts:**
https://drive.google.com/drive/folders/1zioX_4L2fCNX4Agw282PN86pcZZT3_Osr?usp=sharing
4. **Presentation slides:**
https://drive.google.com/drive/folders/1rMUKh1s0HPRBlpp_b1mpS-duNRcwS6YH?usp=sharing

SKILL LAB – 2 3D MODELLING -BIM LAB			
Course Code	25CVSK412	CIE Marks	50
Teaching Hours/Week (L: T: P)	0:0:2	SEE Marks	50
Credits	01	Total Marks	100
Contact Hours	14	Exam Hours	2
Examination type (SEE)	Practical		
Prerequisites: The students should have knowledge on • Basic Computer Skills • Basic Understanding of Building Construction • Knowledge of CAD Software • Spatial Visualization Skills			
Course objectives: • Understand the concept of Building Information Modelling • Create the workflow followed in industry during creation of BIM 3D model which includes • Building the discipline-based model and create the federated models			
Teaching-Learning Process (General Instructions) Teachers can use following strategies to accelerate the attainment of the various course outcomes. 1. Chalk and Talk with Black Board 2. ICT based Teaching 3. Demonstration based Teaching			
Exercise			
1. Introduction Building Information Modelling			
2. Revit Projects: Project Templates, Revit File Types Working with Revit Elements and Families Exploring the User Interface Starting a Project			
3. Setting Up Levels and Grids (Datum Planes) Setting up Levels & Modifying Creating Grids			
4. Modelling Walls Creating Walls Modify wall types			
5. Working with Doors and Windows Loading Door and Window Types from the Library Creating Additional Door and Window Sizes			
6. Using Editing Tools & Working with Views: Using Editing Commands Setting the view display Visibility Graphics, Duplicate Views Elevations & Sections , Adding Callout Views Creating and Modifying 3D Views			
7. Modelling Floors Creating and Modifying Floors			
8. Modelling Stairs, Railings, and Ramps Creating & Modifying Stairs Working with Railings Sketching Custom Stairs Creating Ramps			
9. Modelling Roofs Creating Roofs by Footprint Using Join & unjoin roof			

Course outcome (Course Skill Set)

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

CO1: Prepare, read and interpret the drawings in a professional set up. (PO-1,2,5,6 PSO-1,2)

CO2: Know the procedures of submission of drawings and Develop working and submission drawings for building. (PO-1,2,5,6 PSO-1,2)

CO3: Plan of residential or public building as per the given requirements with details (PO-1,2,5,6 PSO-1,2)

Assessment Details (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) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures 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 Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.

The marks scored shall be scaled down to **20 marks** (40% of the maximum marks). The final CIE marks of the course out of 50 will be the sum of scaled-down marks scored in the report write-up/journal and marks of a test

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedules mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

- 1. The minimum duration of SEE is 02 hours

Suggested Learning Resources:**Books**

1. ISO 19650 - Building Information Modelling (BIM)
BIM Handbook – Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston

Web links and Video Lectures (e-Resources):

E-learning content on L&T EduTech Platform.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Create a plan of residential building and practice BIM tools