Engineering Geology Building Materials and Components

Course Code	**22CV301**	**Year**	**2023-24**	**Semester**	**III**
Course Category	**PCC**	**Branch**	**Civil**	**Course Type**	**Theory**
Credits	**3**	**L-T-P-C**	**3-0-0-3**		
Continuous Internal Evaluation:	**50 Marks**	**Semester End Evaluation:**	**50 Marks**	**Total Marks:**	**100 Marks**

Course Outcomes	**At the end of the course the student will be able to:**	**Mapping to POs**
CO1	Develop ability to Identify and list the varieties of minerals and rocks based on structure and composition	PO1, PO2, PO6, PO7
CO2	Illustrate the various construction material like glass and plastic	PO2, PO3, PO6,PO7
CO3	Comprehend the modern construction material	PO2, PO3, PO6,PO7
CO4	Assessing the properties of building components to match it to quality standards	PO1, PO2, PO6,PO7

Mapping of course out comes with Program outcomes (CO/PO/PSO Matrix)
Note:1-Weakcorrelation 2-Mediumcorrelation 3-Strongcorrelation
***-Average value indicates course correlation strength with mapped PO**

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	2				2	2							
CO2		3	1			2	3							
CO3		2	2			3	3							
CO4	3	2				3	2							
Average *(Rounded tonearestinteger)	3	2	1			2.5	2.5							

MODULE 1

Application of Geology in Civil Engineering Practices, Understanding the earth, internal structure and composition. Classification of Rocks, Igneous Rocks, Sedimentary Rocks and Metamorphic Rocks of their properties with examples.

Mineralogy: Mineral properties, composition and their use in the manufacture of construction materials – Quartz Group (Glass); Feldspar Group (Ceramic wares and Flooring tiles); Kaolin (Paper, paint and textile); Asbestos (AC sheets); Carbonate Group (Cement) ; Gypsum (POP, gypsum sheets, cement); Mica Group (Electrical industries); Ore minerals - Iron ores (Steel); Chromite (Alloy); Bauxite (aluminum); Chalcopyrite(copper). **10 Hours**

Self- study component:- The students shall visit sites and learn to identify different types of rocks and minerals and study their performance

MODULE 2

Stones: Varieties of building stones, qualities of good building stones, dressing of stones, selections and suitability of stones, uses of stones, decay and preservation of stones, quarrying of stones. Bricks- Qualities of brick making earth, standard specifications, properties and testing of bricks Plastics: Types, constituents of plastic, properties, uses of plastics in building industriesPaints, Varnishes and Distempers: Constituents of oil paint, characteristics of a good paint, types of paints,. Varnishes – constituents of varnishes – types of varnishes, Distemper and application to new and old surfaces. Surface preservatives - metallic coating by hot dipping. Glass and its application in Civil Engineering. **10 Hours**

Self- study component: The students shall visit construction sites and learn to identify different types of building materials and study their performance

MODULE 3

Solid and hollow blocks, stabilized mud blocks, aerated blocks, rammed earth, reinforced brick work Properties and application of modern insulation materials in residential buildings Aerogel Vacuum Insulation Panels (VIPs) for building construction industry utilisation of FRP composites in the civil infrastructure Composite Ferro Cement System: s, Precast Concrete Blocks: Laminated Thermo Plastic Panels. **10 Hours**

Self- study component: The students shall visit the construction site and must identify the new construction materials and study their performance

MODULE 4

Brick Masonry: Different types of bonds - English, Flemish. Lintel its types and uses in buildings. Chejja its types and uses in building and chejja. Staircases: Types, Empirical design of doglegged staircase and open well staircase. Location of doors, size of doors and door frames, types of doors and windows, ventilators.. Form work: Material for form work, types of form works, shuttering and scaffolding details in RCC columns, beams and floors **10 Hours**

Self- study component: The students shall visit the construction sites and identify various types of doors , flooring materials and bonds in masonry

Text Books

1. Parbin Singh , “Engineering & General Geology [paperback] Katson educational series [Jan 01, 2013]
2. B.C. Punmia, “Building Construction”, 10thedition, Laxmi Publications, New Delhi, 2007
3. S.C Rangwala., “Engineering Materials”, 28th edition, Charotar Publishing House, Anand, 1997

Reference Books:

1. P.C. Varghese. “Building Construction”, Prentice Hall of India, New Delhi, 2007
2. Sushil Kumar, “Building Construction”, 16th edition, Standard Publishers & Distributors, New Delhi, 2005
3. K.S. Jagadish and B.V. Venkatarama Reddy,1STEdition ,“Alternative Building Materials and Technologies”New age international(p) ltd.
4. W B Mackay, “Building Construction” Vol 4, Pearson Publications.

Engineering Surveying

Course Code	22CV302	Year	2023-24	Semester	III
Course Category	IPCC	Branch	Civil Engineering	Course Type	Theory
Credits	4	L-T-P-C	3-0-2-4		
Continuous Internal Evaluation:	50	Semester End Evaluation:	50	Total Marks:	100

Course Outcomes	At the end of the course the student will be able to:	Mapping to POs
CO1	Apply the knowledge of fundamentals of surveying and solve traverse problems using compass survey	PO1, PO2
CO2	Compute the RLs of points in different field conditions by applying necessary corrections and comprehend the knowledge of contouring and interpolate the contours	PO1, PO2
CO3	Calculate the angles measured by theodolite and determine the RL of points by different methods when the base is accessible and in-accessible	PO1, PO2
CO4	Comprehend the knowledge of working principle and system of measurements in total station and apply the knowledge to set out simple, compound and reverse curves	PO1, PO2,PO5

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
*** - Average value indicates course correlation strength with mapped PO**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2												
CO2	3	2												
CO3	3	2												
CO4	3	2			1									
Average * (Rounded to nearest integer)	3	2			1									

MODULE 1

Introduction - Definition and Importance of survey, Classification of survey. Principles of survey. Classification of maps, Units of measurements, Conventional symbols.

Chain surveying - Accessories used in chain survey, Ranging, Reconnaissance survey, Field book, Index sketch, Errors, Map numbering system. Problems on well-conditioned triangle. **Compass surveying** - Basic definitions, Prismatic and Surveyor's compasses, Traversing, Declination, Quadrantal bearings, Whole circle bearings, Local attraction, and related problems

11 Hrs

Lab component: Field experiments to set out perpendiculars at various points on a given line using cross staff, tape and direct and indirect ranging operations. Measurement of bearing of the sides of a closed traverse.
07Hrs

MODULE 2

Leveling – Objectives and uses of leveling, Definitions and Terms used in leveling, Types of levels, Correction to Curvature and Refraction, Calculation of RL by HI method and Rise and fall method, Fly leveling and Profile leveling, Numerical problems.
Contouring – Definition and Uses, Characteristics of contours, Methods of contouring, Interpolation of contours, Contour gradient

10 Hrs

Lab component: Field experiments to conduct profile leveling to draw the longitudinal and cross section and also to conduct block levelling for preparation of contour Plan.

07Hrs

MODULE 3

Theodolite Survey - Theodolite and types, Fundamental axes and Parts of a transit theodolite, Uses of theodolite, Temporary adjustments of a transit theodolite, Measurement of horizontal angles using Repetition and Reiteration methods – Measurement of vertical angles. **Trigonometric Levelling** - Determination of elevation of objects when the base is accessible and inaccessible by single plane and double plane method – Distance and difference in elevation between two inaccessible objects by double plane method, and related problems.

11Hrs

Lab component: Field experiments to determine the horizontal angle between the points by repetition and reiteration method and also to determine the vertical angle by single plane method using theodolite. `

07Hrs

MODULE 4

Curves: Necessity, types of curves, simple curves – elements, designation of curves,
Simple curves: elements – setting out of simple curves by linear methods and method of Rankine's deflection angles.
Compound curves: elements – setting out of compound curves.
Reverse curve: between two parallel straights – equal radius – unequal radius.
Total station Survey - EDM devices and their working principles, Co-ordinates system of measurements, Temporary adjustment of Total station, Parts of total station, Accessories.

10Hrs

Lab component: Introduction to Total Station, Parts of Total Station and setting up of total station.

07Hrs

Textbooks

1. Punmia B. C., "Surveying Vol 1 &2", Laxmi Publications, Pvt. Ltd, New Delhi 2015.
2. Bassak N. N., "Surveying", Tata McGraw Hill, 2004.

Reference Books:

1. Chandra A. M., "Higher Survey", New Age International, 2006.
2. Roy. S. K., "Fundamentals of Surveying", Prentice Hall of India, 2009.
3. Chandra A. M., "Plane Surveying", New Age International ® Ltd.
4. Punmia B. C, Ashok K Jain, Arun K Jain, Higher Surveying Laxmi Publications Pvt. Ltd 2008.
5. S. S. Bhavikatti, Surveying and Levelling - Vol-1, I.K. International publishing house Pvt. Ltd, New Delhi, 2011

Strength of Materials

Course Code	22CV303	Year	2023-24	Semester	III
Course Category	IPCC	Branch	Civil	Course Type	Theory
Credits	4	L-T-P-C	3-0-2-4		
Continuous Internal Evaluation:	50 Marks	Semester End Evaluation:	50 Marks	Total Marks:	100 Marks

Course Outcomes	At the end of the course the student will be able to:	Mapping to POs
CO1	Comprehend the basic properties of materials and behavior of materials under load with basics of structural mechanism	PO1, PO2, PO3
CO2	Calculate the Bending Moments & Shear Forces for given statically determinate beams subjected to different types of loads and support conditions. Understand the behavior of long and short columns and to calculate their load carrying capacities under axial loading	PO2, PO3, PO4
CO3	Calculate the bending stresses and shear stresses for given beams of symmetric cross sections and represent the variation of fiber stresses and shear stresses in diagrams.	PO2, PO3, PO4
CO4	Compute the deflection of statically determinate beams for various loads and support conditions and understand the concept of compound stresses and the applications of the same in 2-D problems.	PO2, PO3, PO4

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
*** - Average value indicates course correlation strength with mapped PO**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1											
CO2		3	2	1										
CO3		3	2	1										
CO4		2	3	1										
Average * (Rounded to nearest integer)	3	2.5	2	1										

MODULE 1

Simple Stresses and Strains : Introduction, Assumptions, Properties of materials, Types of stresses and strains, definition and units, Hooke's law, Poisson's ratio, volumetric strain, elastic constants and therelationship among them, Stress–Strain diagrams for ferrous and non-ferrous materials, Bars of varying crosssections -Tapering bars of circular and rectangular cross – sections, Elongation due to self-weight, Analysis of composite sections, thermal stresses including compound bars.

10hrs

Lab component: Tension test, compression test on mild steel and shear test on cast iron and mild steel specimen.

8hrs

Self-Study Component: Learn to distinguish ferrous and non-ferrous materials, composite sections and concept of loading and stress.

MODULE 2

Bending moments and shear forces: Statically determinate beams, Definition of shear force and Bending moment, Sign conventions, Relationship between intensity of loading, shear force and bending moment. S.F and B M diagrams for cantilever, simply supported and over-hanging beams subjected to point loads, UDL, UVL and couples. **10 hrs**

Stresses in Beams - Bending stresses in beams: Introduction, Pure bending, Assumptionsin simple bending theory, Bernoulli's Beam bending equation, Modulus of rupture, Section modulus, Flexural rigidity, Beam of uniform strength, Bending stress distribution in rectangular, circular, I,T and channel sections (symmetric about one axis).

11 hrs

Lab Component: Hardness tests on Ferrous and Non-ferrous metals– Brinell's, Rockwell's and Vicker's apparatusand Impact test on Mild Steel (Charpy &Izod). **8hrs**

Self-Study Component : Students shall work out Bending moment and shear force diagrams for typical loading of structural components. They shall also learn to estimate the bending stresses developed in the structural components.

MODULE 3

Shear stresses in beams: Introduction, Expression for shear stress intensity, Shear stress distribution in rectangular section, Circular, I, T and channel sections, Numerical examples (symmetric about one axis).

Torsion of Circular Shafts: Introduction, Application of torsion in civil engineering, Assumptions, Equationfor torsional shear stress in prismatic bar of circular cross-section, Strength and Stiffness, Torsional rigidity and Polar modulus, Power transmitted by solid and hollow circular shafts, Numerical examples.

10hrs

Lab Component: Torsion test on Mild Steel circular section (Vertical and horizontal torsion tests).

6hrs

Self-Study Component : The students shall work out shear stress distribution for typical singly symmetric Cross sections. Torsional stresses in circular shafts and principal stresses and principal planes due to the action of torsional moment and bending moment shall be worked out for typical cases of distribution of torsional moment and bending moment.

MODULE 4

Deflection of Beams: Definition of slope and deflections, Differential equation of flexure, Sign conventions, Expressions for slope and deflection for standard loading cases using (a) Double Integration method and (b) Macaulay's method for prismatic beams. Examples on cantilever beams, simply supported beams and over hanging beams carrying point loads, UDL, UVL and couples.

Columns and Struts: Introduction, Short and long columns, Euler's theory of long columns, Derivations, Assumptions and limitations, Radius of gyration,Effective length, Slenderness ratio, Buckling load (concepts Of stability of structures), Rankien's formula and its applications.

10 hrs

Lab Component. Experimental Investigation on Flexure Test on Wood under point load.

6hrs

Self-Study Component: The students shall learn the importance of flexure by visiting sites of construction and workout slope & deflections in structural elements due to typical loading cases. The students shall calculate the buckling loads for long columns with different end conditions and hence understand the importance of end conditions in the buckling behaviour of columns.

Text Books:

1. Ramamrutham.S, "Strength of Materials", Dhanpath Rai Pub. New Delhi,1988
2. Thimoshenko and Young, "Elements of Strength of Materials", Affiliated East west Press.
3. Davis, Troxell and Hawk, "Testing of Engineering Materials", International Student Edition, McGraw Hill, New Delhi.

Reference Books:

1. Vazirani and Ratwani, "Analysis of Structures" Vol.1, Khanna Publishers, New Delhi 2002
2. Basavarajaiah & Mahadevappa, "Strength of Materials", CBS Publishers and Distributors, New Delhi, 1999.
3. Ferdinand L. Singer, "Strength of Materials", Harper and Row Publications, 1987.
4. Ho1les K A, "Experimental Strength of Materials", English Universities Press, London.

Water Supply and Treatment Engineering

Course Code	22CV304	Year	II	Semester	III
Course Category	PCC	Branch	Civil	Course Type	Theory
Credits	3	L-T-P-C	3-0-0-3		
Continuous Internal Evaluation:	50	Semester End Evaluation:	50	Total Marks:	100

Course Outcomes	At the end of the course the student will be able to:	Mapping to POs
CO1	Estimate average and peak water demand for a community.	PO1,PO2,PO7
CO2	Evaluate available sources of water, quantitatively and qualitatively and make appropriate choices for a community.	PO1,PO6, PO7
CO3	Evaluate water quality and environmental significance of various parameters and plan suitable treatment system	PO1,PO2,PO3
CO4	Design a comprehensive water treatment and distribution system to purify and distribute water to the required quality standards.	PO1,PO2,PO3,

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
*** - Average value indicates course correlation strength with mapped PO**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO2
CO1	2	3					1							
CO2	3					2	2							
CO3	1	3	2											
CO4	1	2	3										1	
Average * (Rounded to nearest integer)	1	3	3			2	2							

MODULE 1

Introduction: Need for protected water supply, Factors affecting water supply scheme and benefits. **Demand Of Water:** Types of water demands - domestic demand, institutional and commercial, public uses, fire demand. Factors affecting per-capita demand, variations in demand of water, Peak factor, Design periods and factors governing the design period. Different methods of Population forecasting. Fire demand - Estimation by Kuichling's formula, Freeman formula and National Board of Fire UnderWriters formula. **Water Treatment:** Objectives and Treatment flowchart – significance of each unit. **Sources:** Concept of hydrological cycle, Surface and subsurface sources - suitability with regard to quality and quantity. Factors governing the selection of particular source of water.

10 Hrs

MODULE 2

Quality of Water: Concept of safe water: wholesomeness, palatability and potable. Waterborne diseases including Health significance of Fluoride and Nitrates. Examination of water: Objectives, Physical, Chemical and Microbiological Examinations using analytical & instrumental techniques. Drinking water standards: BIS & WHO standards. Numerical problems on pH and MPN. **Collection and Conveyance of Water:** Intake structures - different types of intakes; factors for the selection and location of intakes. Pumps - Necessity, types, power of pumps, factors for the selection of a pump. Design of the economical diameter for the rising main. **10 Hrs**

MODULE 3

Aeration – Principle and types of aerators. **Sedimentation**: Theory, settling tanks, types and design. Aided sedimentation- with coagulants, dosages, chemical feeding, flash mixing and flocculates. **Filtration**: Mechanism - theory of filtration, types of filters- slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design (excluding under drainage system and backwashing of filters). **Disinfection**: Definition, Requirements, methods of disinfection, Chlorination, chlorine demand, residual chlorine.

10 Hrs

MODULE 4

Softening: Definition, methods of removal of hardness by lime soda-process and zeolite process with merits and demerits. **Miscellaneous treatment** : Removal of colour, odour and taste with methods like aeration, use of copper sulphate, activated carbon treatment, oxidizing organic matters, removal of iron and manganese. Fluoridation and defluoridation. RO and Nano Filtration. **Methods of Distribution Systems**: System of supply, service reservoirs and their capacity determination, distribution systems of layouts. **Water Conservation** – Rain Water Harvesting.

10Hrs

Self Study Component: Visit to intake structure, water treatment plant and report working of each unit. Design of water treatment plant units and distribution system with population forecasting for the given city. Water conservation methods.

Text Books:

1. Water Supply Engineering: Environmental Engineering - Vol. I – 2017 Santosh Kumar Garg, Khanna Publisher, ISBN-10: 9788174091208
2. Punmia B.C. and Ashok Kumar Jain, **"Environmental Engineering- I**",Arihant Publications,

Reference Books:

1. Hammer and Hammer, "**Water Technology",** Mc Graw Hill Publications Howard S. Peavy, Donald R. Rowe. George Tchobanoglous, **"Environmental Engineering"** - McGraw Hill International Ed. ISBN-10: 9351340260
2. CPHEEO Manual on water supply and treatment engineering, Ministry of Urban Development, Government of India, New Delhi, 3rd Edition, 2018, Akalank Publications; ISBN-10: 8176393819

COMPUTER-AIDED BUILDING PLANNING AND DRAWING

Course Code	**22CV305**	**Year**	**2nd**	**Semester**	**3**
Course Category	**PCCL**	**Branch**	**CIVIL**	**Course Type**	**Lab**
Credits	**1**	**L-T-P-C**	**0-0-2-1**		
Continuous Internal Evaluation:	**50 marks**	**Semester End Evaluation:**	**50 marks**	**Total Marks:**	**100**

Course Outcomes	**At the end of the course the student will be able to:**	**Mapping to POs**
CO1	Prepare, read and interpret the drawings in a professional set up.	PO5, PO6, PO12
CO2	Plan and design residential and public buildings as per the requirements	PO5, PO8, PO10

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
*** - Average value indicates course correlation strength with mapped PO**

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1					3	2						1		
CO2					3			2		1				
Average * (Rounded to nearest integer)					3	2		2		1		1		

List of Exercises

1. Standard layout of drawing sheet:, Size of drawing sheets, Title block as per B.I.S specifications Title of the drawing. Drawing number, Scale, Symbols used in the drawing, types of lines. Name of the firm, and Initials of staff, who have designed, checked and approved. The general principle of dimensioning : Purpose of Scale, units of measurements
2. Plan, elevation and sectional details using paper and pencil for single storied residential building from the given single line diagram. (Set-back distances and calculation of carpet area, plinth area and floor area ratio).
3. Introduction to CAD TOOLS.
4. Plan, elevation and sectional details using CAD TOOLS for single storied residential building from the given single line diagram as per the byelaws.
5. Plan, elevation and sectional details using paper and pencil and preparation of schedule of openings for double storied residential building from the given single line diagram.
6. Plan, elevation and sectional details using CAD TOOLS and preparation of schedule of openings for double storied residential building from the given single line diagram as per the byelaws. (Furniture layout to be included)
7. Plan and elevation using CAD TOOLS and preparation of schedule of openings for public buildings (School) from the given single line diagram.
8. Sectional details using CAD TOOLS and preparation of schedule of openings for public buildings (School) from the given single line diagram.
9. From a given single line diagram, preparation of electrical layout for a given building using CAD tools.

10. From a given single line diagram, preparation of water supply and sanitary layout for a given building using CAD tools.
11. Functional design of buildings using bubble diagram. Development or line diagram for a primary health center with given details and requirements.
12. Functional design of buildings using bubble diagram. Development or line diagram for a office building (Engineer's office) with given details and requirements.
13. Functional design of buildings using bubble diagram. Development or line diagram for a college canteen with given details and requirements.

Self-study component: Students shall visit construction sites and observe the various components of the building

Note:

1. Students should sketch to dimension all the above exercises in a sketch book/ graph book before doing the computer drawing
2. CIE 1 + Lab exam (3 hours)

Text Books:

1. MG Shah, CM Kale, SY Patki, "Building drawing with an integrated approach to Built Environment Drawing" , Tata Mc Graw Hill Publishing co. Ltd., New Delhi

2. Gurucharan Singh, "Building Construction", Standard Publishers, & distributors, New Delhi.

Reference Books:

1. "National Building Code", BIS, New Delhi, 2016.
2. CAD lab Manual, Department of Civil Engineering, MCE

Rural Urban Planning and Architecture

Course Code	22CV306A	Year	2nd	Semester	3
Course Category	ESC	Branch	CIVIL	Course Type	Theory
Credits	3	L-T-P-C	3-0-0-3		
Continuous Internal Evaluation:	50 marks	Semester End Evaluation:	50 marks	Total Marks:	100

Course Outcomes	At the end of the course the student will be able to:	Mapping to POs
CO1	Comprehend the basic objects and principles of town planning and types of planning.	PO1, PO4, PO9
CO2	Apply land use analysis, zoning regulations to development plan.	PO1, PO7, PO9
CO3	Demonstrate the problems in rural areas, legislation in planning; Comprehend the knowledge on norms, procedures, etc., in planning;	PO1, PO6, PO9
CO4	Comprehend the role of Architecture and how this is connected to Society and the Environment	PO1, PO6, PO9

Mapping of course outcomes with Program outcomes (CO/PO/PSO Matrix)

Note:1-Weak correlation 2-Mediumcorrelation 3-Strongcorrelation

*-Average value indicates course correlation strength with mapped PO

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3					1	2							
CO2	3					1	2							
CO3	3					1	2							
CO4	3					1	2							
Average * (Rounded to nearest integer)	3					1	2							

MODULE 1

Definition of Urban unit or town, Standard Urban areas, classification of towns and cities, Urban Infrastructure Management, Components of Urban Infrastructure, definition of planning by various planners, objects of town planning, aims of planning, main goals of Modern town planning, characteristics of successful planning, principles of town planning, necessity of town planning, physical, social and economic resources, origin of towns: Natural growth: Concentric spread, Ribbon Development, Satellite Growth, Scattered Growth, Planned Growth: Horizontal and Vertical Growth, types of planning, relationship between planning, policy and implementation, types of surveys, techniques of surveys, scale for structuring questionnaire. Selection of samples, type of selection of samples, errors in surveying. Population growth, density of population, occupational categories, evolution of towns in India: Ancient, medieval and modern, urbanization in India, Functional classification of towns. **10 Hours**

Self study component: Students shall collect the information from Census, the Hassan Development Authority, Municipality Office regarding population growth, occupational pattern of Hassan city and submit a report.

MODULE 2

Definition of zoning, zoning regulations, principles of zoning, advantages of zoning, maps for zoning, Aspects of Zoning: Density, Height and Use Zoning, building bye-laws, developed and undeveloped area, developed and undeveloped land, land use and land use pattern in urban areas, the character of a town, categories of a town, densities of town, planning process, detailed classification of land uses, classification of urban road and rural roads, Perspective plan, Development plan, Annual plan and Plans of Projects/Schemes, Surveys to be conducted before Development Plan, objectives of a Master Plan, necessity, data to be collected, drawing to be prepared, features of a Master plan, planning standards, report, stages of preparation, method of execution, Outline and Comprehensive Development Plan.

10 Hours

Self study component: Students shall collect the information from the internet on evolution of cities- visit the Hassan Development Authority and collect details on concept of zoning, Comprehensive Development plan for Hassan city submit a report.

MODULE 3

Rural Planning **:** Definition – Surveys – Development plan for a village – Problems of rural housing – Areas of development – Socio Economic aspects of housing, Legislation in Planning: Objectives of Development Controls – Technical considerations for formation of Building Bye-laws – Urban local bodies – Public health and sanitation – Public works and public utilities – Education and Social Welfare Development – Administrative and General Functions– Obligatory and Discretionary functions**.** **10 Hours**

Self study component: Students shall collect the information from the local village panchayath office and collect details on development plan of the village-socio economic aspects of housing, submit a report.

MODULE 4

Architecture as a Profession: Defining and introducing architecture as a profession. Skills and traits for architects. Professional and moral responsibilities of architect. Contribution of pioneering architects in shaping of our environment and society. **10 Hours**

Text Books:

1. Rangawala.S.C., Rangawala P.S & Rangawala.K.S " Town Planning" Charotar Publishing House, Anand, India, 1987. (Module 1, Module 2, Module3 and Module-4)
2. Abir Bandyapadhyay " Text Book of Town Planning" Books and Allied (P) ltd, Calcutta, India 2000 (Module 1, Module 2, Module3 and Module-4)
3. Rame Gowda. K.S " Urban and Regional Planning", Prasaranga, University of Mysore, Mysore, 1986 (Module 1, Module 2, Module3 and Module-4)

Reference Books:

1. Arthur.B.Gallion Simon Eisner "The Urban Pattern" CBS Publishers and Distributors, New Delhi, 1998.
2. Lewis Keeble, "Principles and Practices of Town & Country Planning", The Estates Gazette Limited, London, 1969.
3. Kadiyali L. R., "Traffic Engineering & Transport Planning" Khanna Publishers, Delhi, 2005.
4. C A O' Flahertly, "Transport Planning and Traffic Engineering", Butterworth-Heinemann, An
5. Imprint of Elsevier, 2006. (Edited)
6. Partha Chakroborty & Animesh Das, "Principles of Transportation Engineering", Prentice Hall of India Private Limited, New Delhi, 2003.
7. Kulshrestha S. K., "Dictionary of Urban and Regional Planning", Kalpaz Publications, Delhi,

2006.

8. Urban Development Plans Formulation & Implementation (UDPFI) Guidelines, Ministry of Urban Affairs & Employment, Government of India, New Delhi

Course Code:	22CV306B	Year	2023-24	Semester	III
Course Category:	ESC	Branch	Civil Engineering	Course Type	Theory
Credits:	3	L-T-P-C	3-0-0-3		
Continuous Internal Evaluation:	50	Semester End Evaluation	50	Total Marks	100

Course Outcomes	At the end of the course the student will be able to:	Mapping to POs
CO1	Explain the basics of sustainable development, sustainableengineering, and its role in engineering	PO6, PO7
CO2	Comprehend the integration methods of sustainability toengineering design	PO3, PO7
CO3	Apply the concepts of sustainable engineering and principles in engineering	PO1, PO7
CO4	Apply the principle and methodology of life cycle assessment tool to engineering systems	PO5, PO7, PO9

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
*** - Average value indicates course correlation strength with mapped PO**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1						2	3							
CO2			1				3							
CO3	2						3							
CO4					3		2		1					
Average *(Rounded to nearest integer)	2		1		3	2	3		1					

MODULE 1

Role of engineers, Exploring sustainability - Definition, System thinking, Engineering ecology, Concept of triple P, Overview of making a sustainable design - General applicable design steps, Design steps specific for a sustainable design, Challenges for a sustainable design - Challenges relative to a reference case, Stage-gate innovation funnel, Open innovation with sustainable development goals, Risks and required innovation effort constraints

10 Hours

Self-study Component: Assessment of sustainability in their neighborhood in education, water resources, food supplies, etc., identify the potential threats for sustainability, and explore the possible solutions for the same.

MODULE 2

Design process as teamwork - Forming design groups, Group dynamics, Setting goal and scope - Assigning the design problem, Goal of the design, Design scope, Defining value streams,
Sustainability constraints - Guiding principle for sustainable design, People, Planet, Profit/Prosperity, Required domain knowledge partner and stakeholder identification, Design synthesis - Integral synthesis, Generation of solutions, Risk assessment and mitigation by research and development, Case studies

10 Hours

Self-study Component: Debate on selected topics on sustainability engineering

MODULE 3

Preliminary solutions assessment, Quick scan Life Cycle Assessment (LCA) - Set-up, Goal definition and scoping, Inventory analysis, Impact assessment, Valuation, Improvement, LCA Epilogue, Evaluation of design - Stage/Gate evaluation with stakeholders, Rapid economicanalysis method, Rapid social acceptance guideline, Rapid integral sustainable development assessment, Scenario set building for robustness test to future uncertainties, Red flags method forevaluation with outside stakeholders

10 Hours.

Self-study Component: Perform a Life Cycle Assessment of any daily-use products or activities.

MODULE 4

Sustainability complexity and design competences, Acquiring key competences - Workshop setting, Sustainable design and scientific research, Sustainable design and conventional design, Examples from engineering practices - sustainable design and construction practices in the built environment – GRIHA and LEED rating systems

10 Hours

Self-study Component: Explore the design aspects of a sustainable building / maintaining a sustainable transport system for MCE.

Self-study Component will be evaluated for 20 marks. Students are expected to complete at least two activities and submit a report on the case study. The list of activities includes but not limited to the self-study component listed under each module.

Textbooks:

1. Bakshi, B. R. (2019). Sustainable Engineering: Principles and Practice. UnitedKingdom: Cambridge University Press. ISBN: 9781108420457
2. Harmsen, J., and Jonker, G. (2012). Engineering for Sustainability: A Practical Guide forSustainable Design. Netherlands: Elsevier Science. ISBN: 9780444538468

Reference Books:

1. Wasewar, K. L., and Rao, S. N. (Eds.). (2022). Sustainable Engineering, Energy, and the Environment: Challenges and Opportunities. United Kingdom: Apple Academic Press.ISBN: 9781000565058
2. Ramjeawon, T. (2020). Introduction to Sustainability for Engineers. United Kingdom: CRC Press. ISBN: 9781000026726
3. Babu, G. S., Saride, S., and Basha, B. M. (Eds.). (2017). Sustainability issues in civil engineering (p. 367). Singapore: Springer. DOI: 10.1007/978-981-10-1930-2. ISBN: 9789811019289
4. Gibson, A., and Johnson, A. (2014). Sustainability in Engineering Design. Netherlands: Elsevier Science. ISBN: 9780124045910

Environmental Protection and Management

Course Code	22CV306C	Year	II	Semester	III
Course Category	ESC	Branch	CIVIL	Course Type	Theory
Credits	3	L-T-P-C	3-0-0-3		
Continuous Internal Evaluation:	50	Semester End Evaluation:	50	Total Marks:	100

Course Outcomes	At the end of the course the student will be able to:	Mapping to POs
CO1	Explain various environmental pollution / contamination issues, code of practice and environmental legislation	PO1, PO6, PO7
CO2	Discuss emerging environmental problems, preventive measures and forensics	PO1, PO6, PO7
CO3	Describe urban land use patterns pollutant pathways and protection in urban ecosystems	PO1, PO6, PO7
CO4	Discuss various aspects of environmental systems, biodiversity, natural resources and environmental sanitation	PO1, PO6, PO7

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
*** - Average value indicates course correlation strength with mapped PO**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO1	PSO2
CO1	3					2	1							
CO2	3					2	1							
CO3	3					1	2							
CO4	3					2	2							
Average * (Rounded to nearest integer)	3					2	2							

MODULE 1

Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution. waste Management & Public Health Aspects: Bio-medical Wastes: Sold waste: Hazardous wastes: E wastes: Industrial and Municipal Sludge. Global Environments concern concept policies and case studies Ground water depletion/recharging. Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people. Environmental Toxicology **10Hrs**

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MODULE 2

Recent Trends - Emerging Environmental problems, Responsibility and Degrees of freedom. Prevention of Significant Deterioration. Pollution prevention hierarchy. Environmental cost, Proactive and Passive Environmental management. Critical thinking on sustaining water resources. Remediation. Environmental Forensics. Sustainable

development. Role of Environmental Engineers in Environmental Protection. Code of Environmental Ethics, economic growth and Environmental quality. Cradle to Grave and Grave to Cradle concepts. **10Hrs**

MODULE 3

Urban and Rural Ecosystems - Land use pattern and Landscape, Zoning regulation for different land users and externalities caused by mixed land uses, Special Economic Zone (SEZ), Coastal Regulation Zone (CRZ), Urban green belt concept – Biological species for Carbon Sequestration, Importance of lung space. Neighbourhood concepts.
Environmental Legislation - History, Rules and Acts, Declaration at Stockholm and Rio, Town and Country Planning Acts.
Organizations involved in Environmental Protection: MoEF CC, CPCB, SPCB, Water Boards, NGT, WHO, NEERI, CPHEEO and BIS. **10Hrs**

MODULE 4

Environmental Systems - Assimilative, Supportive and Carrying Capacity, NCR. Environmental Indices – AQI. WQI, NQI. Environmental Sustainability – Resource depletion and Environmental degradation – Control strategies.
Biodiversity – Concept and Importance. Renewable and Non- Renewable Natural Resources.
Environmental Public Health and Sanitation - Urban and Rural. Swimming pool, Water theme parks, Public bathing Ghats; Institutional Sanitation and Standards. Mass Balance concepts. **10Hrs**

Self-Study Component: Students shall visit town municipality office, pollution control board and various parts of the city and collect the information on methods adopted in managing solid waste and its rules and regulation and also various environmental legislation in protecting environment

Text books

1. Richard. O. Mines. Jr. 2014. Environmental Engineering – Principles and Practice. John Wiley and Sons., USA, New York.
2. Gilbert M. Masters. 2005. Introduction to Environmental Engineering Science, 5th Edition. Prentice Hall of India. New Delhi.
3. RuthF. Weiner and Robin Matthews. 2007. EnvironmentalEngineering.4th Edition. Elsevier Science publications – First reprint in India.

Reference books

1. William W Nazaroff and Lisa Alvarez-Cohen. 2010. Environmental Engineering Science. John Wiley & Sons, New Delhi.
2. Verma P.S. and Agarwal V.K. 1998, Concept of Ecology. S. Chand & Company Ltd. Roorkee.
3. Rai, G.D. 1999. Non-conventional Energy Sources. 3rd Edition, Khanna Publications, New Delhi

SMART URBAN INFRASTRUCTURE

Course Code	**22CV358A**	**Year**	2nd	**Semester**	3
Course Category	**AEC/SEC**	**Branch**	CIVIL	**Course Type**	Theory
Credits	01	**L-T-P-C**	1-0-0-1		
Continuous Internal Evaluation:	50 marks	**Semester End Evaluation:**	50 marks	**Total Marks:**	100

Course Outcomes	**At the end of the course the student will be able to:**	**Mapping to POs**
CO1	Discuss the need, components of smart urban infrastructure.	PO6, PO7
CO2	Interpret the various types of infrastructures concepts and guidelines	PO6, PO8
CO3	Review the management of Smart urban infrastructure by artificial intelligence.	PO7, PO8
CO4	Report on the translation of the smart urban infrastructure initiatives by policies and case studies.	PO9, PO10, PO12

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)

Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation

* - Average value indicates course correlation strength with mapped PO

CO s	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1						2	3							
CO2						3		1						
CO3							3	1						
CO4									3	2		1		
Average * (Rounded to nearest integer)						2.5	3	1	3	2		1		

MODULE - 1

Definition of Smart urban infrastructure. The components of smart urban infrastructure. The need, design principles and policy approaches. Advantages of smart urban infrastructure.

Hierarchy of Urban Development ,Transportation Planning,
Classification of Urban road, Footpath Cycle Tracks, Passenger Car Units (PCU), Parking Bus Terminals Truck Terminal Integrated Freight Complex ,
MRT options for the City, Urban Buses and characteristics ,TOD Norms Non-Motorised Vehicles (NMV),Road Safety, Special Requirements for Barrier Free Built Environment for Disab

led and Elderly Persons, Inland Water Transportation , Airport Planning. **4 Hrs**

Self- study component:

Prepare a report on the National corridor development programs of India..

MODULE - 2

The physical, social and commercial infrastructure. Water Supply, Sewerage& Sanitation Drainage Rain Water Harvesting , Electricity,Solid Waste Management, Domestic Gas Supply Pipelines Telecom Services , Service Level Benchmarking for Infrastructure **3 Hrs**

Self- study component: Watch and make a list of five U Tube links on smart infrastructure projects

MODULE - 3

Artificial Intelligence and management of smart urban Infrastructure of cities. Application and case studies. The challenges in the implementation of smart Infrastructure concepts. The science, technology and innovation driven –policy instruments to address the challenges. **3 Hrs**

Self- study component: Download a document related to the topic of module 3 write a project proposal.

MODULE - 4

Sustainable Development . Sustainable Planning Energy Efficiency . Urban Transport,. Urban Infrastructure . Climate Change Mitigation and Adaptation .
Green Building City Bio Diversity Index. Environment Policies and Statutory Obligation .
National Environmental Policy (NEP), 2006 EIA Notification, 2006 .Environment Protection Act, 1986 Fore st Conservation Act, 1980 , Ministry of New and Renewable Energy Environmental Guidelines Environment al Guidelines for Industries Guidelines for Rain Water Harvesting Guidelines for Buffer Zones Environment al Guidelines for Planning Eco fragile zones Coastal Area Eco Sensitive zones . Water bodies in Urban areas . Financing of smart sustainable development.
4 Hrs

Self- study component: Prepare a presentation and report on the self study components carried out in the modele 1, 2 and 3.

Text Books:

1. National level planning guidelines 'Urban Development Plans Formulation and ... The **URDPFI Guidelines**, 2014 **Volume**-I
2. Smart Cities and Infrastructure, Commission on science and technology for development, 19th session, Geneva, May 2016.
3. People smart –sustainable cities, United Nations Publications 405 East 42nd Street S-09FW001 New York, NY 10017 United States of America Email: permissions@un.or

Reference Books:

1.https://www.gfdrr.org/sites/default/files/D3_CaseStudy16_PaulJacobson_PPP_Smart_cities.original.1531294896.pdf.

2. https://egyankosh.ac.in/bitstream/123456789/39131/1/Unit-2.pdf

3. https://unece.org/housing/smart-sustainable-cities

DIGITAL DRAFTING FOR CIVIL ENGINEERS

Course Code	**22CVL358B**	**Year**	2nd	**Semester**	3
Course Category	**AEC/ SEC**	**Branch**	CIVIL	**Course Type**	Lab
Credits	01	**L-T-P**	0-0-2		
Continuous Internal Evaluation:	50 marks	**Semester End Evaluation:**	50 marks	**Total Marks:**	100

Course Outcomes	**At the end of the course the student will be able to:**	**Mapping to POs**
CO1	Read and interpret building drawings in a professional setup using 3 dimension digital drafting tools	**PO3, PO5, PO8**
CO2	Develop 3D model of a residential and commercial building with all the building elements as per the given requirements	**PO1, PO5,PO9, PO10**

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)

Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation

* - Average value indicates course correlation strength with mapped PO

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1			1		3	2		1						
CO2	1				3				2	2				
Average * (Rounded to nearest integer)	1		1		3	2		1	2	2				

List of Exercises:

1. Introduction to BIM. Understanding building drawings in a 3d environment (CO1)
2. Using 3D tools creation of Levels and Grids. (CO1, CO2)
3. Application of various techniques used in the modeling of walls. (CO1, CO2)
4. Using 3D tools components of doors and windows, and floor slabs. (CO1, CO2)
5. The modeling of staircases and railings. (CO1, CO2)
6. 3D Modeling of a single storied two-bedroom house with plumbing and sanitation details. (CO1, CO2)
7. Generation of Topo surface and contours using site tool for a given project. (CO1, CO2)
8. Placing room tags and room legend options. (CO1, CO2)
9. Create new sheet and place views such as floor plans and plot the sheet. (CO1, CO2)

Self-study component: Each student shall on the internet observe and understand spatial characteristics of architecturally designed Buildings, download and document the same. Relate and create similar features in the lab exercises. The students shall visit- ongoing project sites and study for real time experience of BIM.

Text Books:

1. Linkan Sagar, Sristry Rawal REVIT 2019 Architecture step by step. BPB Publications. 2019
2. S.P Arora, S.P.Bindra The Text book of Building Construction, Dhanpat Rai Publications.

Reference Books:

1. Shah. M. H. and Kale. C.M. "Building Drawing" Tata Mc Graw Hill Publishing Co, New Delhi.
2. Linkan Sagar, Sristry Rawal REVIT 2019 Architecture Training Guide, BPB Publications. 2019.
3. REVIT ARCHITECTURE lab manual.

ANALYSIS OF STRUCTURES

Course Code:	22CV401	Year	2023-24	Semester	IV
Course Category:	PCC	Branch	Civil Engineering	Course Type	Theory
Credits:	3	L-T-P-C	3-0-0-3		
Continuous Internal Evaluation:	50	Semester End Evaluation	50	Total Marks	100

Course Outcomes	At the end of the course the student will be able to:	Mapping to POs
CO1	Analyze the structures subjected to moving loads	PO1, PO2, PO3
CO2	Determine the displacements of determinate structures.	PO2, PO3, PO4
CO3	Carryout the analysis of indeterminate structures by three moment equation and moment distribution method	PO2, PO3, PO4
CO4	Carry out the analysis of indeterminate structures by Kani's method and plastic analysis.	PO2, PO3, PO4

Mapping of course outcomes with Program outcomes (CO/PO/PSO Matrix)
Note:1-Weak correlation 2-Mediumcorrelation 3-Strongcorrelation
***-Average value indicates course correlation strength with mapped PO**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2	1											
CO2		3	2	1										
CO3		3	2	1										
CO4		3	2	1										
Average * (Rounded to nearest integer)	3	3	2	1										

MODULE 1

Influence lines and moving loads: Definition & importance of influence line diagram, Influence line diagram for reactions, shear force & bending moment for simple supported beams, Determination of maximum shear force & bending moment at a section and absolute maximum shear force & bending moment in simply supported beams due to moving UDL & series of point loads.

10 Hrs

MODULE 2

Displacements - Energy Methods: Strain energy and complimentary strain energy, strain energy due to axial load, bending and shear, first theorem of Castigliano, Computation of slopes & deflections of cantilever, cantilever bent & simply supported beams.

Deflection of Beams: Mohr's (Moment-Area) theorems, computation of slopes &deflections of cantilever and simply supported beams using moment area theorems

10 Hrs

MODULE 3

Intorduction to indeterminate structures: Static indeterminacy, degrees of freedom, kinematic indeterminacy. Analysis of continuous beams by 3 moment equation **Analysis of continuous beams by Moment Distribution Method:** Definition of terms distribution factor, carry over factor, Analysis of Continuous Beams and non-sway orthogonal rigid jointed Plane frames with kinematic indeterminacy not more than three.

10 Hrs.

MODULE 4

Analysis of continuous beams by Kani's Rotation Contribution Method: Definition of terms rotation factor, rotation contribution, Analysis of Continuous Beams and non-sway orthogonal rigid jointed Plane frames with kinematic indeterminacy not more than three**. Introduction to Plastic analysis of structures:** Ductility of materials, Plastic deformation, Plastic hinge, Plastic analysis of continuous beams.

10 Hrs.

Textbooks:

1. Vazirani V. N. & Ratwani M. N. – "Analysis of Structures" – Vol. II, 15th Ed., Khanna publications, New Delhi, 2002 (Ch.1 to8)
2. Reddy C. S., "Basic Structural Analysis" second Ed., Tata Mc Graw Hill Publishing Co.ltd, 2006 (Ch.3,4,5,7)
3. Ramamruthum S, "Theory of structures", Dhanpat Rai & Sons, New Delhi.

Reference Books:

1. Norris and Wilbur, "Elementary Structural Analysis", International Student Edition. McGraw Hill, New York.
2. Laursen, "Structural Analysis", International Student Edition McGraw Hill, New Delhi.
3. Wang (Chu-Kia), "Statically Indeterminate Structures", McGraw Hill, New York, 1962.
4. Ramamrutham. S, "Theory of Structures" Dhanpath Rai Publications, New Delhi –2008
5. Wang C.K., "Statically indeterminate structures" Tata McGraw Hill Publishing Co. Ltd, Tokyo, 1952.

FLUID MECHANICS AND HYDRAULICS

Course Code	22CV402	Year	2023-24	Semester	IV
Course Category	IPCC	Branch	Civil Engineering	Course Type	Theory
Credits	4	L-T-P-C	3-0-2-4		
Continuous Internal Evaluation	50	Semester End Evaluation	50	Total Marks	100

Course Outcomes	At the end of the course the student will be able to:	Mapping to POs
CO1	Determine the properties encountered in the analysis of fluid flow	PO1, PO2
CO2	Calculate the hydrostatic pressure and force on plane surfaces	PO2, PO3
CO3	Evaluate the flow through pipes and open channels	PO2, PO3
CO4	Validate the basic principles of fluid mechanics	PO4, PO9

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
*** - Average value indicates course correlation strength with mapped PO**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	1	3												
CO2	3	2												
CO3		3	2											
CO4				3					2					
Average * (Rounded to nearest integer)	2	3	2	3					2					

MODULE 1

Fluids: Definition, Types and Properties - Mass density, Specific volume, Specific weight, Relative density, Viscosity, Vapor pressure, Surface tension, Stability of bubble, droplet and jet, Capillarity. **Fluid Statics:** Fluid Pressure and its Measurements, Fundamental Equation of Fluid Statics. Hydrostatic forces on immersed bodies (vertical and inclined), Buoyancy and stability ofimmersed and floating bodies

10 Hours

Lab component: Determination of properties of any given fluid.
Self-study component: Equilibrium conditions of submerge and floating bodies.

MODULE 2

Fluid kinematics: Methods of describing fluid motion, Types of fluid motion, Inviscid flows, Velocity and acceleration, Rotational and irrotational flows, Reynold's transport equation, Continuity equation, Potential flows, Velocity potential and Stream function, Cauchy-Reimann equations, Flownet, Circulation and vorticity. **Fluid dynamics:** Types of forces, Forces influencing fluid motion, Energy and Head, Energy correction factor, Euler and Bernoulli's equations, Application of Bernoulli's equation, Flow measurement

10 Hours

Lab component: Reynold's experiment and classification of flow; Verification of Bernoulli's equation

Self-study component: Linear momentum equation, Momentum correction factor, Applications of momentum equation.

MODULE 3

Pipe flow: Reynold's number and classification of flow, Head loss - Major loss in pipe flow - Hagen-Poiseulle equation, Darcy-Weisbach equations and use of Moody's Diagram, Head loss - Minor losses, Total energy and hydraulic gradient lines, Compound pipes, Pipes in series and parallel, Branching pipes, Pipe networks, Hardy-Cross method. Water Hammer, Equations for pressure rise due to gradual and sudden closure of valves in rigid and elastic pipes - numerical problems. **Introduction to boundary layer theory:** Boundary layer growth in flow over a plate, Flow past immersed bodies.

10 Hours

Lab component: Calibration of Venturi-meter; Determination of major and minor losses in pipes, Determination of hydraulic coefficients of orifice

Self-study component: Surge tanks – types and functions

MODULE 4

Uniform Open Channel Flow: Flow measurement using notches and weirs – rectangular, triangular, trapezoidal notches. Uniform flow Equations for uniform flow - Chezy's and Manning's equations, Most economic channel sections of different geometry, Energy concepts in free surface flows. Specific energy and Specific force diagrams, Critical flow, and Hydraulic exponentfor critical flow. Hydraulic Jump - Equation for a classic hydraulic jump, Practical applications, Energy loss and efficiency of a jump.

10 Hours

Lab component: Calibration of notches and weirs

Self-study component: Free surface flows, Comparison of open channel flow with pipe flow, Classification of flow in open channels.

Laboratory Component: The laboratory component focuses on the assessment of students as an individual as well as a team player for the assigned group activity.

The laboratory component will be evaluated for 20 marks.

Textbooks:

1. Modi, P. N., and Seth, S. M. (2019). Hydraulics and Fluid Mechanics includingHydraulic Machines, 21st Edition, Standard Book House, New Delhi. ISBN: 9788189401269
2. Bansal, R. K. (2010). Textbook on Fluid Mechanics and Hydraulic Machines, LaxmiPublications, New Delhi. ISBN: 9788131808153

Reference Books:

1. Vennard, J. K. (2011). Elementary Fluid Mechanics. United Kingdom: Read BooksLimited. ISBN: 9781446547816
2. Kumar, K. L. (2008). Engineering Fluid Mechanics. India: S. Chand Limited. ISBN:9788121901000
3. Jain, A. K. (2004). Fluid Mechanics: Including Hydraulic Machines. India: Khanna Publishers. ISBN: 9788174091949
4. Arora, K. R. (2005). Fluid Mechanics, Hydraulics and Hydraulic Machines. India: StandardPublishers Distributors. ISBN: 9788180140709

Concrete Technology

Course Code	22CV403	Year	2023-24	Semester	IV
Course Category	IPCC	Branch	Civil Engineering	Course Type	Theory
Credits	4	L-T-P-C	3-0-2-4		
Continuous Internal Evaluation	50	Semester End Evaluation	50	Total Marks	100

Course Outcomes	At the end of the course the students will be able to	Mapping to POs
CO1	Gain knowledge on basic properties of concrete ingredients such as cement, sand etc and Understand the various issues inrespect of types of cement, types of admixtures types of aggregates, mix proportions etc.	PO1, PO2, PO4, PO5
CO2	Apply the knowledge to production of special concrete to conform to the requirements of typical field condition	PO1, PO2, PO4, P05
CO3	Understand the importance of durability and its role in concretemix design.	PO1, PO2, PO3, P04
C04	Learn the importance of quality control of concrete. Test concrete for its properties under fresh and hardened statesinclusive of NDT methods	PO1, PO2, PO4, PO5

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
*** - Average value indicates course correlation strength with mapped PO**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2		1	1									
CO2	3	2		1	1									
CO3	2	1	3	1										
CO4	1	3		2	1									
Average * (Rounded to nearest integer)	2	2	3	1	1									

MODULE 1

Concrete Ingredients – Cement, water and Aggregates: Chemical composition of cement, hydrationof cement, types of cement, manufacture of OPC by wet and dry process (flow charts only). Testingof cement – fineness by sieve test and air permeability test, Normal consistency, setting time, soundness (by Le'Chatelier's and auto clave apparatus) compressive strength of cement, field testing of cement. Grades of Cement, Blended cement.

Quality of mixing water. Fine Aggregate - types, Gradation and zoning, fineness modulus, specific gravity, unit weight, moisture content, bulking, presence of deleterious materials. Coarse aggregate – Importance of size, shape and texture, gradation of aggregates, sieve analysis, specific gravity, unit weight, Alkali – Aggregate reaction, Flakiness and elongation indices, crushing and impact strengths, abrasion resistance tests (Relevant BIS provisions to be discussed regarding the properties of concrete ingredients).

Concrete Admixtures: Chemical admixtures - Plasticizer, super plasticizers, accelerators, retarders and air entraining agents, Mineral admixtures – fly ash, GGBS, silica fumesand rice husk ash - applications, advantages &disadvantages. **12hrs**

Lab Component: Determine normal consistency, setting time and soundness of cement by Le chatalier apparatus and determination of specific gravity and compressive strength of cement.

6hrs

Self-Study Component - The students shall visit the concrete lab and learn to understand the principles of mix design pertaining to ongoing consultancy works.

MODULE 2

Process of manufacture of concrete -Batching (volume batching and weigh batching) Mixing: Hand mixing and mechanical mixing, Transportation - wheel barrow, cable and ropeway, conveyer belt, pumping etc., Placing of concrete, Compaction – hand compaction and compaction by vibration, Curing – different methods of curing. Quality control aspects.

Properties of Fresh Concrete: Workability – factors affecting workability, measurement of workability – slump, flow test, compacting factor, Kelly Bal test and Vee-Bee consistometer. Segregation and bleeding. **Properties of Hardened concrete:** - Compressive Strength - Factors affecting strength - w/c ratio, gel/space ratio, effect of maximum size of aggregate and curing, Testing of hardened concrete- compressive strength, split tensile strength. flexural strength. Relation between compressive strength and tensile strength, bond strength, Modulus of rupture. Elasticity – relation b/w modulus of elasticity and strength, factors effecting modulus of elasticity, Poisson's ratio. Shrinkage – plastic shrinkage, drying shrinkage and autogenous shrinkage, factors affecting shrinkage. Creep – measurement of creep, factors affecting creep.

12hrs

Lab Component: Determination of specific gravity, moisture content , water absorption and Sieve analysis of fine and coarse aggregate and of Workability by slump test, flow test,
compaction factor and Vee Bee test of the concrete mix proportion.

08hrs

Self-Study Component - The students should visit construction site and learn to understand workability and properties of green and hardened concrete. Also, to visit the facility of Creep Rig to understand sustained loading on concrete specimen.

MODULE 3

Concrete mix design: Concept of mix design, variables in proportioning, exposure conditions and statistical quality control of concrete, mix design as per IS:456-2000, IS :10262-2019 and SP-23, numerical examples on mix design as per IS. Method. Mix design with and without admixtures. **Durability:** Definition, significance, permeability of concrete. Sulphate attack, chloride attack, carbonation, freezing and thawing, causes of cracking in concrete – plastic shrinkage, settlement cracks, construction joints, thermal expansion, structural design deficiencies etc

08 hrs

Lab Component: . Determination of crushing, Abrasion and Impact test. Shape tests. (Flakiness index, elongation index and Angularity number) of coarse aggregate and determination of compressive strength and split tensile strength of hardened concrete and demonstration of use of admixture and recycling of concrete aggregates

08hrs

Self-Study Component - The students shall visit the concrete lab and learn to identify the different types of cements, aggregates and testing facilities.

MODULE 4

Non destructive testing of concrete: Principles, applications and limitations of Rebound hammer test, Penetration and pull out test, Ultrasonic pulse velocity test and Core test. **Special concretes:** Constituents, properties and applications of Light weight concrete, high density concrete, high strength and high-performance concrete, fiber reinforced concrete, SCC, HVFAC (High Volume Fly Ash Concrete) and Ready mixed Concrete.

08 hrs

Lab Component: Determination of Specific Gravity, penetration and ductility softening point, Flash and fire point, Viscosity on bitumen and Marshall stability test on bituminous mixes .

6hrs

Self-Study Component - The students shall visit the concrete lab and learn to understand the principles of NDT and special concretes pertaining to ongoing research works.

Text Books:

1. Shetty, M.S., "Concrete Technology- Theory and Prctice", S. Chand and Co, New Delhi. 2001.
2. Neville, A.M. and Brooks, J.J.- "Concrete Technology" ECBS edition, Pearson Education, Asia, 2004.

Reference Books:

1. Gambhir, M.L, "Concrete Technology", Tata Mc Graw Hill, New Delhi, 2002.
2. Krishna Raju, "Concrete Mix Design", Sehgal Publishers, 2005.
3. IS:10262 -2009 Recommended guidelines for concrete mix design- BIS publication
4. A R Santhakumar , ' Concrete Technology' Oxford IBH publishers
5. P K Mehta & Monteiro, 'Concrete – Structure and properties. ICI.
6. N.Y.Nayak " Concreting Applications

Building Materials Testing Lab

Course Code	22CV404	Year	2023-24	Semester	IV
Course Category	PCCL	Branch	Civil Engineering	Course Type	Lab
Credits	1	L-T-P-C	0-0-2-1		
Continuous Internal Evaluation	50	Semester End Evaluation	50	Total Marks	100

Course Outcomes	At the end of the course the student will be able to:	Mapping to POs
CO1	Comprehend and appreciate the importance of testing of basic construction materials, their properties & understand the basics behind the acceptance criteria based on the test results	PO1, PO2, PO3, PO4
CO2	Comprehend the importance of quality control based on material testing for suitability and basic failure mechanism of materials under different loading situations	PO1, PO2, P03, P04, PO5

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
*** - Average value indicates course correlation strength with mapped PO**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	1	3		2										
CO2	1	3		2										

LIST OF EXPERIMENTS

1. Tension test on Mild steel specimen, and Rebars, Prestressing strands.
2. Compression test on Mild Steel, Cast iron and Wood.
3. Torsion test on Mild Steel circular section (Vertical and horizontal torsion tests)
4. Flexure Test on Wood under point loading.
5. Shear Test on Mild Steel.
6. Impact test on Mild Steel (Charpy & Izod).
7. Hardness tests on Ferrous and Non-ferrous metals – Brinell's, Rockwell's and Vicker's
8. Tests on Bricks, Concrete blocks and Tiles.

DEMONSTRATION

1. Demonstration of Strain gauges, Strain indicators, Load cells, proving rings, LVDT. NDT Equipment's.

NOTE: All tests shall be carried out as per relevant BIS codes.

Reference Books:

1. Davis, Troxell and Hawk, “Testing of Engineering Materials”, International Student Edition, McGraw Hill, New Delhi.
2. Holes K A, “Experimental Strength of Materials”, English Universities Press, London.
3. Relevant IS codes.

BUILDING INFORMATION MODELLING IN ARCHITECTURE, ENGINEERING AND CONSTRUCTION (BIM)

Course Code	**22CV405A**	**Year**	2	**Semester**	4
Course Category	**ESC**	**Branch**	CIVIL	**Course Type**	theory
Credits	03	**L-T-P-C**	3-0-0-1		
Continuous Internal Evaluation:	50 marks	**Semester End Evaluation:**	50 marks	**Total Marks:**	100

Course Outcomes	**At the end of the course the student will be able to:**	**Mapping to POs**
CO1	Discuss the various dimensions of Building Information Modelling.	PO6, PO7
CO2	Interpret the various planning tools regarding the BIM fundamentals	PO6, PO8
CO3	Review the integrated roles and relationships in building the project information model	PO7, PO8
CO4	Report on the aspects of interface of the Building Information Modelling .	PO9,PO10, PO12

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)

Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation

* - Average value indicates course correlation strength with mapped PO

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1						3	2							
CO2						2		1						
CO3							2	1						
CO4									3	2		1		
Average * (Rounded to nearest integer)						2.5	2	1	3	2		1		

MODULE - 1

BIM: Scope and Definition: Introduction of Building Information Modelling, importance to construction managers, collaboration as the heart of the BIM process. The process driven way of working, BIM execution plan, Benefits of BIM, Virtual Design and Construction and integrated project delivery. Demonstration of REVIT software modeling. **10 Hours**

Self- study component:

Visit a BIM project website and study the various dimensions of the project.

MODULE - 2

BIM Fundamentals: Background, Level of Development, BIM dimensions and uses in the construction phase, phase planning, site utilization planning, 3D co-ordination and clash detection, virtual mock up, Digital fabrication and layout, field tracking, Design- Bid Build. The construction manager, BIM Co-ordinator/ manager. **10 Hours**

Self- study component: : watch a video of 3D co-ordination and clash detection and report on the same orally.

MODULE - 3

BIM Implementation: Introduction, creating the BIM strategy, ensuring better information management, legal and commercial issues, the BIM execution plan, roles and responsibilities, building the project information model, upskilling, BIM and the construction manager, soft landings. **10 Hours**

Self- study component: Download a BIM execution plan and interpret it. Write a report on the same.

MODULE - 4

Aspects of Interface and Case studies: BIM and a technologically advanced construction industry. Selecting the right tools and technologies for the BIM strategy, using mobile devices, software, proprietary versus open file formats, agigning deliverables with the tasks of constructions managers, plain language question, building information exchange. Classification Case studies **10 Hours**

Self- study component: Prepare a presentation and report on the one BIM project case study.

Text Books:

1. Building Information Modelling, Editors: PhD. Eng. Mariola Książek, MSc. Eng. Jerzy Rosłon, Iceland, Great Britain, 2017,
2. https://science.osti.gov/-/media/sbir/pdf/Market-Research/BTO---Building-Information-Modeling-August-2020-Public.pdf

Reference Books:

1. https://www.autodesk.com/industry/aec/bim#:~:text=Building%20Information%20Modeling%20(BIM)%20is,business%20and%20the%20built%20world.
2. https://constructible.trimble.com/construction-industry/what-is-bim-building-information-modeling

CONSTRUCTION EQUIPMENT, PLANTS AND MACHINERY

Course Code	22CV405B	Year	2023-24	Semester	IV
Course Category	ESC	Branch	Civil Engineering	Course Type	Theory
Credits	3	L-T-P-C	3-0-0-3		
Continuous Internal Evaluation:	50	Semester End Evaluation:	50	Total Marks:	100

Course Outcomes	At the end of the course the student will be able to:	Mapping to POs
CO1	Be able to apply theoretical and practical aspects of project management techniques to achieve project goals.	PO1, PO6, PO7
CO2	To understand the various types of construction equipment's used for earthwork,	PO1, PO6, PO7
CO3	Be able to apply knowledge and skills of modern construction practices and techniques in tunnelling, drilling , blasting, dewatering, material handling conveyors its applications in various projects.	PO1, PO6, PO7
CO4	Be able to apply the concepts of various material handling techniques for appropriate projects.	PO1, PO6, PO7

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
*** - Average value indicates course correlation strength with mapped PO**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3					1	2							
CO2	3					1	2							
CO3	3					1	2							
CO4	3					1	2							
Average * (Rounded to nearest integer)	3					1	2							

MODULE 1

CONSTRUCTION EQUIPMENT

Identification – Planning of equipment – Selection of Equipment – Equipment Management in Projects – Maintenance Management– Equipment cost– Operating cost–Cost Control of Equipment - Depreciation Analysis – Replacement of Equipment- Replacement Analysis – Safety Management.

10Hrs.

MODULE 2

EQUIPMENT FOR EARTHWORK

Fundamentals of Earth Work Operations-Earth Moving Operations-Types of Earth Work Equipment - Tractors, Motor

Graders, Scrapers, Front end Waders – Dozer, Excavators, Rippers,Loaders,trucksandhaulingequipment,CompactingEquipment,Finishingequipment.

10Hrs.

MODULE 3

ASPHALT AND CONCRETE PLANTS

Aggregateproduction-DifferentCrushers–Feeders-ScreeningEquipment-HandlingEquipment Batching and Mixing Equipment-Pumping Equipment–Ready mix concrete equipment, Concrete pouring equipment. Asphalt Plant, Asphalt Pavers, Asphalt compacting Equipment.

10Hrs.

MODULE 4

OTHER CONSTRUCTION EQUIPMENT

Equipment for Dredging, Trenching, Drag line and clamshells, Tunneling – Equipment for Drilling and Blasting - Pile driving Equipment - Erection Equipment - Crane, Mobile crane- Types of pumps used in Construction-Equipment for Dewatering and Grouting–Equipment for Demolition.

MATERIALSHANDLINGEQUIPMENT

Forklifts and related equipment - Portable Material Bins – Material Handling Conveyors – Material Handling Cranes-Industrial Trucks.

10Hrs.

REFERENCES:

1. Deodhar,S.V."ConstructionEquipmentandJobPlanning",KhannaPublishers,NewDelhi,1988.
2. Dr.MaheshVarma,"ConstructionEquipmentanditsplanningandApplication",MetropolitanBook Company,NewDelhi.1983.
3. Peurifoy,R.L.,Ledbetter,W.B.andSchexnayder,C.,"ConstructionPlanning,EquipmentandMethods",Mc GrawHill,Singapore,2006.
4. SharmaS.C."ConstructionEquipmentandManagement",KhannaPublishers,NewDelhi,1988.

CONCRETING TECHNIQUES AND PRACTICES

Course Code	22CV405C	Year	2023-24	Semester	IV
Course Category	ESC	Branch	Civil Engineering	Course Type	Theory
Credits	3	L-T-P-C	3-0-0-3		
Continuous Internal Evaluation:	50	Semester End Evaluation:	50	Total Marks:	100

Course Outcomes	At the end of the course the student will be able to:	Mapping to POs
CO1	Evaluate the properties of concrete by conducting test on cement, aggregate and concrete (with & without admixtures) for using the data for mix design procedures.	PO1, PO2, PO6
CO2	Understand to select and proportionate different materials used in a concrete mix including admixtures.	PO1, PO2,PO6
CO3	Design a concrete mix as per requirement of construction project.	PO1, PO2, PO6
CO4	Apply the best practices in concrete construction from industry's requirement, thumb rules, mitigation of concreting issues at Sites.	PO1, PO2, PO6

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
*** - Average value indicates course correlation strength with mapped PO**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2				1								
CO2	3	2				1								
CO3	3	2				1								
CO4	3	2				1								
Average * (Rounded to nearest integer)	3	2				1								

MODULE 1

BLENDING OF AGGREGATES

Fine aggregate: Functions, requirement, Alternatives to River sand, M-sand introduction and manufacturing. Coarse aggregate: Importance of size, shape and texture. Grading and blending of aggregate. Testing on aggregate, requirement. Recycled aggregate

10Hrs.

MODULE 2

MATERIAL PROPERTIES OF CONCRETE

Rheological behavior of concrete, requirements of workability of concrete, Durability & Effect of environmental conditions, Strength & maturity of hardened concrete, Impact, Dynamic and fatigue behavior of concrete, shrinkage and creep of concrete, behavior of concrete under fire.. **10Hrs**.

MODULE 3

METHODS OF MIX DESIGN

Concrete mix design, Basic considerations and choice a mix proportions, various methods of mix designs including IS Code method. Quality control and quality assurance of concrete, Acceptance criteria, Quality management in concrete construction, Inspection and testing of concrete. Non-destructive testing of concrete, core test and load test. RMC concrete - manufacture, transporting, placing, precautions, Methods of concreting- Pumping, under water concreting, shotcrete, High volume fly ash concrete concept, properties, typical mix. Self compacting concrete concept, materials, tests, properties, application and Typical mix.

10Hrs.

MODULE 4

PUMPING AND PLACING OF CONRETE

Pumped concrete, Management of the Concrete Pumping Operation, Selection of Concrete Pump Rigs Before Deployment, Travelling to and from the Site (Truck-mounted Concrete Pump Rigs), During the Pour, Pumping Special Types of Concrete, Concrete Pump Rigs Inspection and Testing.

10Hrs.

REFERENCES:

1. Neville, A.M., Properties of Concrete, Pearson Education Asia (P) Ltd, England, 2000.
2. Concrete Technology, Gambhir M.L, Tata McGraw Hill
3. Concrete Technology, Gambhir M.L, Tata McGraw Hill
4. Concrete Technology, M.S.Shetty, S.Chand& Company New Delhi
5. Concrete microstructure, properties & materials, P.KumarMehata, Paulo & J.M. Monteiro,
6. Light Weight Concrete, Short &Kenniburg, Asia Publishing House, Bombay

Water Resources Engineering

Course Code	22CV405D	Year	2023-24	Semester	IV
Course Category	ESC	Branch	Civil Engineering	Course Type	Theory
Credits	3	L-T-P-C	3-0-0-3		
Continuous Internal Evaluation:	50	Semester End Evaluation:	50	Total Marks:	100

Course Outcomes	At the end of the course the student will be able to:	Mapping to POs
CO1	Explain the significance of hydrological cycle and different sources of water and rainfall distribution	PO1, PO2
CO2	Identify the different ways of water losses and concept of run off	PO1, PO2, PO3
CO3	Describe the concept of river gauging, design discharge and hydrograph theory	PO1, PO2,
CO4	Estimate the rate of flow for confined and unconfined aquifer AND parameters of hydrologic random variables and establish statistical relationships between the variables	PO1, PO2, PO3

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
*** - Average value indicates course correlation strength with mapped PO**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2												
CO2	3	2	1											
CO3	3	2												
CO4	3	2	1											
Average * (Rounded to nearest integer)	3	2	1											

MODULE 1

Introduction: Scope of Hydrology and Water Resources. Hydrological cycle, types of representation,Qualitative representation of Hydrological cycle. Watershed, drainage and catchment area and water budget equation. Climatic seasons and rainy seasons in India. Precipitation: Definition, Types and Forms of precipitation, Measurement of precipitation and types of rain gauges, introduction to Telemetric Rain Gauges(TRG) and Tropical Rainfall Measuring Mission (TRMM). Rainfall data source, Indian Meteorological Department (IMD) and state gauging department. Rain gauge network, optimum number of rain gauges. Various types of representation of precipitation data, Mass Curve and Estimation of missing precipitation data,Consistency of rainfall data. Different methods of computation of average depth of precipitation over an area.

10 Hrs

Self-study component: Students should prepare a report on following a) visit a nearby Rain Gauge Station to observe the typical arrangements. b) Collect the information on Telemetric Rain Gauge (TRG) & TropicalRainfall Measurement Mission (TRMM). c) Visit the Indian Meteorological Department (IMD) and extract rainfall data.

MODULE 2

Water Losses: Infiltration, Definition, processes, factors affecting infiltration. Measurement of infiltration (double ring infiltrometer), Horton's infiltration curve and infiltration indices. **Evaporation**, Definition, process, factors affecting evaporation and measurement of evaporation by IS pan. **Evapo-transpiration**. Definition, PET and AET, factors affecting Evapo-transpiration and estimation of Evapo-transpiration by Blaney–Criddle equation and Lysimeters. **Runoff:** Definition, Components, factors affecting Runoff. Basin yield, rainfall-runoff relationship using simple regression analysis. Computation of maximum flood discharge using Dicken's, Ryve's and rational and Empirical formulae. **10 Hr**

Self-study component: Students should prepare a report: Visit a nearby IMD station and collect layout details for raingauge, evaporation pans, anemometer, and sunshine recorder.

MODULE 3

Stream flow measurement: Area-Velocity and Slope-Area methods, Stage discharge curve, Runoff, Long and short-term runoff, hydrograph analysis - Components of hydrograph, separation of base flow. Unit hydrograph theory, derivation, and application of unit hydrograph. Computation of unit hydrograph ordinatesof different duration, S-Curve & its uses.

Groundwater Hydrology: Soil water zones: vertical distributions of soil water and ground water table. **Soilmoisture relations:** definition and relation between Porosity, Specific retention, Specific yield. **Occurrence of ground water**: Definitions of aquifer, aquitard, aquifuge, aquiclude, perched aquifer and Unconfined aquifer, Confined aquifer, Leaky aquifer.

10 Hrs

Self-study component: Students should prepare a report on stream gauging station, stage discharge curve. Simple hydrograph on stream flow data of the nearby station.

MODULE 4

Aquifer parameters: Types and classification of ground water movement, Darcy's law, and its validity. Definition, mathematical expression and units of Storage coefficient, Permeability, Hydraulic conductivity, Transmissivity, Storativity. **Well Hydraulics:** Assumptions in Steady radial flow into a confined andunconfined wells and expression for discharge into well, Yield and Safe Yield of an open well using pumpingtest and recuperation test, Specific capacity, Saline water intrusion in aquifers and control. Artificial ground water recharging.

Introduction to Probability and Statistical Techniques in Water Resources Engineering: Types of Variables, Discrete Random Variables, Continuous Random Variables, Deterministic Process & expectations.Expression and simple numerical on correlation and regression analysis. Types of probability distributions in water resource engineering (expression and parameters), descriptions and simple numerical normal distributions **10 Hrs**

Self-study component: Students should prepare a report on a) collect the information on bore-log data and Ground water level of an observation well. b) Map of major river basins of India c) List of important water resource projects of India and in Karnataka.

Textbooks:

1. Subramanya, K. (2013). Engineering Hydrology. India: McGraw Hill Education (India) Private Limited.
2. Reddy, P. J. R. (2011). A Textbook of Hydrology. India: University Science Press

Reference books:

1. Berndtsson, R., Bhunya, P., Ojha, C. S. P. (2008). Engineering Hydrology. India: Oxford UniversityPress.
2. Garg, S. K. (2013). Hydrology and Water Resources Engineering. India: Khanna Publishers, Delhi

Total Station Application in Civil Engineering

Course Code	22CVL456A	Year	2023-24	Semester	IV
Course Category	AEC	Branch	Civil Engineering	Course Type	Lab
Credits	1	L-T-P-C	0-0-2-1		
Continuous Internal Evaluation:	50	Semester End Evaluation:	50	Total Marks:	100

Course Outcomes	At the end of the course the student will be able to:	Mapping to POs
CO1	Calculate the bearings of traverse and determine the elevations of different points on the ground to obtain cutting and filling for various projects using total station	PO1, PO2,PO5,PO9
CO2	Determine the area of given boundary using total station and to set out different types of curves and center line marking in the field using Total station	PO1, PO2, PO5,PO9

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
*** - Average value indicates course correlation strength with mapped PO**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	3			2				1					
CO2	2	3			2				1					
Average * (Rounded to nearest integer)	2	3			2				1					

List of Exercises

1. To carryout Temporary adjustments of total station
2. To Determine the horizontal angle and vertical angle between the points using total station
3. To Determine the area of given boundary by traverse surveying
4. To determine the difference in elevation between two points using Total station
5. To Conduct profile levelling and cross sections for water supply / sewage line and draw theHighway longitudinal section to determine the cutting and filling for given formation level.
6. Preparation of Block levelling and contour mapping
7. To set out a simple curve using total station
8. To set out Compound curve by Using Total Station. (Using Rankine's deflection angles)
9. To set out Reverse curve by Using Total Station. (Using Rankine's deflection angles)
10. Preparation of Centre line marking, Column positioning and Footing marking using Total station.

Reference Materials:

1. Basak. N. N., “Surveying”, Tata McGraw Hill Publishing Co., ltd, 2004
2. Punmia, B. C, “Irrigation and Water Power Engineering”, Laxmi Publications, New Delhi,1992.
3. Khanna, S. K. & Justo CES, “Highway Engineering”, Nemchand Brothers, Roorkee, 2003.
4. Garg, S. K., “Water Supply Engineering”, Khanna Publishers, New Delhi, 2007

COMPONENTS OF A SMART CITY

Course Code	**22CV456B**	**Year**	2	**Semester**	4
Course Category	**AEC/SEC**	**Branch**	CIVIL	**Course Type**	Theory
Credits	01	**L-T-P-C**	1-0-0-1		
Continuous Internal Evaluation:	50 marks	**Semester End Evaluation:**	50 marks	**Total Marks:**	100

Course Outcomes	**At the end of the course the student will be able to:**	**Mapping to POs**
CO1	Discuss the need, key outcomes that define a Smart city.	PO6, PO7
CO2	Interpret the guiding principles and steps to make a city smart	PO6, PO8
CO3	Review the financing pattern and the benchmarking for smart cities	PO7, PO8
CO4	Report on the translation of the smart city initiatives by the government of India.	PO9, PO10, PO12

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
*** - Average value indicates course correlation strength with mapped PO**

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1						3	2							
CO2						2		1						
CO3							2	1						
CO4									3	2		1		
Average * (Rounded to nearest integer)						2.5	2	1	3	2		1		

MODULE - 1

Definition of Smart city. The key outcomes that define a smart city. The need for smart city. The guiding principles of smart cities. The various steps that need to be considered to make the city smart. **4 Hours**

Self- study component:

Visit a smart city website and study the various projects of the smart cities mission.

MODULE - 2

Smart City initiatives worldwide, the Indian scenario, The process of selection for smart cities. Case studies. The challenges before the Indian smart cities. . **4 Hours**

Self- study component: : Download the document of a smart city and understand the process of development of the vision for the city by people participation

MODULE - 3

Policies and regulations, the funding pattern. The nature and extent of the central government support. Program financing and loan repayment process. Tendering for smart cities. The proposed benchmarks for smart city. Program monitoring. **4 Hours**

Self- study component: Download the document of a smart city and understand the financial scheme

MODULE - 4

The smart city initiatives by the Government of India - Policy for smart city, Mission statement & guidelines, Case studies. Implementation and monitoring of projects. **4 Hours**

Self- study component: Prepare a presentation and report on the self study components carried out in the modelu 1, 2 and 3.

Text Books:

1. Making a City Smart: Learnings from the Smart Cities Mission, Ministry of Housing and Urban Affairs, Government of India. March 2021 (New Delhi)
2. Smart cities in India, Pallavi Shukla, Information Analyst, TERI and Programme Officer, TERI ENVIS Center on Renewable Energy & Environment The Energy & Resources Institute, (TERI) Website: www.teriin.org (2015)

Reference Books:

1. https://unece.org/sites/default/files/2021-01/SSC%20nexus_web_opt_ENG_0.pdf

2. Mission statement &guidelines on Smart City Scheme". Government of India - Ministry of Urban Development http://smartcities.gov.in/upload/uploadfiles/files/Smart City Guidelines(1).pdf.