Malnad College of Engineering,

Hassan

[An Autonomous Institution Affiliated to VTU Belagavi]

Autonomous Programme

Bachelor of Engineering in Civil Engineering

Scheme & Syllabus

III & IV Semester

(2024-25 Admitted Batch)

Academic Year: 2025-26

Department of Civil Engineering

Vision of the Department

The Department of Civil Engineering will be a centre of excellence in industry-oriented teaching, training, research, professional ethics, social responsibility, and continuing education for practicing engineers through sponsored research and consultancy services

Mission of the Department

1. To improvise the curriculum to include contents pertaining to situational experience of a variety of sites and develop a sense of social responsibility and to enhance research orientation of students through internship programs.
2. To enhance sponsored research and consultancy works to achieve effective industry-institute-interaction and conduct Continuing Education Programme for practicing engineers.
3. To inculcate professional ethics through quality and modern construction practices.
4. To switch over to modern methods of material testing, Engineering analysis and design.

Program Educational Objectives (PEOs)

PEO1: The graduate will be successful professionally and contribute to core civil engineering construction projects, infrastructure projects, alternative construction technology projects, green buildings towards environmental sustainability for academic domain as well as for research and pursue higher studies.

PEO2: The graduate will be professionally sound in a broad area of knowledge of various dimensions of civil engineering and allied fields.

PEO3: The graduate will be a team leader/effective team member with ethical values, versatile, quick learner will adapt to given professional context with lifelong learning capability.

PROGRAM OUTCOMES (POs)

1. **Engineering knowledge**: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
3. **Design/Development of solutions**: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
4. **Conduct investigations of complex problems**: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
5. **Engineering tool usage**: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
6. **The engineer and the world**: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
8. **Individual and collaborative team work:** Function effectively as an individual, and as a member or leader in diverse/multidisciplinary settings.
9. **Communication:** Communicate effectively and inclusively within the community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
10. **Project management and finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. **Life-long learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOMES

PSO1: The Graduates will demonstrate ability to design a civil engineering system, components or process to meet desired Project needs.

PSO2: Graduates will be familiar with civil engineering professional software tools and demonstrate their ability in applying them for the solution of design situations.

Malnad College of Engineering, Hassan
Department of Civil Engineering

Scheme of Evaluation for Theory Courses

	Portions for CIE	Mode of Evaluation	Weight age in Marks
CIE-1	Syllabus to be decided by the Course Coordinators such that the entire COs shall be covered.	Descriptive Test	10
CIE-2		Descriptive Test	10
CIE-3		Descriptive Test	10
Activity	Minimum of Two Activities to be conducted	Assignment/Case Study/Practical/ Working Model/Quiz	20
		Total	50

Examination		Max. Marks	Minimum Marks to be scored	Minimum Average Marks to qualify
CIE	Tests	30	12 (>=40%)	40 (= 40%)
	Activities	20	08 (>=40%)	
SEE		50	17.50 (>=35%)	

Scheme of Evaluation for Laboratory Courses

Evaluation Type	Evaluation Modules	Marks
Continuous Internal Evaluation (C.I.E.) in every Laboratory session by the Course Coordinator	**Conduction of Experiments**	**10**
	Observation and Tabulation of Results	**10**
	Record Writing	**20**
	Viva-Voce/Quiz	**10**
Continuous Internal Evaluation(C.I.E.)		**50**
Semester End Examination (S.E.E.)		**50**

Note: The marks distribution to be made based on the rubrics for a particular laboratory course.

COURSE TYPES

Basic Science Course	BSC
Engineering Science Course	ESC
Emerging Technology Course	ETC
Programming Language Course	PLC
Professional Core Course	PCC
Integrated Professional Core Course	IPCC
Professional Core Course Laboratory	PCCL
Professional Elective Course	PEC
Open Elective Course	OEC
Project/Mini Project/Internship	PI
Humanities and Social Sciences, Management Course	HSMC
Ability Enhancement Course	AEC
Skill Enhancement Course	SEC
Universal Human Value Course	UHV
Non-credit Mandatory Course	MC

THIRD SEMESTER												
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PCC	24CV301	Engineering Geology ,Building Materials and Components	3	0	0	3	50	50	100	3
2	IPCC	24CV302	Engineering Surveying	3	0	2	5	50	50	100	4
3	IPCC	24CV303	Strength of Materials	3	0	2	5	50	50	100	4
4	PCC	24CV304	Water Supply and Treatment Engineering	3	0	0	3	50	50	100	3
5	PCCL	24CV305	Computer Aided Building Planning and Drawing	0	0	2	2	50	50	100	1
6	ESC		ESC/ETC/PLC	2	0	2	4	50	50	100	3
7	UHV	24SCR	Social Connect and Responsibility	0	0	2	2	100	-	100	1
8	AEC/ SEC		Ability Enhancement Course/Skill EnhancementCourse-III	If the course is a Theory				50	50	100	1
				1	0	0	1				
				If the course is a laboratory							
				0	0	2	2				
9	MC	24NYP1	NSS,YOGA,PE	0	0	2	2	100	-	100	A
10	BSC	24BCM301	Bridge Mathematics-I (Mandate Audit Course for Diploma entry students)	3	0	0	3	100	-	100	A
			Total	18		14	32				20
Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme												

Engineering Science Course(ESC/ETC/PLC)	
Course Code	**Course Name**
24CV306A	Urban and Rural Planning
24CV306B	Sustainability in Engineering Design
24CV306C	Environmental protection and Management
Ability Enhancement Course–III	
24CV358A	Smart Urban Infrastructure
24CVL358B	Digital Drafting for Civil Engineers (Lab)
24CVL358C	Skill Lab

FOURTH SEMESTER

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PCC	24CV401	Basic Structural Analysis	3	0	0	3	50	50	100	3
2	IPCC	24CV402	Fluid Mechanics and Hydraulics	3	0	2	5	50	50	100	4
3	IPCC	24CV403	Concrete Technology	3	0	2	5	50	50	100	4
4	ESC		ESC/ETC/PLC	3	0	0	3	50	50	100	3
5	UHV	24UHV	Universal Human Values	0	2	0	2	50	50	100	1
6	AEC/SEC		Ability Enhancement Course/Skill Enhancement Course- IV	If the course is a Theory				50	50	100	1
				1	0	0	1				
				If the course is a laboratory							
				0	0	2	2				
7	MC	24NYP2	NSS,YOGA,PE	0	0	2	2	100	-	100	A
8	BSC	24BE406	Biology for Engineers	0	2	0	2	50	50	100	1
			Total	13	04	08	25				17

Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme

Engineering Science Course (ESC/ETC/PLC)	
Course Code	**Course Name**
24CV404A	Building Information Modelling in Architecture, Engineering and Construction (BIM)
24CV404B	Construction Equipment, Plants and Machinery
24CV404C	Concrete Design and Placements
24CV404D	Hydrology and Water Resources Engineering
24CV404E	Waste water engineering
Ability Enhancement Course–III	
Course Code	**Course Name**
24CVL405A	Total Station Application in Civil Engineering (Lab)
24CV405B	Components of a Smart City

FIFTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PCC	24CV501	Advanced Structural Analysis	3	0	0	3	50	50	100	3
2	PCC	24CV502	Construction Planning and Management	3	0	0	3	50	50	100	3
3	IPCC	24CV503	Geotechnical Engineering	3	0	2	5	50	50	100	4
4	IPCC	24CV504	Transportation Engineering	3	0	2	5	50	50	100	4
5	PCCL	24CV505	Environmental Engineering Laboratory	0	0	2	2	50	50	100	1
6	HSMC	24EVS	Environmental Studies	1	0	0	2	50	50	100	1
7	PEC	24CV56X	Professional Elective Course – I	3	0	0	3	50	50	100	3
8	MC	24NYP3	NSS,YOGA,PE	0	0	2	2	100	-	100	A
9	AEC	24RIP	Research Methodology and IPR	3	0	0	3	50	50	100	3
			Total	19	0	08	27				22

Professional Elective Courses	
Course Code	**Course Name**
24CV561	Occupational Safety and Health assessment
24CV562	Remote Sensing and GIS
24CV563	Groundwater Development and Management
24CV564	Repair and Rehabilitation of Structures
24CV565	Stability Analysis of Slopes
24CV566	Environmental Impact Assessment

SIXTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	IPCC	24CV601	Design and Detailing of RC Structures	3	0	2	5	50	50	100	4
2	PCC	24CV602	Irrigation Engineering and Hydraulic Structures	3	0	0	3	50	50	100	3
3	PCC	24CV603	Applied Geotechnical Engineering	3	0	0	3	50	50	100	3
4	PI	24PROJ1	Main Project Phase-I	0	0	4	4	50	50	100	2
5	PEC	24CV65X	Professional Elective Course - II	3	0	0	3	50	50	100	3
6	OEC	24OEXX	Open Elective Course-I	3	0	0	3	50	50	100	3
7	PCCL	24CVL606	Software Application Lab	0	0	2	2	50	50	100	1
8	PCC	24CV607	Advanced Survey Training	0	0	2	2	50	50	100	1
9	OEC	24SWY	*Swayam (NPTEL only)	AUDIT							
10	MC	24NYP4	NSS,YOGA,PE	0	0	2	2	100	-	100	A
11	AEC	24ASK	Analytical Ability and Soft Skills	0	0	2	2	50	50	100	1
			Total	15	0	12	27				21

Professional Elective Course-II	
Course Code	**Course Name**
24CV651	Theory of Elasticity
24CV652	Structural dynamics
24CV653	Traffic Engineering
24CV654	Rural Water Supply & Sanitation
24CV655	Groundwater Hydraulics
24CV656	Modern Construction Methods and Mechanization
24CV657	Composites & Smart Materials

Open Elective Course-I	
Course Code	**Course Name**
24OECV661	Water Supply and Sanitation
24OECV662	Composite and Smart Materials
24OECV663	Hazardous Waste Management
24OECV664	Sustainability in Engineering Systems
24OECV665	Railway Engineering
24OECV666	Remote Sensing and GIS
24OECV667	Hydrology

SEVENTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PCC	24CV701	Specifications & Quantity Surveying	3	0	0	3	50	50	100	3
2	PCC	24CV702	Prestressed Concrete Structures	3	0	0	3	50	50	100	3
3	PCC	24CV703	Design of Steel Structures	3	0	2	5	50	50	100	4
4	PCC	24CV704	Design of Bridges and Flyovers	3	0	0	3	50	50	100	3
	PCC	24CV705	Technical Seminar	0	0	2	2	50	50	100	1
4	PI	24PROJ2	Main Project Phase-II	0	0	8	8	50	50	100	4
5	PEC	24CV76X	Professional Elective Course - III	3	0	0	3	50	50	100	3
6	OEC	24OECV 77X	Open Elective Course– II	3	0	0	3	50	50	100	3
Total				18	02	10	30				24

Professional Elective Course-III	
Course Code	**Course Name**
24CV761	Railway, Harbour & Airport Engineering
24CV762	Earthquake Resistant Design of Structures
24CV763	Advanced Foundation Design
24CV764	Industrial Waste water Treatment
24CV765	Advanced Design of RC Structures
24CV766	Finite Element Analysis
24CV767	Building Information Modelling
24CV768	Watershed Management

Open Elective Course-II	
Course Code	**Course Name**
24OECV771	Water Supply and Sanitation
24OECV772	Composite and Smart Materials
24OECV773	Hazardous Waste Management
24OECV774	Sustainability in Engineering System
24OECV775	Railway Engineering
24OECV776	Remote Sensing and GIS
24OECV777	Water Resources Management
24OECV778	Engineering Optimization

EIGHTH SEMESTER											
Sl. No	**Course Category**	**Course Code**	**Course Title**	**Teaching Hours/Week**				**Exam Marks**			**Credits**
				L	**T**	**P**	**Total**	**CIE**	**SEE**	**Total**	
1	PEC	24SW01	Professional Elective (Online Course)	3	0	0	3	50	50	100	3
2	OEC	24SW02	Open Elective (Online course)	3	0	0	3	50	50	100	3
3	PI	24INT	Internship (Research/Industry) (15-20 weeks)	0	0	12	12	100	100	200	10
Total				6	0	12	18				**16**

Course Title	ENGINEERING GEOLOGY, BUILDING MATERIALS AND COMPONENTS		
Course Code	24CV301	(L-T-P)C	(3-0-0)3
Exam	3 Hrs	Hours/Week	3
SEE	100 Marks	Total Hours	42L+48ABL=90

Course Objective:

1.Study and identify different types of natural materials like rocks & minerals and soil.

2. Give students a clear understanding on structural functions and role of materials to achieve that

Course Outcomes:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Identify varieties of minerals and rocks based on structure and composition	PO1	
2	Apply your knowledge in various construction materials, for sustainable and innovative building solutions.	PO1	
3	Analyze modern construction materials designed for energy efficiency and sustainability	PO2	
4	Assess the properties of building materials & components to compare it to quality standards	PO7, PO9, PO10	

MODULE-1	10 Hrs.

Application of Geology in Civil Engineering Practices, Understanding the earth, internal structure and composition. Introduction to the Seismic zone . 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; Carbonate Group (Cement) ; Gypsum (POP, gypsum sheets, cement); Silica Group ; Ore minerals - Iron ores (Steel); Chromite (Alloy); Bauxite(aluminum);Chalcopyrite(copper).

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

MODULE-2	10 Hrs.
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, Testing of Stones. Bricks Qualities of brick making earth, standard specifications, properties and testing of bricks Solid and hollow blocks, stabilized mud blocks, aerated blocks, rammed earth, reinforced brick work. Different types of masonry bonds - English, Flemish. ***Self- study component: The students shall visit construction sites and learn to identify different types of Masonry units , bonds in masonry and study their performance***	
MODULE-3	**10 Hrs..**
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 formwork, types of form works, shuttering and scaffolding details in RCC columns, beams and floors ***Self- study component: The students shall visit the construction sites and identify various types of doors, and***	
MODULE-4	**12 Hrs.**
Lintel its types and uses in buildings, Plastics: Types, constituents of plastic, properties, uses of plastics in building industries Paints, 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. 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 FerroCement System: s, Precast Concrete Blocks: Laminated ThermoPlastic Panels ***Self- study component: The students shall visit the construction site and must identify the new construction materials and study their performance***	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	"Engineering & General Geology [paperback]	Parbin Singh	Eighth edition	Katson educational series	[2020]
2	"Building Construction",	B.C. Punmia	Twelfth Edition	Laxmi Publications, New Delhi,	2023

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	"Building Construction",	P.C. Varghese.	2nd edition	Prentice Hall of India, New Delhi,	2017
2	"Building Construction",	Sushil Kumar,	20th edition,	Standard Publishers & Distributors, New Delhi,	2023
3	IS 2185 Concrete masonry units:		Fourth edition		2005
4	IS 1077-1992 COMMON BURNT CLAY BUILDING BRICKS-SPECIFICATION		Fifth edition		2005

EBooks and online course materials:

1. https://www.classcentral.com/subject/construction-materials
2. https://testbook.com/civil-engineering/building-materials-uses

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc23_ce107/preview
2. https://onlinecourses.nptel.ac.in/noc20_ar04/preview

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component			
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Assignment 2) Regular short quizzes conducted for each module for understanding of the most recent concepts.	20
Total		**50**

Activity Based Learning (27 Hours)

ABL1 (XX Hours) : Activity 1 Details		**Hours**
1.	Field Visit	8
2	Report	6
Total		**14**
ABL2 (YY Hours): Activity 2 Details		**Hours**
1	1.Presentation	3
	2.Assignment	10
Total		**13**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test(1,2 and 3)	3
Quiz(1and 2)(optional)	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2												
CO2	3												
CO3		3											
CO4							2		2	2			

Course Title	ENGINEERING SURVEYING		
Course Code	24CV302	(L-T-P)C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	100 Marks	Total Hours	42L+28P+50ABL=120

Course Objective:

1. Understand conventional and modern methods of surveying.
2. Develop ability to transform basic concepts of surveying to field practice.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply the knowledge of fundamentals of surveying to determine the relative position of points in the horizontal plan.	PO1, PO2	
2	Apply the knowledge of fundamentals of surveying to calculate the relative position of points in vertical plan	PO1, PO2	
3	Comprehend the knowledge of working principle and system of measurements in EDM	PO1	
4	Apply the knowledge surveying to set out simple, compound and reverse curves.	PO1, PO2	

MODULE-1	12 Hrs.

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 with a well-conditioned triangle.

Compass surveying - Basic definitions, Prismatic and Surveyor's compasses, Traversing, Declination, Quadrantal bearings, Whole circle bearings, Local attraction, and related problems

Total station Survey - EDM devices and their working principles, Coordinates system of measurements, Temporary adjustment of Total station, Parts of total station, Accessories.

Self - study component: Students shall study the various maps and drawings in surveying

MODULE-2	10 Hrs..
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 Use of Total Station for Levelling and Contouring ***Self-study component: Students shall visit the ongoing project of water supply and highway.***	
MODULE-3	**10 Hrs..**
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 ● Use of Total Station for Measurement of Angles ***Self-study component: Students shall study the advanced survey techniques***	
MODULE-4	**10 Hrs.**
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. ● Use of Total Station to set the Curves ***Self-study component: Students shall visit the ongoing highway projects.***	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Surveying Vol 1 & 2	Punmia B. C	18th	Laxmi Publications, Pvt. Ltd, New Delhi	2016
2	Surveying	Bassak N. N	2nd	Tata McGraw Hill	2017

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Fundamentals of Surveying	Roy. S. K.,	2nd	Prentice Hall of India,	2010
2	Surveying and Levelling	S. S. Bhavikatti,	2nd	International publishing house Pvt.	2018

EBooks and online course materials:

1. https://archive.nptel.ac.in/courses/105/107/105107122/

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc22_ce05/preview

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	26
6	Evaluation of Learning Process	-	-	10
Total Learning Hours/Semester				**120**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Laboratory Plan (if integrated course):

Lab Program	Program Details
1	Field experiments to set out perpendiculars at various points on a given line using cross staff, tape and area calculation
2	Direct ranging operations.
3	Indirect ranging operations.
4	Measurement of bearing of the sides of a closed traverse.
5	Profile leveling to draw the longitudinal and cross section of highway.
6	Block levelling for preparation of contour Plan.
7	Determine the horizontal angle between the points by repetition and reiteration method
8	Determine the horizontal angle between the points by reiteration method
9	Determine the vertical angle by single plane method using theodolite.
10	Introduction to Total Station, Parts of Total Station and setting up of total station.

Activity Based Learning (27 Hours)

ABL1 (13 Hours) : Activity 1 - Centreline Marking		**Hours**
Designing cycling path centerlines:		
1.	Measure RLs and compute cross-sections.	07
2.	Calculate earthwork volumes.	06
Total		**13**
ABL2 (13 Hours): Activity 2 - Bridge fieldwork with data analysis		**Hours**
Data Processing & Quality Check Station		
1.	Import raw data into software, validate coordinate frames	07
2.	Analyze outliers, perform adjustment, generate reports	06
Total		**13**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test(1,2 and 3)	3
Quiz(1and 2)(optional)	1
Lab Test	3
Semester End Exam	3
Total	**10**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2											
CO2	3	2											
CO3	3												
CO4	3	2											

Course Title	STRENGTH OF MATERIALS		
Course Code	24CV303	(L-T-P)C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	100 Marks	Total Hours	42L+48ABL=90

Course Objective:

To understand how solid materials behave under various types of forces and loads.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
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 a 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	

MODULE-1	10 Hrs

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 the relationship among them, Stress–Strain diagrams for ferrous and non-ferrous materials ,FRP Bars and Prestressing Strands, Bars of varying cross sections -Tapering bars of circular and rectangular cross – sections, Elongation due to self-weight, Analysis of composite sections, thermal stresses including compound bars.

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

MODULE-2	10 Hrs

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. Stresses in Beams - Bending stresses in beams: Introduction, Pure bending, Assumptions in 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)

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	10 Hrs

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, Equation for 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.

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	10 Hrs

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 overhanging beams carrying point loads, UDL, UVL and couples.
Columns and Struts: Introduction, Short and long columns, Concept of Stability of 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), Rankine's formula and its applications.

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.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Strength of Material	S. Ramamrutham and R. Narayanan	20	Dhanpat Rai Pub. New Delhi	2020
2	Strength of Materials	Thimoshenko and Young	3	CBS Publisher and Distributor	2002

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	"Analysis of Structures"	Vazirani and Ratwan	Vol 1	Khanna Publishers	2002
2	"Strength of Materials"	SS Bhavikatti	Fourth	Vikas Publishing House	2018

EBooks and online course materials:

1. https://onlinecourses.nptel.ac.in/noc24_me145/preview

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component			
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Laboratory Plan (for integrated course):

Lab Program	Program Details
1	Tension test on mild steel specimen and Reinforcing bars, bend and Rebend Tests
2	Compression test on mild steel and Cast Iron specimen.
3	Shear test on cast iron specimen
4	Hardness tests on Ferrous and Non-ferrous metals– Brinell's apparatus
5	Impact test on Mild Steel (Charpy & Izod).
6	Torsion test on Mild Steel circular section (Vertical and horizontal torsion tests).
7	Experimental Investigation on Flexure Test on Wood under point load condition.

Activity Based Learning (27 Hours)

ABL1 (XX Hours) : Activity 1 Details		**Hours**
1.	Identify the physical and mechanical differences between ferrous and non-ferrous materials listing out their typical applications in engineering structures.	2
2.	Identify the behavior of composite materials and how composite sections respond under axial loading.	3
3.	Understand the concept of thermal stress and evaluate its effects in compound bars subjected to temperature variation.	1
4.	Draw Shear Force (S.F) and Bending Moment (B.M) diagrams for cantilever, simply supported, and overhanging beams subjected to point loads, uniformly distributed loads (UDL), uniformly varying loads (UVL), and couples.	4
5.	Develop proficiency in estimating section modulus and flexural rigidity for beams under bending.	4
6.	Analyze the development of torsional stresses in solid and hollow circular shafts and apply relevant equations to calculate stiffness and power transmission.	2
7.	Determine shear stress distribution for standard symmetric cross-sections subjected to transverse loads.	4
Total		**20**
ABL2 (YY Hours): Activity 2 Details		**Hours**
8.	Work out deflection and slope in prismatic beams using double integration and Macaulay's method for various loading conditions.	2
9.	Visit construction sites (or refer to case studies) to observe real-world structural deflections and correlate theoretical findings.	2

10.	Compute buckling loads for columns with various end conditions using Euler's and Rankine's methods, and understand the importance of slenderness ratio and effective length in structural stability.	3
Total		**07**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test(1,2 and 3)	3
Quiz(1and 2)(optional)	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	1										
CO2		3	2	1									
CO3		3	2	1									
CO4		2	3	1									

Course Title	WATER SUPPLY AND TREATMENT ENGINEERING		
Course Code	24CV304	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs	Hours / Week	03
SEE	100 Marks	Total hours	42L+48ABL=90

Course Objective:

1. Study drinking water quality standards and to illustrate qualitative analysis of water
2. Understand and design of different unit operations and unit process involved in water treatment process

Course Outcomes:

#	Course outcomes	Mapping toPOs	Mapping to PSOs
CO1	Estimate average and peak water demand for a community.	PO1, PO2	-
CO2	Evaluate available sources of water, quantitatively and qualitatively and make appropriate choices for a community.	PO1, PO6	-
CO3	Evaluate water quality and environmental significance of various parameters and plan suitable treatment system	PO1, PO2	PSO1
CO4	Design a comprehensive water treatment and distribution system to purify and distribute water to the required quality standards.	PO1, PO2,	PSO1

MODULE-1	12 Hrs.

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 a particular source of water.

Self Study Component: Forecast the future population and design water supply scheme for hassan city

MODULE-2	10 Hrs.
Quality of Water: Concept of safe water: wholesomeness, palatability and potability. 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. ***Self Study Component: Visit nearby intake structure and submit a detailed report on it.***	
MODULE-3	**12 Hrs**
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. ***Self study Component: Students shall visit nearby water treatment plants and study various treatment techniques adopted and shall submit a report of their observations***	
MODULE-4	**10 Hrs**
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 Nanofiltration. **Distribution Systems**: System of supply, service reservoirs and their capacity determination, distribution systems of layouts. **Water Conservation** – Rain Water Harvesting. ***Self study Component: Design a simple rainwater harvesting layout for a household.***	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Environmental Engineering: Volume I – Water Supply Engineering	Santosh Kumar Garg	28	Khanna Publisher	2022
2	Water Supply Engineering	B. C. Punmia, Arun Kumar Jain, Arun Kr. Jain	10	Laxmi Publications	2022

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Water and Wastewater Technology	Mark J. Hammer & Mark J. Hammer Jr.	VII	Pearson Education	2012
2	CPHEEO Manual on water supply and treatment engineering,	Ministry of Urban Development, Government of India, New Delhi,	III	Akalank Publications	2019

EBooks and online course materials:

1. https://www.google.co.in/books/edition/Water_Supply_Engineering/74HYY31zwhQC?hl=en&gbpv=0

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc21_ce3

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component			
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1. Group Activity - Field visit and report submission 2. Quiz	20
Total		**50**

Activity Based Learning (27 Hours)

ABL1 (XX Hours) : Field Visit and Report Submission - Group Activity		**Hours**
1	Design a water supply scheme for a Hassan City	05
2	Visit a nearby Intake structure and submit a detailed report	05
3	Visit nearby water treatment plants and study various treatment techniques adopted and shall submit a report of their observations	05
4	Design a simple rainwater harvesting layout for a household	05
5	Submit a report on the concept of different colour coded caps in packaged drinking water bottles	05
Total		**25**
ABL2 (YY Hours): Activity 2 Details		**Hours**
1	Assignment	01
2	Quiz	01
Total		**02**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test(1,2 and 3)	3
Quiz(1and 2)(optional)	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2	3											
CO2	3					2							
CO3	2					3							
CO4	3					3							

Course Title	COMPUTER AIDED BUILDING PLANNING AND DRAWING		
Course Code	24CV305	**(L-T-P)C**	(0-0-2) 1
Exam	3 Hrs	**Hours/Week**	02
SEE	100 Marks	**Total Hours**	28P+2ABL=30

Course Objective: Provide students with a basic understanding to achieve skill sets to prepare computer aided engineering drawings using advanced tools and understand the details of construction of different building elements

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Prepare, read and interpret the drawings in a professional set up.	PO5, PO6, PO11	
2	Plan and design residential and public buildings as per the requirements	PO5, PO8, PO10	

MODULE-1	14 Hrs

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.

(Continued…)

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.

Functional design of buildings using bubble diagram. Development or line diagram for a college canteen with given details and requirements.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	"Building drawing with an integrated approach to Built Environment Drawing"	MG Shah, CM Kale, SY Patki,	5th edition	Tata Mc Graw Hill Publishing co. Ltd., New Delhi	2017
2	"Building Construction"	Gurucharan Singh,	17th edition	Standard Publishers, & distributors, New Delhi.	2019

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	National Building Code",			BIS, New Delhi,	2016
2	CAD lab Manual, Department of Civil Engineering, MCE				2022

EBooks and online course materials:

1. https://Engineering drawing and computer graphics - Course (nptel.ac.in)

Online Courses and Video Lectures:

1. https://youtu.be/5SUchhTEvNQ?si=eUy54l5edaNjrZ8Z
2. https://youtu.be/1p4i2OKGJeM?si=yLdRwu-wgY_DRhrw

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Tutorial Component			
5	Activity Based Learning (ABL1&ABL2)	-	-	-
6	Evaluation of Learning Process	-	-	02
Total Learning Hours/Semester				**30**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 20 marks and 30 marks	50
Total		**50**

Activity Based Learning (02 Hours)

ABL1 (01 Hour) : Activity 1 Details	Hours
Prepare the plan of the existing Civil PG Block in a manual drawing Measurements (Pre-Drawing Work)- Length and breadth of rooms, corridors, staircases. Thickness of walls (internal & external), Door and window locations, opening sizes, Position of columns (if visible).	
Total	**01**
ABL2 (01 Hours): Activity 2 Details	**Hours**
Prepare the plan of the existing Civil PG Block Manual drawing. Select Suitable Scale, Draw Outer Walls, Draw Internal Partitions, Mark Openings (Doors & Windows), Indicate Columns, Label Rooms and Add Dimensions	
Total	**01**

Evaluation of Learning Process (7 Hours)

Type of Evaluation	**Hours**
Test	3
Viva voce	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1					3	2					1		
CO2					3			2		1			

Course Title	URBAN AND RURAL PLANNING		
Course Code	24CV306A	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	42L+48ABL=90

Course Objective:

1. Gain Knowledge of Rural, Urban life and fundamentals of architecture.
2. Gain comprehensive knowledge about development plans of a village, town with rules and regulations.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Comprehend the basic objects and principles of town planning and types of planning.	PO1, PO4, PO9	
2	Apply land use analysis, zoning regulations to development plan.	PO1, PO7, PO9	
3	Describe the concepts, principles, philosophies of great pioneers like Hebenezer Howard, Patrick Geddes, Le Corbusier, C.A. Doxiadis, etc. during and post-industrial revolution, transportation problems in the developing countries.	PO1, PO6, PO9	
4	Demonstrate the problems in rural areas, legislation in planning; Comprehend the knowledge on norms, procedures, etc., in planning.	PO1, PO6, PO9	

MODULE-1	10 Hrs.

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, use of Survey data in Planning, Population growth, density of population, occupational categories, evolution of towns in India: Ancient, medieval and modern, urbanization in India, Functional classification of towns.

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	10 Hrs.

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.

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	10 Hrs.

The Industrial Revolution and Urban Planning **:**The Garden city concept, Satellite Towns, Philosophy of Patrick Geddes, Le Carbusier – C.A. Doxiades – Evolution of cities, Planning Theory:Land use theories – Descriptives – Exploratory and Speculative theories.

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

MODULE-4	10 Hrs.

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.

Self study component: Students shall collect the information from the Urban local bodies and present a report on the obligatory and discretionary functions.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Town Planning	Rangwala.S.C., Rangawala P.S &Rangawala.K.S		Charotar Publishing House, Anand, India	1987
2.	Text Book of Town Planning	AbirBandyapadhyay		Books and Allied (P) ltd, Calcutta, India	2000
3.	Urban and Regional Planning	Rame Gowda. K.S		Prasaranga, University of Mysore	1986

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	The Urban Pattern	Arthur.B.Gallion Simon Eisner		CBS Publishers and Distributors, New Delhi	1998
2.	Principles and Practices of Town & Country Planning	Lewis Keeble		The Estates Gazette Limited, London	1969
3.	Traffic Engineering & Transport Planning	Kadiyali L. R		Khanna Publishers, Delhi	2005
4.	Transport Planning and Traffic Engineering	C A O' Flahertly		An Imprint of Elsevier	2006
5.	Principles of Transportation Engineering	ParthaChakroborty&Animesh Das		Prentice Hall of India Private Limited, New Delhi	2003
6.	Dictionary of Urban and Regional Planning	Kulshrestha S. K		Kalpaz Publications, Delhi	2006
7.	Urban Development Plans Formulation & Implementation (UDPFI) Guidelines	Ministry of Urban Affairs & Employment		Government of India, New Delhi.	-

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc20_ar11/course
2. https://onlinecourses.swayam2.ac.in/cec20_ar01/course?
3. https://onlinecourses.nptel.ac.in/noc24_ar11/preview?
4. https://onlinecourses.nptel.ac.in/noc24_ce80/preview?

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Activity Based Learning (27 Hours)

ABL1 (09 Hours) : Activity 1 Details		**Hours**
	1. Case study of a city based on concentric spread, ribbon development, satellite growth, scattered growth and planned growth in teams of two. 2. Identify and document challenges faced and mini projects like blue green infrastructure, lake development in the case study selected. 3. Presentation, discussion and reflection in groups of four students each.	3 4 2
Total		**09**
ABL2 (18 Hours): Activity 2 Details		**Hours**
	1. **Intro Session** – Overview of planning issues for Hassan (urban vs rural, ecological, social). 2. **Mapping Exercise** – Sketch local area, identify zones, discuss challenges. 3. **Field Workshop** – Gather community input, digitize local spatial data. 4. **Ecological Strategy Module** – Plan green corridors, sponge interventions. 5. **Model Build Charrette** – Teams propose redevelopment/planning solution. 6. **Field Visit** – On-site analysis of a local urban/rural feature. 7. **Implementation Project** – Community-based mini-project proposal 8. **Reflection & Presentation** – Students present plans and reflect on learning.	2 2 4 2 2 2 2 2
Total		**18**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test(1,2 and 3)	3
Quiz(1and 2)	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3			2					1				
CO2	3						2		1				
CO3	3					2			1				
CO4	3					2			1				

Course Title	SUSTAINABILITY IN ENGINEERING DESIGN		
Course Code	24CV306B	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs	Hours/Week	3
SEE	100 Marks	Total Hours	42L+48ABL=90

Course Objective: Understand sustainable development goals, life cycle assessment, renewable energy integration, waste reduction, and environmentally conscious design practices.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Explain the basics of sustainable Development, sustainable engineering, and its role in engineering	PO6, PO7	
CO2	Comprehend the integration methods of sustainability	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	

MODULE-1	10 Hrs.

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

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	10 Hrs.

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

Self-study Component: Develop a risk mitigation strategy for an R&D project in any industry construction.

MODULE-3	10 Hrs.
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 economic analysis method, Rapid social acceptance guideline, Rapid integral sustainable development assessment, Scenario set building for robustness test to future uncertainties, Red flags method for evaluation with outside stakeholders. ***Self-study Component: Perform a Life Cycle Assessment of any daily-use products or activities***	
MODULE-4	**10 Hrs.**
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 system ***Self-study Component: Explore the design aspects of a sustainable building / maintaining a sustainable transport system for MCE***	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Sustainable Engineering: Principles and Practice	Bakshi, B. R.	1st	Cambridge University Press	2019
2	Engineering for Sustainability: A Practical Guide for Sustainable Design	Harmsen, J., and Jonker, G	1st	Elsevier Scienc	2012

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Sustainable Engineering, Energy, and the Environment: Challenges and Opportunities.	Wasewar, K. L., and Rao, S. N.	1st	Apple Academic Press	2022
2	Introduction to Sustainability for Engineers	Ramjeawon, T.	1st	United Kingdom: CRC Press	2020

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component			
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1- Group discussion 2) Details of activity 2- Quiz	20
Total		**50**

Activity Based Learning (27 Hours)

ABL1 (14 Hours) : Activity 1 -Identify eco-friendly materials for engineering projects		**Hours**
1.	Select sustainable materials based on cost, carbon footprint, recyclability, and availability.	07
2.	Comparison chart and justification for their choices.	07
Total		**14**
ABL2 (13 Hours): Activity 2 - Design a Green Product		**Hours**
1.	Design a small product (e.g., a solar-powered light, reusable packaging, water-saving device).	08
2.	Presentation and report on the product	05
Total		**13**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test(1,2 and 3)	3
Quiz (1and 2) (optional)	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO 11**	**PSO1**	**PSO2**
CO1						2	3						
CO2		1					3						
CO3	2						3						
CO4					3		2						

Course Title	ENVIRONMENTAL PROTECTION AND MANAGEMENT		
Course Code	24CV306C	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs	Hours/Week	3
SEE	100 Marks	Total Hours	42L+48ABL=90

Course Objective: Understand the various components of the environment and the significance of the sustainability of a healthy environment.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Explain various environmental pollution / contamination issues, code of practice and environmental legislation	PO1, PO6, PO7	
2	Discuss emerging environmental problems, preventive measures and forensics	PO1, PO6, PO7	
3	Describe urban land use patterns pollutant pathways and protection in urban ecosystems	PO1, PO6, PO7	
4	Discuss various aspects of environmental systems, biodiversity, natural resources and environmental sanitation	PO1, PO6, PO7	

MODULE-1	10 Hrs.

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: Solid waste: Hazardous wastes: E wastes: Industrial and Municipal Sludge. Global Environments concern: concept policies and case studies Groundwater depletion/recharging. Climate Change; Acid Rain; Ozone Depletion; Fluoride problem in drinking water; Resettlement and rehabilitation of people. Environmental Toxicology.

Self-Study Component: Students shall Choose one local or global case study (e.g., Ganga Action Plan, Bhopal Gas Tragedy, Flint Water Crisis) and present its causes, impact, and lessons learned.

MODULE-2	10 Hrs..
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. 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. ***Self-Study Component:Students shall Research and present one recent environmental issue (e.g., microplastics, PFAS, climate migration).***	
MODULE-3	**10 Hrs..**
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. Neighborhood concepts. Environmental Legislation - History, Rules and Acts, Town and Country Planning Acts. Organizations involved in Environmental Protection: MoEF, CPCB, SPCB, Water Boards, NGT, WHO, NEERI, CPHEEO and BIS ***Self-Study Component:Students shall Analyze a real-world SEZ or CRZ in India. How has it affected local ecosystems?***	
MODULE-4	**10Hrs.**
Environmental Systems: Assimilative, Supportive and Carrying Capacity, NCR. Environmental Indices – AQI. WQI. 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. ***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***	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Environmental Engineering – Principles and Practice.	Richard. O. Mines. Jr.,		John Wiley and Sons., USA, New York.	2014
2	Introduction to Environmental Engineering Science,	Gilbert M. Masters.	Prentice Hall of India. New Delhi.	5th Edition	2005
3	Environmental Engineering.	RuthF. Weiner and Robin Matthews.	Elsevier Science publications – First reprint in India.	4th Edition	2007

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Environmental Engineering Science.	William W Nazaroff and Lisa Alvarez-Cohen.		John Wiley & Sons, New Delhi.	2010
2	Concept of Ecology.	Verma P.S. and Agarwal V.K.		S. Chand & Company Ltd. Roorkee.	1998
3	Non-conventional Energy Sources.	Rai, G.D.	3rd Edition,	Khanna Publications, New Delhi	1999

EBooks and online course materials:

1. https://nptel.ac.in/courses/120108004
2. https://onlinecourses.nptel.ac.in/noc23_ch72

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc23_lw06

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component			
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1: Group Activity 2) Details of activity 2: Quiz	20
Total		**50**

Activity Based Learning (27 Hours)

ABL1 (31 Hours) : Activity 1 Details	**Hours**
Students shall Choose one local or global case study (e.g., Ganga Action Plan, Bhopal Gas Tragedy, Flint Water Crisis) and present its causes, impact, and lessons learned.	9
Students shall Research and present one recent environmental issue (e.g., microplastics, PFAS, climate migration).	9
Students shall Analyze a real-world SEZ or CRZ in India. How has it affected local ecosystems	9
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	9
Total	**36**
ABL2 (10 Hours): Activity 2 Details	
Quiz and Assignment	**10**
Total	**41**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test (1,2 and 3)	3
Quiz and Group Activity	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3					2	1						
CO2	3					2	1						
CO3	3					1	2						
CO4	3					2	2						

Course Title	SMART URBAN INFRASTRUCTURE		
Course Code	24CV358A	(L-T-P)C	(2-0-0)1
Exam	3Hrs	Hours/Week	1
SEE	100 Marks	Total Hours	28L+2ABL=60

Course Objective:

1. Practical understanding of Smart City Infrastructure
2. Learn about Organizational Structure of Smart City management in City

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

COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
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	-

MODULE-1	4 Hrs

Smart urban infrastructure: Definition, 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, Road Safety, Public transport systems- Different types & importance, Special Requirements for Barrier Free Built Environment for Disabled and Elderly Persons, Inland Water Transportation,Harbour and Airport Planning

Self- study component: Prepare a report on the National corridor development programs of India.

MODULE-2	3 Hrs

The physical, social and commercial infrastructure: Sewerage & Sanitation Drainage-Types of sewer systems,Sewage treatment plants (STPs), Urban flooding,Integration of green infrastructure, Electricity-Smart grids and smart metering. Solid Waste Management-Collection, transport, processing, recycling, and disposal of solid waste. Domestic Gas Supply Pipelines-Components,Safety protocols. Telecom Services-Telecom towers, fiber optics, 5G networks. Integration with smart city infrastructure (IoT, public Wi-Fi).

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

MODULE-3	3 Hrs

Artificial Intelligence and management of smart urban Infrastructure of cities: Application-Smart cities,Smart transportation, smart water management, and case studies-singapore,smart city mission. The challenges in the implementation of smart Infrastructure concepts-Technical, financial, social and environmental. The science, technology and innovation driven –policy instruments to address the challenges-Standards and Protocols, Innovation Hubs and Incubators, Public-Private Partnerships,International Collaboration.

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

MODULE-4	**4 Hrs**

Sustainable Development: Sustainable Planning Energy Efficiency. Urban Transport, Urban Infrastructure. Climate Change Mitigation and Adaptation. Green Building City BioDiversity Index. National Environmental Policy (NEP), 2006 EIA Notification, 2006.Environment Protection Act, 1986 Forest Conservation Act, 1980, Ministry of New and Renewable Energy Environmental Guidelines Environmental 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 smart sustainable development

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

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Smart City Infrastructure	Vishal Kumar, Vishal Jain, Bharti Sharma	Volume-I	Wiley-Scrivener	2022
2	Transportation and Power Grid in Smart Cities	Hussein T. Mouftah, Melike Erol-Kantarci, Mubashir Husain Rehmani	1st Edition	Wiley	2018

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Smart Cities: Concepts, Practices, and Applications	Krishna Kumar, Gaurav Saini	1st Edition	CRC Press	2022
2	Smart Urban Computing Applications	M.A. Jabbar, Sanju Tiwari, Fernando Ortiz-Rodriguez	1st Edition	River Publishers	2023

EBooks and online course materials:

1. http://www.gfdrr.org/sites/default/files/D3_CaseStudy16_PaulJacobson_PPP_Smart_cities.original.1531294
2. https://egyankosh.ac.in/bitstream/123456789/39131/1/Unit-2.pdf
3. https://unece.org/housing/smart-sustainable-cities

Online Courses and Video Lectures:

1. http://www.coursera.org/learn/smart-cities

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	4	4
4	Tutorial Component			
5	Activity Based Learning (ABL1&ABL2)	-	-	12
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**51**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1: Quiz 2) Details of activity 2: Group Activity	20
Total		**50**

Activity Based Learning (12 Hours)

ABL1 (6 Hours) : Activity 1 Details	**Hours**
Quiz	6
Total	**6**
ABL2 (6 Hours): Activity 2 Details	
Group Activity	6
Total	**12**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test(1,2 and 3)	3
Quiz and group activity	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1						2	3						
CO2						3							
CO3							3	2					
CO4									3				

Course Title	DIGITAL DRAFTING FOR CIVIL ENGINEERS (LAB)		
Course Code	24CVL358B	**(L-T-P)C**	**(0-0-2) 1**
Exam	3 Hrs.	**Hours/Week**	**2**
SEE	100 Marks	**Total Hours**	28L+2ABL=30

Course Objective: Students will gain knowledge on drafting works in Civil Engineering Course
Course Outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Prepare, read and interpret and create building model as per given requirements	PO3, PO5, PO6, PO8	
2	Develop a 3D model of a residential and commercial building with all the building elements	PO1, PO5, PO8,PO9	

List of Exercises	14

1. Introduction to BIM. Using 3D tools creation of Levels and Grids. Application of various techniques used in the modeling of walls.
2. Using 3D tools creation of doors and windows, and various types of roofs.
3. The different types of floors, floor finishes, key steps involved in creation of ceilings.
4. The modeling of staircases and railings.
5. 3D Modeling of a single storied two-bedroom house with plumbing and sanitation details.
6. 3D Modeling of a framed structure like office building
7. Generation of Topo surface and contours using a site tool for a given project. Rendering concepts and generation of walkthrough.
8. Placing room tags and room legend options. Creation of door schedule, window schedule and room schedule of a project.
9. Create new sheet and place views such as floor plans and plot the sheet.

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.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	REVIT 2019 Architecture step by step.	Linkan Sagar, Sristry Rawal	1st edition	BPB Publications.	2019
2	The Text book of Building Construction,	S.P Arora, S.P.Bindra		Dhanpat Rai Publications	2010

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	"Building Drawing"	Shah. M. H. and Kale. C.M.	5th edition	Tata Mc Graw Hill Publishing Co, New Delhi	2019
2	REVIT 2019 Architecture Training Guide	Linkan Sagar, Sristry Rawal	1st edition	BPB Publications	2019

EBooks and online course materials:

1. https://www.amazon.in/Revit-Architecture-Learn-Designing-Beginners-ebook/dp/B0893DMYVF
2. https://www.sdcpublications.com/Textbooks/Autodesk-Revit/74/

Online Courses and Video Lectures:

1. https://youtu.be/kFaaaOwBs94?si=0MiKDmqg27VF_bp0
2. https://youtu.be/E3jK0wDqt3g?si=i0nUqe5nnRK1MOIh

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	02
6	Evaluation of Learning Process	-	-	-
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 20 marks each and 30 marks	50
Total		**50**

Activity Based Learning (27 Hours)

ABL1 (01 Hour) : Activity 1 Details	Hours
Prepare the plan of the Civil cadlab in a manual drawing Measurements (Pre-Drawing Work)- Length and breadth of rooms, corridors, staircases. Thickness of walls (internal & external), Door and window locations, opening sizes, Position of columns (if visible).	
Total	**01**
ABL2 (01 Hours): Activity 2 Details	**Hours**
Prepare the plan, section, elevation and 3D model of the Civil cadlab using Digital Drafting tools Select Suitable Scale, Draw Outer Walls and Internal Partitions, Mark Openings (Doors & Windows), Indicate Columns, Label Rooms and Add Dimensions. Draw the corridor and the railings.	
Total	**01**

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Test	3
Viva	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1			1		3	2		1					
CO2	1				3				2	2			

Course Title	SKILL LAB		
Course Code	24CVL358C	(L-T-P)C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2
SEE	100 Marks	Total Hours	28P+2ABL=30

Course Objective:

1. Understand basic concepts of AI/ML and their relevance in Civil engineering.
2. Use GIS software for typical problems in Civil Engineering.

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

COs	Course Outcomes	Mapping to PO's	Mapping to POS's
CO1	Understand basic concepts of AI/ML and their relevance in civil engineering.	PO1, PO5	PSO2
CO2	Analyze the different terrain maps and the characteristics of catchment delineation	PO1, PO5	PSO2
CO3	Demonstrate skills in data handling, model training, and interpretation using Excel or Colab.	PO1, PO5,PO8	PSO2

Part A: AI/ML in Civil Engineering	14 Hrs.

a) Introduction to AI, ML, DL.
b) Types of ML (Supervised, Unsupervised)
c) Applications in Civil Engg.
d) Understanding datasets: CSV, Excel.
e) Visualizing data. Correlation and trends.
f) Concrete Strength Prediction: Predict compressive strength based on mix design using Linear Regression-using Google Colab + scikit-learn
g) Soil Classification using ML: Classify soil type using decision trees / KNN based on test results-using Google colab
h) Model Evaluation & Ethics: Understanding accuracy, precision, R^2 score, and ethical use of AI.

Part B: GIS	14 Hrs.

a) Introduction to software, downloading of DEM.
b) Mosaicking of DEM.
c) Terrain analysis (Development of slope, hill shade map, contour map).
d) Catchment delineation using arc hydro tool with calculation of area of catchment, length of river using attribute table.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	"Remote Sensing and Image Interpretation"	R.W Kiefer	6th Edition	John Wiley & sons Publications	2011
2	AI: A modern approach	Russell/Norvig	4th edition	Pearson	2022

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Virtual 3D modelling using GIS	Arunima Mahapatra	1st edition	Lambert	2025
2	Practical handbook of machine learning	Sujit bhattacharya | Subhrajit bhattacharya	2nd Edition	GKP	2024

EBooks and online course materials:

1. https://nptel.ac.in/courses/105101221
2. https://nptel.ac.in/courses/105103193
3. https://nptel.ac.in/courses/105102015

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	-
6	Evaluation of Learning Process	-	-	02
Total Learning Hours/Semester				**30**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 15 marks each. Report: 20 marks	30+20
Total		**50**

Activity Based Learning (02 Hours)

ABL1 (01 Hour) : Activity 1 Details	**Hours**
Submit a report on Linear Regression analysis for the following data set 1.concrete mix dataset (CSV) with parameters like cement, water, and aggregates. 2.Load the dataset in Google Colab using pandas. 3.Visualize the data using scatter plots (matplotlib/seaborn) to understand correlations. 4. Apply Linear Regression using scikit-learn to predict compressive strength. 5. Evaluate the model using R^2 score.	
Total	**01**
ABL2 (01 Hours): Activity 2 Details	**Hours**
Prepare a report on catchment delineation and area calculation using GIS software. 1.Download a DEM file of a small region. 2.Open the DEM in QGIS or ArcGIS. 3.Use basic tools to generate: ● Slope map ● Catchment boundary delineation 4.Calculate the area of the catchment using the attribute table.	
Total	**01**

Evaluation of Learning Process (2 Hours)

Type of Evaluation	**Hours**
Test(1and 2)	2
Activity (Reports)	
Semester End Exam	
Total	

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2				3								
CO2	3				3								
CO3	3				3			3					

Course Title	BASIC STRUCTURAL ANALYSIS		
Course Code	24CV401	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs	Hours/Week	3
SEE	100 Marks	Total Hours	42L+48ABL=90

Course Objective: To impart knowledge about concepts classical methods of structural analysis
Course Outcomes: At the end of course, student will be able to,

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Comprehend the knowledge on various forms of engineering structures, role of determinacy of structures and analysis of trusses.	PO1,PO2	PSO1
CO2	Comprehend the behavior of arches and cables.	PO1,PO2	PSO1
CO3	Analyze the displacements of structures by energy methods & Mohr's theorems	PO1,PO2	PSO1
CO4	Analyze indeterminate structures to get an insight of behavior of structures under different types of loads	PO1,PO2	PSO1

MODULE-1	10Hrs

Introduction: Meaning & definition of structural analysis, Degrees of freedom, Static & Kinematic indeterminacy. Analysis of Plane Trusses: Behavior of trusses, assumptions, analysis of statically determinate plane trusses by method of joints & method of sections Arches: Three hinged circular and parabolic arches with supports at same and different levels, determination of horizontal thrust, normal thrust, radial shear and bending moment.

Self-Study Component - The students shall visit different kinds of structures within the campus and outside the campus and learn to identify structural components.

MODULE-2	10 Hrs.

Cables: Analysis of cables under point loads and udl, length of cables - Supports at same and at different levels. Displacements - Energy Methods: Strain energy and complementary 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.

Self-Study Component - The students shall visit different structural arrangements pertaining to arches and cables and learn to identify their structural action.

MODULE-3	10 Hrs.

Displacements - Virtual work principle- Concept of virtual work/unit load, 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. ***Self-Study Component - The students shall understand the importance & role of elastic constant & moment of inertia pertaining to slope & deflection in structures.***	
MODULE-4	**10 Hrs.**
Deflection of beams: Conjugate beam principle, computation of slopes & deflections of cantilever & simply supported beams by conjugate beam concept. Analysis of Indeterminate Structures: Consistent Deformation method, Applications to Propped cantilever and fixed beams. Analysis of Indeterminate Structures: Clapeyron's theorem of three moments – Application to continuous beams. ***Self-Study Component - The students shall visit different construction sites and learn to identify & understand the behavior of determinate and indeterminate structures.***	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Basic Structural Analysis	Reddy C. S	3rd	Tata McGraw Hill, New Delhi.	2017
2	Theory of structures	Ramamruthum S	11th	Dhanpat Rai & Sons, New Delhi.	2014

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Elementary Structural Analysis	Norris and Wilbur,	2nd	McGraw Hill, New York.	1960
2	Structural Analysis	Laursen	International Student Edition	McGraw Hill, New Delhi.	2020
3	Theory of Structures	Pandit and Gupta	1st Edition	McGraw Hill Education	2017

Online Courses and Video Lectures:

1. https://archive.nptel.ac.in/courses/105/105/105105166/
2. https://archive.nptel.ac.in/courses/105/101/105101085/

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Collaborative learning 2) Assignment	20
Total		**50**

Activity Based Learning (27 Hours)

ABL1 (12 Hours) : Activity 1- Individual Assignment		**Hours**
1	Analyse the truss and determine the forces acting on the members.	4
2	Analyse the beam using strain energy and unit load method.	4
3	Analyse the beam using the moment area and conjugate beam method.	4
Total		**12**
ABL2 (15 Hours): Activity 2- Collaborative learning		**Hours**
1	Consider a real world problem and analyse the truss and determine the forces acting on the members.	5
2	Consider a real world problem and analyse the beam using strain energy and unit load method.	5
3	Consider a real world problem and analyse the beam using the moment area and conjugate beam method.	5
Total		**15**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test(1,2 and 3)	3
Quiz(1and 2)(optional)	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2	3										1	
CO2	2	3										1	
CO3	2	3										1	
CO4	2	3										1	

Course Title	FLUID MECHANICS AND HYDRAULICS		
Course Code	24CV402	**(L-T-P)C**	(3-0-2)4
Exam	3 Hrs	**Hours/Week**	5
SEE	100 Marks	**Total Hours**	42L+78ABL=120

Course Objective:

1. To understand the basic principles of fluid mechanics
2. To identify various types of flows
3. To understand boundary layer concepts and flow through pipes

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand fundamental concepts of fluid mechanics including fluid properties, statics, and basic flow characteristics.	PO1	
2	Apply principles of fluid kinematics and dynamics in solving flow-related engineering problems.	PO1	
3	Analyse fluid flow in pipe and open channel systems considering flow conditions and energy concepts.	PO2	
4	Perform experimental and activity-based studies on fluid flow systems using laboratory setups, and analyse results to validate theoretical concepts.	PO8,PO9	

MODULE-1	**10 Hrs.**

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-numerical problems. Fluid Statics: Fluid Pressure and its Measurements, Fundamental Equation of Fluid Statics. Hydrostatic forces on immersed bodies (vertical and inclined)

Self-study component: Equilibrium conditions of submerged and floating bodies.

MODULE-2	10 Hrs..
Fluid kinematics: Methods of describing fluid motion, Types of fluid motion, Velocity and acceleration, Rotational and irrotational flows, Reynold's transport equation, Continuity equation, Velocity potential and Stream function, Cauchy-Reimann equations, Flownet. Fluid dynamics: Types of forces-definition and effects of Coriolis force, Forces influencing fluid motion, Euler and Bernoulli's equations, Application of Bernoulli's equation - numerical problems and Flow measurement. **Self-study component: Linear momentum equation, Momentum correction factor, Applications of momentum equation**	
MODULE-3	**10 Hrs.**
Pipe flow: Reynold's number and classification of flow, Head loss - Major & Minor loss in pipe flow-numerical problems, Darcy-Weisbach equations and use of Moody's Diagram, Total energy and hydraulic gradient lines, Compound pipes, Pipes in series and parallel, Branching pipes-numerical problems. Water Hammer, Equations for pressure rise due to gradual and sudden closure of valves in rigid and elastic pipes - numerical problems. **Self-study component: Surge tanks – types and functions**	
MODULE-4	**10 Hrs.**
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 exponent for critical flow. Hydraulic Jump - Equation for a classic hydraulic jump, Energy loss and efficiency of a jump. **Self-study component: Free surface flows, Comparison of open channel flow with pipe flow, Classification of flow in open channels.**	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	"Hydraulics and Fluid Mechanics, including Hydraulic Machines",,	Modi P. N and Seth S. M,	20th edition, 2015.	Stanford Book House, New Delhi	2015
2	"Fluid Mechanics and Hydraulic Machines-problems and solutions",	Subramanya K	1st edition	Tata McGraw Hill Publishing Co. Ltd.	2018
3	"A Text book of Fluid Mechanics and Hydraulic Machines",	Bansal R. K	Revised 9th edition	Laxmi publications, New Delhi,	2017

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Fluid mechanics and hydraulic machines.	Gupta, S.C	-	Pearson Education India	2006
2.	Fluid Mechanics and Hydraulic Machines.	Goyal, M.K	-	PHI Learning Pvt. Ltd	2015

EBooks and online course materials:

https://Fluid Mechanics [Introduction Video]

Online Courses and Video
Lectures:https://www.youtube.com/watch?v=N1ZVw8GDSaE&t=126s

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component			
5	Activity Based Learning (ABL1&ABL2)	-	-	29
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**120**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Laboratory Plan (if integrated course):

Lab Program	Program Details
1	Determine the properties of fluid:specific mass, specific weight, specific volume and specific gravity.
2	Determination of Cd for: · Venturimeter
3	Determination of Cd for: · Orificemeter
4	Determination of Cd for: Rectangular Notch
5	Determination of Cd for: Triangular Notch
6	Determine the loss of head in pipes (Major loss)-½ inch,
7	Determine the loss of head in pipes (Major loss)-1inch
8	Determine the loss of head in pipes (Major loss)- 3/4 inch
9	Determination of Minor Losses in Pipes (Sudden Enlargement and Contraction)
10	Determination of Hydraulic Coefficients of Vertical Orifice

Activity Based Learning (27 Hours)

ABL1 (XX Hours) : Activity 1 Details		**Hours**
	1. **Research and identify** at least **three types of surge tanks** (e.g., simple, restricted orifice, differential) and **summarize their working principles**. 2. **Compare their functions** in terms of water hammer control, cost, maintenance, and operational efficiency. Present your comparison in a tabular format. 3. Based on a **given scenario** (assume a hilly terrain with a long penstock and variable load), **recommend the most suitable type of surge tank**, justifying your choice based on system needs and technical feasibility.	5Hrs 5Hrs 4Hrs
Total		**14**
ABL2 (YY Hours): Activity 2 Details		**Hours**
	1. **Define and explain** the three types of equilibrium (stable, unstable, and neutral) for both **submerged and floating bodies**, with clear diagrams for each case. *(3 marks)* 2. Conduct or simulate a simple experiment using materials like a plastic bottle (partially filled), a wooden block, and a metal object in water. **Record observations** on how each body behaves when slightly tilted. Identify their type of equilibrium and explain why. *(4 marks)* 3. Based on your understanding and the experiment, **derive the conditions for equilibrium** using concepts like **center of gravity (G)** and **center of buoyancy (B)**. Explain how **metacentric height (GM)** affects floating body stability. *(3 marks)*	5Hrs 5Hrs 5Hrs
Total		**15**

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Test(1,2 and 3)	3
Laboratory	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2												
CO2	3												
CO3		3											
CO4								2	2				

Course Title	CONCRETE TECHNOLOGY		
Course Code	24CV403	(L-T-P)C	(3-0-2) 4
Exam	3 Hrs	Hours/Week	5
SEE	100 Marks	Total Hours	42L+78ABL=120

Course Objective:

1. To understand various aspects related to concrete ingredients, properties of concrete and concrete mix design
2. Understand the importance of quality control procedures in ensuring the durability and performance of concrete structures.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply the fundamental properties of concrete ingredients, for conventional concrete mixtures	PO1	
2	Analyze the fresh and hardened concrete results for optimized mix design	PO1, PO2	
3	Demonstrate proficiency in conducting and interpreting non-destructive tests of concrete	PO2, PO4	
4	Validate the basic principles of concrete mix design and its practical applications.	PO3	

MODULE-1	12 Hrs.

Concrete Ingredients – Cement, water and Aggregates: Chemical composition of cement, hydration of cement, types of cement, manufacture of OPC by wet and dry process (flow charts only). 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, Alkali – Aggregate reaction,(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 fumes and rice husk ash - applications, advantages & disadvantages.

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	10 Hrs.

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 affecting modulus of elasticity, Poisson's ratio. Shrinkage – plastic shrinkage, drying shrinkage and autogenous shrinkage, factors affecting shrinkage. Creep – measurement of creep, factors affecting creep.

Self-Study Component - The students should visit construction sites 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 specimens.

MODULE-3	10 Hrs.

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. Sulfate attack, chloride attack, carbonation, freezing and thawing, causes of cracking in concrete – plastic shrinkage, settlement cracks, construction joints, thermal expansion, structural design deficiencies etc

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	10 Hrs.

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 concrete: 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.

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

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	"Concrete Technology- Theory and Practice",	Shetty, M.S	8th	S. Chand and Co, New Delhi.	2022
2	"Concrete Technology"	Neville, A.M. and Brooks, J.J.	2nd	Pearson Education, Asia	2010

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	"Concrete Technology"	Gambhir, M.L,	5th	Tata Mc Graw Hill, New Delhi	2017
2	Recommended guidelines for concrete mix design-	IS:10262 -2019	2nd	BIS publication	2019

EBooks and online course materials:

1. Concrete Technology: Theory and Practice by M S Shetty & A K Jain | S Chand Publishing
2. Bce051 - Concrete Technology | PDF

Online Courses and Video Lectures:

1. Concreting materials | Coursera
2. NPTEL :: Civil Engineering - Concrete Technology

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	26
6	Evaluation of Learning Process	-	-	10
Total Learning Hours/Semester				**120**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Laboratory component	Details of activities to be conducted 1) Laboratory record 2) Laboratory CIE	20
Total		**50**

Laboratory Plan (if integrated course):

Lab Program	Program Details
1	Determination of specific gravity and fineness of cement. (Sieve or Blaine's air Permeability test)
2	Determination of normal consistency and setting time.
3	Soundness of cement by Le chatelier apparatus and compressive strength of cement.
4	Determination of specific gravity, moisture content, water absorption of fine aggregate
5	Determination of specific gravity, moisture content, water absorption of Coarse aggregate
6	Determination of Sieve analysis of coarse and fine aggregate
7	Flakiness and elongation indices on Coarse Aggregate
8	Crushing and impact strengths, abrasion resistance tests Coarse Aggregate
9	Workability by slump test, flow test
10	Workability by compaction factor
11	Vee Bee test of the concrete mix proportion.
12	Determination of compressive strength of hardened concrete
13	Determination of split tensile strength of hardened concrete
14	Demonstration of use of NDT.

Activity Based Learning (26 Hours)

ABL1 (13 Hours) : Activity1- NDT		**Hours**
Use of UPV and Rebound Hammer NDT machines and testing the existing buildings in the campus and preparing the report on the same.		
1.	Use of UPV for testing and prepare the report	7
	A. For Concrete cubes B. For existing buildings	
2.	Use of Rebound Hammer for testing and prepare the report	6
	C. For Concrete cubes D. For existing buildings	
Total		**13**
ABL2 (13 Hours): Activity2		**Hours**
1.	Students shall visit different construction sites and record the data for	
	E. Grade of concrete F. Workability G. Compressive strength H. Type of mix The site should cover residential buildings, commercial buildings, roads, drains and any other special structures. Minimum of 3 sites has to be covered	3*4=12+1
Total		**13**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test(1,2 and 3)	3
Quiz(1and 2)(optional)	1
Lab Test	3
Semester End Exam	3
Total	**10**

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3												
CO2	2	3											
CO3		2			3								
CO4			3										

Course Title	BIOLOGY FOR ENGINEERS		
Course Code	24BE406	(L-T-P)C	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
SEE	100 Marks	Total Hours	28L+2ABL=30

Course Objective:

1. To analyze the structure and function of human organ systems from an engineering perspective, incorporating principles of mechanics and biology.
2. To compare biological systems with engineered systems, focusing on fluid mechanics, stress, and transport mechanisms.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Explain the structure and functions of various organ systems in the human body in an engineering perspective.	PO1, PO2, PO11	
2	Relate the basic principles of engineering mechanics to the human body.	PO1, PO2, PO11	
3	Relate various natural transport mechanics in engineered systems.	PO1, PO2, PO11	
4	Compare the mechanics of fluids in natural and engineered systems.	PO1, PO2, PO11	

MODULE-1	8 Hrs.

Introduction to Human anatomy: Overview of human anatomy, Structural Organization of the human body-cardiovascular system, endocrine system, digestive system, respiratory system, excretory system, lymphatic system, nervous system, nervous system, muscular system and skeletal system.

MODULE-2	7 Hrs.

Skeletal System: Material Properties of bones, Stress and Strain, Bending Moment and torsional Loads, Area, Moment of Inertia, Joints of Human Body and Degree of Freedom.

MODULE-3	7 Hrs.

Transport System in the Human Body: Transportation of matter (solids, liquids and gases), removal of waste products, convection and diffusion mechanisms, Fick's Law, Osmosis for water Balance, Comparison of engineering system design with transport systems in human body.

MODULE-4	8 Hrs.
Circulatory System: Fluid Mechanics in Human body, Comparison of natural system with engineered system, Viscosity of fluids, Type of fluid Flow and the influence of Reynolds' number, Fluid energy, Hydrostatic Pressure, Comparison of Engineering System Designs with circulatory systems in human body.	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Biology for Engineers	Johnson A T	2nd	CRC Press	(2018)

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Environmental Biology for engineers and Scientists	Vaccari, D A Strom, P F & Alleman, John Wiley & Sons	1st	Wiley-Interscience	(2005)
2.	Biologically-inspired condition monitoring of civil engineering structures	Smarsly K	International Journal of computer and Electrical Engineering, 2 (4), 770	-	(2010)

EBooks and online course materials:

1. https://books.google.co.in/books?id=-2LNBQAAQBAJ&printsec=frontcover#v=onepage&q&f=false
2. https://www.researchgate.net/publication/381665726_Biology_for_Engineers

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	-
6	Evaluation of Learning Process	-	-	05
Total Learning Hours/Semester				**30**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two Multiple Choice Questions Patterned CIE conducted for 20 marks each	40
Activity Details	Details of activities to be conducted 1) Presentations and Models	10
Total		**50**

Activity Based Learning (27 Hours)

ABL1 (XX Hours) : Activity 1 Details		**Hours**
Total		**XX**
ABL2 (YY Hours): Activity 2 Details		**Hours**
Total		**YY**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test(1 and 2)	2
Viva- Voce	-
Semester End Exam	3
Total	**5**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2	1									2		
CO2	2	1									2		
CO3	2	1									2		
CO4	2	1									2		

Course Title	BUILDING INFORMATION MODELLING IN ARCHITECTURE, ENGINEERING AND CONSTRUCTION (BIM)		
Course Code	24CV404A	**(L-T-P)C**	(3-0-0) 3
Exam	3 Hrs	**Hours/Week**	3
SEE	100 Marks	**Total Hours**	42L+48ABL=90

Course Objective:

1. To learn the concept of Building Information Modeling.
2. To understand the workflow followed in industry during creation of BIM 3D model which includes building the discipline-based model.
3. To explain the process of creating the BIM model.
4. To comprehend the various emerging trends of BIM

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Discuss the various dimensions of Building Information Modelling.	PO6, PO7	PSO1
2	Interpret the various planning tools regarding the BIM fundamentals	PO6, PO8	PSO1
3	Review the integrated roles and relationships in building the project information model	PO7, PO8	PSO1
4	Report on the aspects of interface of the Building Information Modelling	PO9, PO10, PO12	PSO1

MODULE-1	**10 Hrs.**

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.

Self- study component: Visit a BIM project website and study the various dimensions of the project.

MODULE-2	**10 Hrs.**

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.

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

MODULE-3	10 Hrs.
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. ***Self- study component: Download a BIM execution plan and interpret it. Write a report on the same.***	
MODULE-4	**10 Hrs.**
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, assigning deliverables with the tasks of construction managers, plain language question, building information exchange. Classification Case studies ***Self- study component: Prepare a presentation and report on the one BIM project case study.***	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Building Information Modelling,	PhD. Eng. Mariola Książek, MSc. Eng. Jerzy Rosłon, Iceland, Great Britain		CONSTRUCTION ENGINEERING AND MANAGEMENT DEPARTMENT CIVIL ENGINEERING FACULTY WARSAW UNIVERSITY OF TECHNOLOGY POLAND	2017

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Sacks, R., Eastman, C., Lee, G. and Teicholz, P. References. In BIM Handbook https://doi.org/10.1002/9781119287568.refs	(eds R. Sacks, C. Eastman, G. Lee and P. Teicholz).	https://doi.org/10.1002/9781119287568.refs		(2018).
2	BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers	Rafael Sacks, Ghang Lee, Luciana Burdi, MarziaBolpagni	DOI:10.1002/9781394222254	Print ISBN:9781394222223	2025

EBooks and online course materials:

1. https://hvacsimplified.in/wp-content/uploads/2022/05/4_5879807870286957058.pdf
2. https://www.scribd.com/document/352641159/BIM-In-Theory-and-Practice-eBook

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Activity Based Learning (27 Hours)

ABL1 (14 Hours) : Activity 1 Details		**Hours**
	Select the right tools and technologies for a Building Information Modeling (BIM) strategy for enhancing collaboration, efficiency, and project outcomes in an Architectural firm in Hassan. Define the firms requirement. ***(continued)***	

	Key stages and Considerations for Choosing BIM Tools: **1. Project Requirements and Scale/ Organization Profile** ● **Small to Medium Projects**: Software that offer comprehensive BIM capabilities suitable for architectural design and documentation. ● **Large-Scale or Infrastructure Projects**: Tools that are designed to handle complex geometries and large datasets efficiently. **2. Interoperability and Open Standards** ● Ensure the software supports **Industry Foundation Classes (IFC)** and **open BIM** standards to facilitate seamless data exchange across different platforms and stakeholders. **3. Collaboration and Coordination Features** ● Look for tools that offer robust **clash detection**, **real-time collaboration**, and **cloud-based workflows** to enhance team coordination and reduce errors. **4. Usability and Learning Curve** ● Choose software with an intuitive user interface and a supportive learning community to ensure smooth adoption and minimize training time. **5. Cost and Licensing** ● Consider the total cost of ownership, including licensing fees, training costs, and potential hardware requirements. Evaluate whether a subscription-based model or a perpetual license best fits an organization's budget and usage patterns. By carefully evaluating these factors and aligning them with your organization's specific needs and goals, you can select the BIM tools and technologies that will best support your strategy and drive successful project outcomes	2 3 3 3 3
Total		**14**

ABL2 (13 Hours): Activity 2 Details		Hours
	The demand for skilled BIM Managers is on the rise as the construction industry. It increasingly adopts digital technologies. Professionals in this role can expect competitive salaries, opportunities for career advancement, and the chance to play a central role in transforming the construction landscape. For pursuing a career as a BIM Manager, how can one gain proficiency in BIM software, obtain relevant certifications, and stay updated on industry trends and standards.What are the pay packages. **Skills and Qualifications to be presented in report** ● Educational Background: ● Experience: ● Technical Proficiency required: ● Project Management Skills required: ● Communication and Collaboration required**:** **Sequence of Activity:** 1. Briefing and discussion 2. Search for materials in websites 3. Preparation of report and feedback from faculty 4. Presentation	 1 6 3 3
Total		**13**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	Hours
Test(1,2 and 3)	3
Quiz(1and 2)	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO 2**
CO1						3	2						
CO2						2		1					
CO3							2	1					
CO4									3	2	1		

Course Title	CONSTRUCTION EQUIPMENT, PLANTS AND MACHINERY		
Course Code	24CV404B	**(L-T-P)C**	(3-0-0) 3
Exam	3 Hrs.	**Hours/Week**	3
SEE	100 Marks	**Total Hours**	42L+48ABL=90

Course Objective: Introduce students to construction equipment and selected construction methods. This includes economy, selection, productivity of common construction equipment, and construction procedures for industrial, heavy civil, and commercial construction projects**.**

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Apply theoretical and practical aspects of project management techniques to achieve project goals and problems	3	
CO2	Comprehend the various types of construction equipment used for earthwork	1	
CO3	Apply knowledge and skills of modern construction practices and techniques in tunnelling, drilling, blasting, dewatering, material handling conveyors its applications in various projects	1	
CO4	Apply the concepts of various material handling techniques for appropriate projects.	1	

MODULE-1	**10 Hrs.**

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.

Self Study Component: Study different types of construction equipment and their specific uses in construction.

MODULE-2	**10 Hrs..**

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, trucks and hauling equipment, Compacting Equipment, Finishing Equipment

Self Study Component: Learn about maintenance procedures to ensure equipment longevity and safe operation practices.

MODULE-3	10 Hrs..

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 compaction Equipment.

Self Study Component: Understand cost effective utilization of equipment including factors like fuel efficiency, project scheduling and equipment rental versus ownership.

MODULE-4	10 Hrs.

OTHER CONSTRUCTION EQUIPMENT

Equipment for Dredging, Trenching, Dragline 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.

MATERIALS HANDLING EQUIPMENT

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

Self Study Component: Explore advancements in construction machinery technology such as GPS Tracking and automation

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Construction Planning, Equipment and Methods	Peurifoy, R. L. ,Ledbetter, W.B. and Schexnayder, C.,"	10th	Mc Graw Hill, Singapore,	2006
2	Construction Equipment and Job Planning	Deodhar, S.V.	4th	Khanna Publishers	2014

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Construction Equipment and its planning and Application	Dr. Mahesh Varma	3rd	Metropolitan Book Company	1983
2	Construction Equipment Management	Sharma S .C.	5th	Khanna Publishers ,	2007

EBooks and online course materials:

1. https://archive.nptel.ac.in/courses/105/103/105103206/

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1-Report on Construction site visit 2) Details of activity 2- Quiz	20
Total		**50**

Activity Based Learning (27 Hours)

ABL1 (14 Hours) : Activity 1- Equipment Identification		**Hours**
1.	Students visually recognize and name various construction machines at site visit.	08
2.	Preparing report for site visit.	06
Total		**14**
ABL2 (13 Hours): Activity 2 - Understand real-world decision-making regarding equipment use		**Hours**
1.	Assign students roles such as project manager, site engineer, safety officer	07
2.	Justify equipment choice, calculate productivity, and present a plan	06
Total		**13**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test(1,2 and 3)	3
Quiz(1and 2)(optional)	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1			3										
CO2	3												
CO3	3												
CO4	3												

Course Title	CONCRETE DESIGN AND PLACEMENTS		
Course Code	24CV404C	**(L-T-P)C**	(3-0-0)3
Exam	3 Hrs.	**Hours/Week**	3
SEE	100 Marks	**Total Hours**	42L+48ABL=90

Course Objective: Test the basic properties of ingredients of concrete, fresh and hardened properties of concrete

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Evaluate the properties of concrete by conducting tests on cement, aggregate and concrete (with & without admixtures) for using the data for mix design procedures	PO1, PO2	
2	Describe the rheological behavior and workability requirements of fresh concrete and explain the development of strength and maturity in hardened concrete	PO2, PO3	
3	Design a concrete mix as per requirement of construction project(	PO2, PO3	
4	Analyze the best practices in concrete construction from industry's requirement, thumb rules, mitigation of concreting issues at Sites	PO1, PO2	

MODULE-1	10 Hrs.

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

Self- study component: Collect the samples of river sand, M-sand, and quarry dust.Observe and record properties: color, grain size, texture, cleanliness.Discuss suitability based on requirements (IS 383).

MODULE-2	10 Hrs..

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.

Self- study component: : Conduct a slump test or flow table test on fresh concrete. Vary mix proportions or admixtures to observe different flow behavior.

MODULE-3	10 Hrs..

TESTING OF CONCRETE & MIX DESIGN

Concrete mix design, Basic considerations and choice of 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.

Self- study component: Real-time application of code-based design.

MODULE-4	10 Hrs.

PUMPING AND PLACING OF CONCRETE

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.

Self- study component: Provide a list of concreting methods. Students match with applications (tunnels, bridges, high-rise, repairs).Create an infographic with method → equipment → advantage → precaution.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	"Concrete Technology-Theory and Practice",	Shetty, M.S	8th	S. Chand and Co, New Delhi.	2022
2	"Concrete Technology"	Neville, A.M. and Brooks, J.J.	2nd	Pearson Education, Asia	2010

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	"Concrete Technology"	Gambhir, M.L,	5th	Tata Mc Graw Hill, New Delhi	2017
2	Recommended guidelines for concrete mix design-	IS:10262 -2019	2nd	BIS publication	2019

EBooks and online course materials:

1. https://ebooks.wileyindia.com/home/product-details/288259

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc25_ce64/preview
2. https://www.swayamprabha.gov.in/program_data/flipMore/C17/12

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Activity Based Learning (27 Hours)

ABL1 (XX Hours) : Activity 1 Details		**Hours**
1.	Conduct the tests and understand the differences in properties between river sand, M-sand	2
2.	Learn to perform basic aggregate tests like sieve analysis, water absorption, and specific gravity.	1
3.	Prepare concrete mixtures with different water-cement ratios or varying proportions of ingredients (cement, sand, coarse aggregate, and admixtures)	2
4.	Observe and analyze the workability of fresh concrete using slump	1
5.	Understand and solve the relationship between the maturity of concrete and its strength.Use the maturity method to calculate the maturity index based on temperature and time.	1
Total		**07**
ABL2 (YY Hours): Activity 2 Details		**Hours**
6.	Choose a hypothetical construction project,collect necessary data, design the concrete mix by calculating proportions of cement, aggregates, and water.	5
	Understand the importance and techniques of NDT for concrete.	2
	Understand the complexities of pumping concrete and the management of pumping operations.	2
7.	Visualize and compare different concrete placement methods and their applications.	3
8.	Discuss how variables such as **pipe length**, **pressure**, and **type of concrete** affect the pumping operation.	3
9.	Provide a detailed report, including assumptions, calculations, and a comparison with typical mix designs used in the industry.	5
Total		**20**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test(1,2 and 3)	3
Quiz(1and 2)(optional)	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**
CO1	3	2											
CO2		3	1										
CO3		3	2										
CO4	2	2											

Course Title	HYDROLOGY AND WATER RESOURCES ENGINEERING		
Course Code	24CV404D	(L-T-P) C	(3-0-0)3
Exam	3 Hrs	Hours/Week	03
SEE	100 Marks	Total Hours	42L+48ABL=90

Course Objective: Develop understanding about different components of the hydrological cycle

1. Enable the students to estimate runoff, infiltration, evaporation, groundwater flow and peak floods.

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

#	Course Outcomes	Mapping to POs
1	Understand the significance of the hydrological cycle and different sources of water and rainfall distribution.	PO1
2	Apply methods for the measurement and analysis of inflow and outflow	PO1
3	Apply stage-discharge relationships and unit hydrograph theory for flood prediction and water management.	PO1
4	Apply the knowledge of IMD, stream gauging, and groundwater monitoring stations to observe, collect data, and prepare reports to real-world hydrological systems	PO6, PO8, PO9

MODULE-1	10Hrs.

Hydrological cycle-types of representation, Water budget equation. Climatic seasons in India. Precipitation: Definition, Types and Forms of precipitation, Measurement of precipitation. Rain gauges - Types, Rain gauge network, Optimum number of rain gauges. Mass Curve and Estimation of missing precipitation data, Consistency of rainfall data. Different methods of computation of average depth of precipitation over an area.

Self-study component: Students should prepare a report on following

a) Visit a nearby Rain Gauge Station to observe the typical arrangements.

MODULE-2	11Hrs..
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. ***Self-study component: Students should prepare a report: Visit a nearby IMD station and collect layout details for rain gauge, evaporation pans, anemometer, and sunshine recorder.***	
MODULE-3	**11 Hrs..**
Stream Gauging. Introduction Measurement of stage and velocity using current meters and float. Computation of discharge by Area-Velocity and Slope-Area methods. Simple stage–discharge curve. **HydrographTheory**:Definition, concept and types of hydrographs. Components of hydrograph, separation of base flow. Unit hydrograph theory, derivation and application of unit hydrograph. Computation of unit hydrograph ordinates of different duration.S-Curve and its uses **AI/ML Application in Hydrograph Theory:** Predicting Direct Runoff Hydrograph from Rainfall Using Linear Regression **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	**10Hrs.**
Ground Water Hydrology and Well Hydraulics: Scope and importance of ground water and availability of groundwater.Aquifers, aquitard, aquifuge, aquiclude, perched aquifer, and Aquifer parameters, Darcy's law and its validity. Steady radial flow into a well in confined and unconfined aquifers. ***Self study component: Students shall visit the District Geologist's office and learn about underground aquifers and rock formations, rainwater harvesting and recharging of underground water. Ground water level monitoring.***	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Engineering Hydrology.	Subramanya, K.	4th	India: McGraw Hill Education (India) Private Limited.	2013
2	A Textbook of Hydrology.	Reddy, P. J. R.	3rd	India: University Science Press	2011

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Hydrology	Ojha, C.S.P	Revised edition	Oxford University Press,	2008
2	Hydrology and water resources engineering	S. K. Garg.	27th	Khanna Publication,	2004

EBooks and online course materials:

1. https://books.google.co.in/books?id=Nh8Y3vIjXK8C&printsec=frontcover&redir_esc=y#v=onepage&q&f=false

Online Courses and Video Lectures:

1. https://youtu.be/IphCId7mkhk

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	28
6	Evaluation of Learning Process	-	-	06
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted Apply the knowledge of IMD, stream gauging, and groundwater monitoring stations to observe, collect data, and prepare reports to real-world hydrological systems	20
	Total	**50**

Activity Based Learning (27 Hours)

ABL1 (15 Hours) : Activity 1 details - Observation and Data Collection from IMD, Stream Gauging, and Groundwater Monitoring Stations		**Hours**
	Pre-Field Preparation Introduction to IMD, CWC (Central Water Commission), and CGWB (Central Ground Water Board) monitoring systems.	08
	Field Visit to IMD Station - Data charted analysis	06
Total		**14**
ABL2 (YY Hours): Activity 2 details - Data Analysis, Report Preparation, and Interpretation of Hydrological Observations		**Hours**
	Data Compilation and Validation ● Organizing raw data from field notes into tabular formats. ● Validation and consistency checks.	04
	Data Analysis (3 hours) ● Graphical analysis of rainfall, streamflow, and groundwater data.	04
	Report Writing Workshop (2 hours) ● Guidance on structuring a hydrological report.	04
	Presentation and Review (2 hours) ● **Group presentations of findings.**	02
Total		**14**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test(1,2 and 3)	3
Semester End Exam	3
Total	**6**

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2												
CO2	3												
CO3	3												
CO4						2		2	2				

Course Title	WASTEWATER ENGINEERING		
Course Code	24CV404E	(L-T-P)C	(3-0-0)3
Exam	3 Hrs	Hours/Week	3 Hours
SEE	100 Marks	Total Hours	42L+48ABL=90

Course Objective: To inculcate the basics concepts of wastewater treatment, its design and management

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

Sl. No.	Course outcomes	Mapping toPOs	Mapping to PSOs
CO1	Estimate average and peak wastewater from a community and design suitable conveyance systems for sewage and storm water.	PO1, PO2, PO6	-
CO2	Evaluate wastewater quality to suggest suitable small scale treatment option	PO1, PO2, PO6	-
CO3	Design a comprehensive wastewater treatment system to achieve required quality standards for safe disposal and reuse of wastewater	PO1, PO2, PO6	PSO1
CO4	Design an effective and efficient sludge and wastewater disposal system	PO1, PO6,	PSO1

MODULE-1 — 10 Hrs.

Introduction: Wastewater disposal - Necessity for sanitation, types of sewerage systems and their suitability. **Quantity of Sewage:** Dry weather flow, factors affecting dry weather flow, Estimation of storm flow, Rational method and Empirical formulae of design of storm water drain, Time of concentration. **Design of Sewers:** Hydraulic formulae for velocity, self-cleansing and non-scouring velocities, Design of hydraulic elements for circular sewers flowing full and for partially full, Sewer pipe material, Shapes of sewers, laying of sewers, jointing and testing of sewers, ventilation and cleaning of sewer.

Self Study Component: Review different sewer pipe materials and their properties and prepare a comparison table

MODULE-2 — 10 Hrs.

Sewer Appurtenances: Catch basins, Manholes, Flushing tanks, oil and grease traps, Drainage traps, Basic principles of house drainage, typical layout plan showing house drainage connections, maintenance of house drainage. Sewage Pumps - Need, Types of pumps and pumping stations. **Analysis of Sewage:** Physical, chemical, and biological characteristics, concepts of Aerobic and Anaerobic activity, CNS cycles, more emphasis on BOD and COD –significance, Sampling and techniques.

Self Study Component: Understand the basic principles of house drainage including gradient, venting, and water seals and Review routine maintenance practices to avoid blockages and maintain hygiene in domestic drainage

MODULE-3	10 Hrs.
Disposal of Effluents: By dilution, self-purification phenomenon, oxygen sag curve, Zones of purification, Sewage farming, sewage sickness, Disposal standards on land and water, Chlorination of sewage. **Treatment of Sewage:** Flow diagram of municipal sewage treatment plant. **Primary Treatment:** screening, grit chambers, skimming tanks and design of primary sedimentation tank**.** ***Self Study Component: Research on modern chlorination alternatives like UV or ozonation in tertiary treatment and present findings. Conduct a mock BOD/COD test in a lab setup or virtually through a simulation platform.***	
MODULE-4	**10 Hrs.**
Secondary treatment: Trickling filter (introduction only), Activated sludge process - Principle and flow diagram, methods of aeration, modifications, F/M ratio, Design of ASP. Methods of sludge disposal: Sludge digestion and Sludge drying beds. **Miscellaneous Treatment Methods:**Septic tanks and Oxidation Pond. Introduction to RBC, UASB, Anaerobic filters. ***Self Study Component: Students shall visit the nearby Industry and observe the methods adopted for sewage treatment and disposal. The students shall submit a report of their observations under self-study components.***	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Environmental Engineering – Vol. II: Sewage Disposal and Air Pollution Engineering	S.K. Garg	29th Edition	Khanna Publishers	2022
2	Wastewater Engineering	Dr. B.C. Punmia, Er. Ashok Jain, Dr. Arun Jain	3rd Edition	Laxmi Publications Pvt. Ltd.	2018

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Wastewater Engineering: Treatment and Resource Recovery	Metcalf & Eddy, George Tchobanoglous, H. David Stensel	5th Edition	McGraw-Hill Education	2014
2	Wastewater Treatment: Concepts and Design Approach	G.L. Karia and R.A. Christian	2nd Edition	PHI Learning Pvt. Ltd.	2013

EBooks and online course materials:

1. Wastewater Engineering: Treatment and Reuse - https://archive.org/details/wastewaterengine0000unse
2. Fundamentals of Wastewater Treatment and Engineering - https://priodeep.weebly.com/uploads/6/5/4/9/65495087/fundamentals_of_wastewater_treatment_and_engineering.pdf
3. Basic Principles of Wastewater Treatment - https://library.oapen.org/bitstream/handle/20.500.12657/31052/1/640138.pdf

Online Courses and Video Lectures:

1. Wastewater Treatment and Recycling by Prof. Manoj Kumar Tiwari, IIT Kharagpur https://onlinecourses.nptel.ac.in/noc24_ce105/preview
2. Physico-Chemical Processes for Wastewater Treatment by Prof. Vimal Chandra Srivastava (IIT Roorkee) - https://onlinecourses.nptel.ac.in/noc22_ch25/preview

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Field visit and report submission 2) Quiz	20
Total		**50**

Activity Based Learning (27 Hours)

ABL1 (XX Hours) : Activity 1 Details		**Hours**
Field Visit and Report Submission	Design a combined sewerage system for Hassan city	05
	Visit a nearby rain gauge station and submit a report on the working principle and determination of rainfall intensity	05
	Visit a nearby newly constructed layout and submit a detailed report on various sewer appurtenances installed	05
	Submit a plan of your individual houses showing drainage connections	05
	Visit a nearby sewage treatment plant and submit a report on various unit of STP	06
Total		**26**
ABL2 (YY Hours): Activity 2 Details		**Hours**
Quix	Conduction of quiz	01
Total		**01**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test(1,2 and 3)	3
Quiz(1and 2)(optional)	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2											
CO2	2					3							
CO3	3	2											
CO4	3					2							

Course Title	TOTAL STATION APPLICATION IN CIVIL ENGINEERING (LAB)		
Course Code	24CVL405A	**(L-T-P)C**	(0-0-2) 1
Exam	3 Hrs	**Hours/Week**	2
SEE	100 Marks	**Total Hours**	42L+48ABL=90

Course Objective:

1. Understand conventional and modern methods of surveying.
2. Develop ability to transform basic concepts of surveying to field practice.

Course Outcomes:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	To determine the relative position of points in horizontal plane and vertical plane using total station.	PO5, PO9	
2	Develop plans, draw maps and draft reports for surveying projects of Civil Engineering works	PO2, PO8	

Lab Program	Program Details
1	To carry out 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 using total station
4	To determine the difference in elevation between two points using Total station
5	To Conduct profile levelling and cross levelling for existing highway projects.
6	To Prepare contour map by block levelling using total station.
7	To set out a simple curve using total station
8	To set out the Compound curve by Using Total Station. (Using Rankine's deflection angles)
9	To set out the 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.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	An Introduction to Total Station Topographic Survey Procedures	J Paul Guyer	2nd	Independently Published	25 February 2018
2.	Advanced Surveying: Total Station, GIS and Remote Sensing	GOPI	1st	Pearson Education India	1 January 2006

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Surveying	Basak. N. N	2nd	Tata McGraw Hill Publishing Co., ltd	2004
2.	Irrigation and Water Power Engineering	Punmia, B. C	16th	Laxmi Publications, New Delhi	2009
3.	Highway Engineering	Khanna, S. K. & Justo CES	10th	Nemchand Brothers, Roorkee	2018
4.	Water Supply Engineering	Garg, S. K	2nd	**Laxmi Publications**	2016

EBooks and online course materials:

1. Surveying

Online Courses and Video Lectures:

1. https://nptel.ac.in/courses/Digital Land Surveying And Mapping (DLS&M)

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	27
6	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				**90**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Activity Based Learning (27 Hours)

ABL1 (XX Hours) : Activity 1 Details		**Hours**
Total		**XX**
ABL2 (YY Hours): Activity 2 Details		**Hours**
Total		**YY**

Evaluation of Learning Process(7 Hours)

Type of Evaluation	**Hours**
Test(1,2 and 3)	3
Quiz(1and 2)(optional)	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Course Outcomes	**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1					3				2				
CO2		3						2					
CO3													
CO4													

Course Title	COMPONENTS OF A SMART CITY		
Course Code	24CV405B	**(L-T-P)C**	(2-0-0) 1
Exam	3 Hrs.	**Hours/Week**	2
SEE	100 Marks	**Total Hours**	28L+2ABL=30

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Discuss the need, key outcomes that define a Smart city.	PO1, PO6, PO7	
2	Interpret the guiding principles and steps to make a city smart	PO1, PO6, PO8	
3	Review the financing pattern and the bench marking for smart cities	PO1, PO7, PO8	
4	Report on the translation of the smart city initiatives by the government of India.	PO1, PO9, PO10	

MODULE-1	**6 Hrs.**

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.

Self- study component: Visit a smart city website and study the various projects of the smart cities mission.

MODULE-2	**6 Hrs..**

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

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	**6 Hrs..**

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.

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

MODULE-4	6 Hrs.
The smart city initiatives by the Government of India - Policy for smart city, Mission statement & guidelines, Case studies. Implementation and monitoring of projects. ***Self- study component: Prepare a presentation and report on the self study components carried out in the module 1, 2 and 3.***	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
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 (TERI) Website: www.teriin.org (2015)			The Energy & Resources Institute,	2015

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Mission statement & guidelines on Smart City Scheme". Government of India			Ministry of Urban Development	

EBooks and online course materials:

1. https://unece.org/sites/default/files/2021-01/SSC%20nexus_web_opt_ENG_0.pdf
2. http://smartcities.gov.in/upload/uploadfiles/files/Smart City Guidelines(1).pdf

Online Courses and Video Lectures:

1. Online Course: https://www.coursera.org/learn/urban-development

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	4	4
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1&ABL2)	-	-	12
6	Evaluation of Learning Process	-	-	06
Total Learning Hours/Semester				**50**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 20 marks each	40
Activity Details	Details of activities to be conducted 1) Details of activity 1: Poster 2) Details of activity 2: Quiz	10
Total		**50**

Activity Based Learning (27 Hours)

ABL1 (6 Hours) : Activity 1 Details	**Hours**
Poster	6
Total	**6**
ABL2 (6 Hours): Activity 2 Details	**6**
Quiz	6
Total	**12**

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Test(1 and 2)	2
Quiz and Poster	1
Semester End Exam	3
Total	**6**

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3					2	2						
CO2	3					2		2					
CO3	3						2	2					
CO4	3								3	2			