Malnad College of Engineering, Hassan

[An Autonomous Institution Affiliated to VTU Belagavi]

Autonomous Programme

Bachelor of Engineering in Civil Engineering

Scheme & Syllabus

VII & VIII Semester

(2022-2023 Admitted Batch)

Academic Year: 2025-2026

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 and Course Code**		**Course Title**	**L-T-P**	**Credits**	**Contact Hours**
1.	PCC	22CV301	Engineering Geology and Building Materials	3-0-0	3	3
2.	IPCC	22CV302	Engineering Surveying	3-0-1	4	5
3.	IPCC	22CV303	Strength of Materials	3-0-1	4	5
4.	PCC	22CV304	Water Supply and Treatment Engineering	3-0-0	3	3
5.	PCCL	22CV305	Computer Aided Building Planning and Drawing	0-0-1	1	2
6.	ESC	22CV306X	ESC/ETC/PLC	3-0-0	3	3
7.	UHV	22CV307	Social Connect and Responsibility	0-0-1	1	2
8.	AEC/SEC	22CV358X	Ability Enhancement Course/Skill Enhancement Course-III	1-0-0	1	1
				Total	**20**	**24**
	PCC: Professional Core Course; IPCC: Professional Core Course Theory Integrated with Practical of the same course PCCL: Professional Core Course Laboratory **AEC: Ability Enhancement Course; UHV: Universal Human Value Courses**					

THIRD SEMESTER						
Sl. No.	**Course Category and Course Code**		**Course Title**	**L-T-P**	**Credits**	**Contact Hours**
1.	ESC	22CV306A	Rural, Urban Planning and Architecture	3-0-0	3	3
2	ESC	22CV306B	Sustainability in Engineering Design	3-0-0	3	3
3.	ESC	22CV306C	Environmental Protection and Management	3-0-0	3	3
4.	AEC/SEC	22CV358A	Smart Urban Infrastructure	1-0-0	1	2
5.	AEC/SEC	22CVL358B	Digital Drafting for Civil Engineers (Lab)	0-0-1	1	2
	PCC: Professional Core Course; IPCC: Professional Core Course Theory Integrated with Practical of the same course PCCL: Professional Core Course Laboratory **AEC: Ability Enhancement Course; UHV: Universal Human Value Courses**					

FOURTH SEMESTER						
Sl. No.	**Course Category and Course Code**		**Course Title**	**L-T-P**	**Credits**	**Contact Hours**
1.	PCC	22CV401	Analysis of Structures	2-1-0	3	4
2.	IPCC	22CV402	Fluid Mechanics and Hydraulics	3-0-1	4	5
3.	IPCC	22CV403	Concrete Technology	3-0-1	4	5
4.	ESC	22CV405X	ESC/ETC/PLC	3-0-0	3	3
5.	AEC/SEC	22CV456X	Ability Enhancement Course/Skill Enhancement Course-III	1-0-0	1	1
6.	BSC	22CV407	Biology for Engineers	1-0-0	1	2
7.	UHV	22UHV	Universal Human Values	1-0-0	1	1
				Total	**17**	**20**
	PCC: Professional Core Course; IPCC: Professional Core Course Theory Integrated with Practical of the same course PCCL: Professional Core Course Laboratory **AEC: Ability Enhancement Course; UHV: Universal Human Value Courses**					

Sl. No.	**Course Category and Course Code**		**Course Title**	**L-T-P**	**Credits**	**Contact Hours**
1.	ESC	22CV405A	Building Information Modelling in Architecture, Engineering and Construction (BIM)	3-0-0	3	3
2.	ESC	22CV405B	Construction Equipment, Plants and Machinery	3-0-0	3	3
3	ESC	22CV405C	Concreting Techniques and Practices	3-0-0	3	3
4	ESC	22CV405D	Water Resources Engineering	3-0-0	3	3
5	AEC/SEC	22CV456A	Total Station Application in Civil Engineering (Lab	0-0-1	1	2
6	AEC/SEC	22CV456B	Components of a Smart City	1-0-0	1	2
	PCC: Professional Core Course; IPCC: Professional Core Course Theory Integrated with Practical of the same course PCCL: Professional Core Course Laboratory **AEC: Ability Enhancement Course; UHV: Universal Human Value Courses**					

FIFTH SEMESTER						
Sl. No.	**Course Category and Course Code**		**Course Title**	**L-T-P**	**Credits**	**Contact Hours**
1.	PCC	22CV501	Advanced Structural Analysis	2-1-0	3	4
2.	PCC	22CV502	Construction Planning and Management	3-0-0	3	3
3.	IPCC	22CV503	Geotechnical Engineering	3-0-1	4	5
4.	IPCC	22CV504	Transportation Engineering	3-0-1	4	5
5.	PCCL	22CV505	Environmental Engineering Laboratory	0-0-1	1	2
6.	PEC	22CV55X	Professional Elective Course	3-0-0	3	3
7.	AEC	22RIP	Research Methodology and IPR	3-0-0	3	2
8.	HSMC	22EVS	Environmental studies	0-0-2	1	2
				Total	**22**	**23**
	PCC: Professional Core Course; IPCC: Professional Core Course Theory Integrated with Practical of the same course PCCL: Professional Core Course Laboratory **AEC: Ability Enhancement Course; UHV: Universal Human Value Courses**					

Sl. No.	**Course Category and Course Code**		**Course Title**	**L-T-P**	**Credits**	**Contact Hours**
1.	PEC	22CV551	Occupational Safety and Health assessment	3-0-0	3	3
2.	PEC	22CV552	Remote Sensing and GIS	3-0-0	3	3
3.	PEC	22CV553	Waste water engineering	3-0-0	3	3
4.	PEC	22CV554	Energy and environment	3-0-0	3	3
5.	PEC	22CV555	Satellite Imagery in GIS	3-0-0	3	3
6.	PEC	22CV556	Groundwater Development and Management	3-0-0	3	3
7.	PEC	22CV557	Repair and Rehabilitation of Structures	3-0-0	3	3
8.	PEC	22CV558	Stability Analysis of Slopes	3-0-0	3	3
9.	PEC	22CV559	Advanced Construction Materials and Green Buildings	3-0-0	3	3
	PCC: Professional Core Course; IPCC: Professional Core Course Theory Integrated with Practical of the same course PCCL: Professional Core Course Laboratory **AEC: Ability Enhancement Course; UHV: Universal Human Value Courses**					

SIXTH SEMESTER						
Sl. No.	**Course Category and Course Code**		**Course Title**	**L-T-P**	**Credits**	**Contact Hours**
1.	IPCC	22CV601	Design and Detailing of RC Structures	3-0-1	4	5
2.	PCC	22CV602	Irrigation Engineering and Hydraulic Structures	3-0-0	3	3
3.	PCC	22CV603	Applied Geotechnical Engineering	3-0-0	3	3
4.	PEC	22CV65X	Professional Elective Course	3-0-0	3	3
5.	OEC	22OECV66X	Open Elective Course	3-0-0	3	3
6.	PROJ	22PROJ1	Major Project Phase-I	0-0-2	2	4
7.	PCCL	22CVL606	Software Application Lab	0-0-1	1	2
8.	PCC	22CV607	Advanced Survey Training	0-0-2	2	3
9.	OEC	22SWY	Swayam (NPTEL Only)	Audit		
10.	AEC/ SDC	22ASK	Analytical ability & Soft skills	0-0-2	1	1
				Total	**22**	**25**
	PCC: Professional Core Course; IPCC: Professional Core Course Theory Integrated with Practical of the same course PCCL: Professional Core Course Laboratory **AEC: Ability Enhancement Course; UHV: Universal Human Value Courses**					

Sl. No.	**Course Category and Course Code**		**Course Title**	**L-T-P**	**Credits**	**Contact Hours**
1.	PEC	22CV651	Matrix Methods of Structural Analysis	3-0-0	3	3
2.	PEC	22CV652	Structural dynamics	3-0-0	3	3
3.	PEC	22CV653	Soft Computing and Automation in Civil Engineering	3-0-0	3	3
4.	PEC	22CV654	Industrial Waste Water Treatment	3-0-0	3	3
5	PEC	22CV655	Ground Improvement Techniques	3-0-0	3	3
6.	PEC	22CV656	Traffic Engineering	3-0-0	3	3
7.	PEC	22CV657	Rural Water Supply & Sanitation	3-0-0	3	3
8.	PEC	22CV658	Environmental Impact Assessment	3-0-0	3	3
9.	PEC	22CV659	Theory of Elasticity	3-0-0	3	3
10.	PEC	22CV660	Urban Transportation Planning	3-0-0	3	3
11.	PEC	22CV661	Groundwater Hydraulics	3-0-0	3	3
12.	PEC	22CV662	Modern Construction Methods And Mechanization	3-0-0	3	3
	PCC: Professional Core Course; IPCC: Professional Core Course Theory Integrated with Practical of the same course PCCL: Professional Core Course Laboratory **AEC: Ability Enhancement Course; UHV: Universal Human Value Courses**					

SIXTH SEMESTER: OPEN ELECTIVES						
Sl. No.	**Course Category and Course Code**		**Course Title**	**L-T-P**	**Credits**	**Contact Hours**
1.	OEC	22OECV661	Engineering Seismology	3-0-0	3	3
2.	OEC	22OECV662	Water Supply and Sanitation	3-0-0	3	3
3.	OEC	22OECV663	Sustainability in Engineering Systems	3-0-0	3	3
4.	OEC	22OECV664	Composite and Smart Materials	3-0-0	3	3
5.	OEC	22OECV665	Remote Sensing and GIS	3-0-0	3	3
6.	OEC	22OECV666	Urban Design and Regeneration	3-0-0	3	3
7.	OEC	22OECV667	Railway Engineering	3-0-0	3	3
8.	OEC	22OECV668	Hazardous Waste Management	3-0-0	3	3
9.	OEC	22OECV669	Advanced Construction Materials and Green Buildings	3-0-0	3	3
	PCC: Professional Core Course; IPCC: Professional Core Course Theory Integrated with Practical of the same course PCCL: Professional Core Course Laboratory **AEC: Ability Enhancement Course; UHV: Universal Human Value Courses**					

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	22CV701	Specifications & Quantity Surveying	3	2	0	5	50	50	100	4
2	PCC	22CV702	Prestressed Concrete Structures	3	2	0	4	50	50	100	4
3	IPCC	22CV703	Design of Steel Structures	3	0	2	5	50	50	100	4
4	PCC	22CV704	Technical Seminar	0	0	2	2	100	-	100	1
5	PI	22PROJ2	Main Project Phase-II	0	0	8	8	50	50	100	4
6	PEC	22CV75X	Professional Elective Course - III	3	0	0	3	50	50	100	3
7	OEC	22OECV76X	Open Elective Course–II	3	0	0	3	50	50	100	3
Total				15	04	12	30				23

Professional Elective Course-III	
Course Code	**Course Name**
22CV751	Railway, Harbour & Airport Engineering
22CV752	Earthquake Resistant Design of Structures
22CV753	Finite Element Analysis
22CV754	Industrial Wastewater Treatment
22CV755	Advanced Design of RC Structures
22CV756	Composite & Smart Materials
22CV757	Urban Design and Regeneration
22CV758	Watershed Management
22CV759	Advanced Foundation Design

Open Elective Course-II	
Course Code	**Course Name**
22OECV761	Water Supply and Sanitation
22OECV762	Composite and Smart Materials
22OECV763	Hazardous Waste Management
22OECV764	Sustainability in Engineering systems
22OECV765	Railway Engineering
22OECV766	Remote Sensing and GIS
22OECV767	Water Resources Management
22OECV768	Engineering Optimization
22OECV769	Green Buildings

EIGHTH SEMESTER											
Sl.No	**Course Category**	**Course Code**	**CourseTitle**	**Teaching Hours/Week**				**Exam Marks**			**Credits**
				L	**T**	**P**	**Total**	**CIE**	**SEE**	**Total**	
1	PEC	22SW01	Professional Elective (Online Course)	3	0	0	3	50	50	100	3
2	OEC	22SW02	Open Elective (Online course)	3	0	0	3	50	50	100	3
3	PI	22INT	Internship (Research/Industry) (15-20 weeks)	0	0	12	12	100	100	200	10
Total				6	0	12	18				**16**

Course Title	SPECIFICATIONS & QUANTITY SURVEYING		
Course Code	22CV701	**(L-T-P) C**	(3-2-0) 4
Exam	3 Hrs	**Hours/Week**	5 Hrs
SEE	50 + 50 marks	**Total Hours**	40+28

Course Objectives:

1. To equip students with the knowledge and skills to prepare, interpret, and apply construction specifications.
2. To equip the students for ensuring that projects are executed according to design intent and quality standards.

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 importance of estimation and specifications with different types of contracts and check measurement and bill Preparations for a given project.	P01, & PO7	
2	Determine the quantities of various items identified in a project for given specifications	PO2, & PO7	
3	Apply long wall and short wall method and centerline method for calculating quantities	P02, PO7,	
4	Conduct rate analysis for standard items with given specifications	P01, & PO7	

MODULE-1	18 Hrs..

Introduction:- Different type of estimates — Study of various drawings attached with estimates- important terms, units of measurement — abstract — approximate methods of estimating cost of buildings.

Estimating - Methods of taking out quantities and cost — center line method— long and short wall method or crossing method — Preparation of detailed and abstract estimates for the following Civil Engineering works: Buildings framed structures with flat or sloped RCC slabs and Masonry structures

Self-study component: Students shall visit a building under construction and observe how the center line is marked and find the total length of the centre line. They shall also identify the long walls, short walls and intersection points of the walls. They shall observe the progressive construction of masonry and RC components, prepare a report and submit

MODULE-2	17 Hrs..

Estimating; Building components: Beams - Columns, Column Footings, stair cases and retaining walls. Estimating - Steel trusses, A.C. Sheet and G.I. Sheet roofs, RCC slab culverts, pipe culverts, metal led roads, C.C. track way, premix carpeting, stabilized soil roads, manholes and septic tanks

Self-study component: Students shall visit a building under construction and observe how Building components: Beams - Columns, Column Footings, stair cases barbending schedules are made and prepare a report and submit.

MODULE-3	17 Hrs..

Rate Analysis - Definition and purpose — Working out quantities and rates as per CPWD standards for the following standard items of work: earthwork indifferent types of soils— cement concrete of different mixes, brick and stone masonry, flooring — plastering— RCC works, painting, white washing and distempering.

Computation of Earthwork in cuttings and embankments for Roads and canals Methods of computation of earthwork — cross-sections — mid section formula — trapezoidal or average end area or mean sectional area formula — prismoidal formula- for different terrain

Self-study component: Students shall visit a highway under construction and observe how cuttings and embankments for Roads and canals are made and prepare a report and submit.students need to collect local / state govt SR

MODULE-4	16 Hrs..

Specifications: Definition of specifications — objective of writing specifications — essentials of specifications — general and detailed specifications of various items of work in buildings.

Contracts - Types of contract — essentials of contract agreement-legal aspects- penal provisions on breach of contract — Definition of the terms — Tender — earnest money deposit— security deposit — tender forms—documents and types— Comparative statements — acceptance of contract documents and issue of work orders- Duties and liabilities- termination of contract—completion certificate- quality control—rights of contractor—refund of deposit Administrative approval— Technical sanction— Nominal muster roll— measurement books — procedure for recording and checking measurements preparation of bills.

Self-study component: Students shall visit a building under construction. They will go through the estimates in detail by including the measurement of actual at site along with working drawings, contract details, specifications, rate of various components like materials, Labor, machinery, prepare a report and submit. Ready software packages may be used to prepare for the estimates.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Estimating and Costing in Civil Engineering Theory and Practice	Datta, B. N	Twenty Eighth Revised	CBS Publications	2020
2	Estimating Costing Specification & Valuation in Civil Engineering	Chakraborti N.	Twenty Ninth Edition.	M. Chakraborti	2024

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	.Quantity Surveyor's Pocket Book	Duncan Cartlidge	4th Edition	Taylor & Francis Ltd	2022
2	“Estimating, Costing and Accounts”.	Kohli, D. D. and Kohli, R. C	10 th Edition	S. Chand Co.,New Delhi	2008

EBooks and online course materials:

1. https://www.scribd.com/document/428161054/Estimation-Costing-Valuation-BTech-Civil-Engineering-Notes-eBook-PDF-Download
2. https://aits-tpt.edu.in/wp-content/uploads/2023/08/Estimation-Costing-and-Valuation-min.pdf

Online Courses and Video Lectures:

1. https://www.coursera.org/learn/construction-cost-estimating
2. https://onlinecourses.swayam2.ac.in/nou20_cs11/preview

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	Two Details of activities will be conducted Details of activity 1: Measure the dimensions of a Building and draw a plan and compute the quantities of various items of work in excel spreadsheet. (Group Activity) Details of activity 2: Regular short quizzes conducted for each module for understanding of the most recent concepts.	20
Total		**50**

Course Articulation Matrix

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

Course Title	PRESTRESSED CONCRETE STRUCTURES		
Course Code	22CV702	**(L-T-P) C**	(3-2-0) 4
Exam	3 Hours	**Hours/Week**	5 Hours
SEE	100 Marks	**Total Hours**	40+28

Course Objective: To learn broader understandings on various aspects of Prestressed concrete structures

Course Outcomes: Upon completion of the course, students shall be able to

COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply your knowledge to distinguish between pre- tensioning and post-tensioning systems in pre-stressed concrete by describing their properties and applications.	PO1	
2	Analyze the variation of stresses and the factors contributing to the loss of prestress in pre-tensioned and post-tensioned members.	PO2	
3	Design Prestressed concrete beams considering permissible stresses, anchorage zones, and end blocks as per IS codal provisions.	PO3, PO7	
4	Compare and prepare a report on the process involved in Pre tensioned and Post tensioned concrete with the conventional Reinforced concrete.	PO8, PO9, PO11	

MODULE-1	**14 Hrs.**

Introduction & fundamentals – Definition of pre-stressing & pre-stressed concrete, comparison & advantages over RCC, Types and Applications of PSC. High Strength materials - necessity, properties, Difference between pre tensioning and post tensioning systems**.**
Casting, transportation and Erection of PSC Elements

Self-study component: Students shall visit nearby factory producing pre tensioned electric poles and observe the method of pre tensioning materials used and testing of products.

MODULE-2	**13 Hrs.**

Analysis of prestress - Resultant stress concept, pressure line concept, load balancing concept.
Variation of stresses - Variation of stress in steel in bonded and unbonded beams, Cracking moment.
Losses of Prestress – Types of losses in pre-tensioning and post-tensioning. Determination of losses due to various causes.

Self-study component: Students shall visit nearby factory producing pre tensioned members and calculate the losses of Prestress in members.

MODULE-3	12 Hrs.

Deflection of Pre-stressed Members – Short term and long-term deflections, deflections at transfer & working load stage, codal provisions. **Flexural Strength and Shear Capacity -** IS recommendations, ultimate flexural strength, ultimate shear resistance, shear reinforcement as per IS codal provisions.

Self-study component: Students shall visit a construction site comprising post tensioning of beams and slabs and collect the details

MODULE-4	11 Hrs..

Design of PSC Beams - Permissible stresses, design of symmetrical and unsymmetrical sections. **Anchorage Zone and End Blocks –** Transmission of prestress in pre-tensioning systems, transmission length, anchorage stresses in post tensioning systems, end blocks, design of end blocks by IS Method. Post-Tensioned slabs and beams in Building construction.

Self-study component: Students shall visit a construction site comprising post tensioning of beams and slabs and collect the details of Anchorage zone, end blocks.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Prestressed Concrete	N. Krishnaraju	6th	McGraw Hill	2018
2.	Fundamentals of Prestressed Concrete	Sinha, N. C. & Roy, S. K.	3rd	S. Chand. Co New Delhi	2011

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Prestressed Concrete Structures	P. Dayaratnam, P. Sarah	7th	Oxford & IBH Publishing Co Pvt. Ltd	2017
2.	Prestressed Concrete	K. U. Muthu., Azmi Ibrahim, Maganti Janardhana, M. Vijayanand	Revised	Prentice Hall India Learning Private Limited, Delhi	2016

EBooks and online course materials:

1. https://students.aiu.edu/submissions/profiles/resources/onlineBook/k7z4g2_concrete%20structures.pdf?utm_source
2. https://vardhaman.org/wp-content/uploads/2021/03/PRESTRESSED-CONCRETE-STRUCTURES-1.pdf?utm_source

Online Courses and Video Lectures:

1. https://nptel.ac.in/courses/105/106/105106118/

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 & Report submission 2) Quiz	20
Total		**50**

Course Articulation Matrix

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

Course Title	DESIGN OF STEEL STRUCTURES		
Course Code	22CV703	**(L-T-P) C**	(3-0-2) 4
Exam	3 Hours	**Hours/Week**	5 Hours
SEE	100 marks	**Total Hours**	40+28

Course Objectives: To enable students to choose the appropriate steel sections and connections for a given steel structure and imparts knowledge of design of steel structural elements using relevant codes and specifications

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Illustrate the basic concepts of limit state design of steel structural members both in collapse and in serviceability as per IS 800 – 2007	PO1, PO8	
2	Analysis and design of bolted & welded steel connections	PO2, PO3, PO8	
3	Analysis and design of Tension members and compression members	PO2, PO3, PO8	
4	Analysis of flexural members	PO2, PO8	

MODULE-1	(10+8) Hrs.

Introduction: Advantages and disadvantages of Steel structures, Limit state method of design, Partial safety factors for material and loads, Loads and load combinations, Design concepts, Code and Specifications, Section classification. Structural Fasteners:Bolted connections – Standard notations, specifications, advantages, behavior of bolted joints - strength of bolts,
Design of simple bolted connections – Black bolts and HSFG Bolts.

Lab components: Drawings (plan and elevation) to be prepared for the following simple bolted connections:

1.Lap joints
2. Butt joints
3.Truss joints

Self-Study Component: Students shall visit an ongoing construction project site to observe the types of bolted connections

MODULE-2	(10+8) Hrs.

Structural Fasteners (contd..) Welded connections – Standard notations, advantages and disadvantages , fillet and butt welds - defects in welds - welding symbols - strength of welds, design of simple welded connections and welded bracket connections.

Design of Welded Beam Connections**:** Beam to column - seated, stiffened and un-stiffened connections (Excluding moment resisting connections).

Lab components: Drawings (front & side views) to be prepared for the following welded connections: 1.Bracket connections 2. Unstiffened Beam-column connections 3.Stiffened seated Beam-column connections

Self-Study Component: Students shall visit an ongoing construction project site to observe the types of welded connections

MODULE-3	(10+6)Hrs

Design of Tension Members: Modes of failures, axially loaded tension members and their connections, Design of lug angles, Design of truss ties and joints.

Design of Compression Members: End restraints, effective length, Standard Rolled steel sections -design of struts,columns and splices.

Lab components: Drawings (elevation and sectional views) to be prepared for the following:

1. Bolted and welded tension members
2. Welded truss joint
3. Splices

Self-Study Component: Students shall visit an ongoing construction project site to observe the connection details of steel structures

MODULE-4	(10+6)Hrs.

Design of Compression Members (Contd..) Design of Standard Built-up sections- Lacing and battening system, Column bases –Design of Slab and gusseted base. Design of Flexural Members: design of Laterally restrained beams –check for flexure, shear , Web crippling, web buckling and deflection.

Lab components: Drawings (plan and elevation) to be prepared for the following:

1.Laced Columns

2. Battened columns

3. Slab base and gusseted base.

Self-Study Component: Students shall visit an ongoing construction project site to learn about pre-engineered buildings.

Note: The designs shall be done as per IS 800-2007 - limit state method and SP6 (a) – 1984 or Standard Steel table

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Limit State Design of Steel Structures	Subramanian. N	Fifth	Oxford University press,New Delhi	2017
2	Limit State Design of Steel Structures	S K Duggal	Third Edition	Mc Graw Hill Education Pvt.Ltd, New Delhi	2022

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Design of Steel Structures	Ramachandra	Fifth	Standard Book House, New Delhi.	2016
2	Limit State Design of Steel Structures	Prof. Shah V.L and Prof. Veena Gore	Fifth	Structures Publications, New Delhi	2016

EBooks and online course materials:

1. **https://onlinecourses.nptel.ac.in/noc23_ce76/preview**
2. **https://www.mooc-list.com/tags/steel-structures**

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 Integrated Laboratory	20
Total		**50**

Laboratory Plan (if integrated course):

Lab Program	Program Details
1	Elevation and sectional views of simple bolted connections: Lap joints
2	Elevation and sectional views of simple bolted connections: Butt joints
3	Elevation and sectional views of simple bolted connections: Truss joints
4	Front and side of Bracket connections
5	Front and side views of Unstiffened Beam-column connections
6	Front and side views of Stiffened seated Beam-column connections
7	Elevation and sectional views of Bolted and welded tension members
8	Elevation and sectional views of Welded truss joint
9	Elevation and sectional views of splices
10	Plan and Elevation of Laced Columns
11	Plan and Elevation of Battened Columns
12	Plan and Elevation of Slab base and gusseted base.

Course Articulation Matrix

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

Course Title	TECHNICAL SEMINAR		
Course Code	22CV704	**(L-T-P) C**	(0-0-2) 1
Exam	-	**Hours/Week**	-
SEE	-	**Total Hours**	-

Course Objective: To upgrade technical presentation and communication skills through literature survey, review and documentation.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Demonstrate the ability to conduct a literature review on current research and developments in Civil Engineering to identify and analyze advancements in the domain.	PO2	
2	Develop effective technical communication and presentation skills through the preparation and delivery of a structured technical report on a selected Civil Engineering topic.	PO8,PO9	

SCHEME FOR SEMINAR EVALUATION:

Sl. No.	Criteria	Maximum Marks
1	Organization and style	15
2	Content and knowledge	20
3	Understanding and relevance	20
4	Presentation	10
5	Format and flow of communication	15
6	Report organization and presentation	20
	Total	**100**

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	3				

Course Title	MAIN PROJECT PHASE-II		
Course Code	22PROJ2	**(L-T-P) C**	(0-0-8) 4
Exam	3 Hours	**Hours/Week**	8
SEE	100 Marks	**Total Hours**	96

Course Objective: To involve in team work to demonstrate the acquired skill & knowledge gained to identify, formulate, analyze, evaluate and to provide meaningful engineering solutions to industrial/ societal needs

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Implement the design with appropriate techniques, resources and contemporary tools	PO3, PO5	PSO1, PSO2
2	Communicate effectively with team members and mentors, make presentations and prepare technical document	PO9, PO10, PO11	PSO2
3	Use ethical practices in all endeavors	PO8	
4	Share the responsibilities for carrying out the project & playing individual roles appropriately	PO9	

STAGE - 1	32 Hrs.

Stage I (30M) - First internal evaluation shall be taken up during this phase. This includes a presentation on fine tuning of objectives & methodologies carried out in seventh semester.

STAGE - 2	32 Hrs.

Stage II (20 M) –Mid phase evaluation shall be taken up during this phase. This includes presentation, intermediate project progress demonstration, draft copy of the paper, details regarding conference presentation.

STAGE-3	32 Hrs.

Stage III (50 M) – Final project Demo, report submission and details of technical paper publication.

The evaluation of the project stages shall be carried out by the evaluation committee comprising of project guide & other faculty members. The committee will be constituted by the project coordinator in consultation with the Head of the department.

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three project phase presentations will be conducted in presence of project guide, evaluator & coordinator and marks will be awarded based on the student's presentation	50
Total		**50**

Course Articulation Matrix

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

Course Title	RAILWAY, HARBOUR & AIRPORT ENGINEERING		
Course Code	22CV751	**(L-T-P) C**	(3 - 0 - 0) 3
Exam	03 Hours	**Hours/Week**	03 Hours
SEE	100 Marks	**Total Hours**	40

Course Objective: To learn broader understandings on various aspects of railway, harbor & airport engineering

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Illustrate the role of railways, comparing with other modes, and highlight the initiatives by Indian Railways towards development	PO1, PO2,	–
2	Explain the various key elements of the construction of track, maintenance & geometric design.	PO1, PO2	–
3	Illustrate the various components of harbour, wave action and elements of harbour structures and concepts of airport planning	PO1, PO2	–
4	Explain the concepts of airport orientation, geometric design of runway and taxiway	PO1, PO2	–

MODULE-1	**10 Hrs.**

Introduction: Role of railways in transportation, Historical developments of railways in India, Selection of routes - preliminary and locations surveys. **Permanent way**: Rail – functions and types, Sleeper – functions and requirements, Ballast – functions, requirements and types. Gauges, cross section of permanent way, coning of wheel, creep of rail, **rail damage** – defects, rail joints, calculation of quantity of materials needed for laying of tracks.

Self-study component: Students shall visit nearby Railway and Metro stations and observe the components of railway track, rail joints, sleepers and other details, prepare a report and submit.

MODULE-2	**10 Hrs.**

Construction and Maintenance: Construction – earth work – formation and consolidation, plate laying, laying of ballast. Maintenance – necessity, advantages, **Station and Yards:** Railway station – site selection, requirements, classification. **Geometric Design of Track:** gradient – necessity, ruling gradient, pusher gradient, momentum gradient, gradients in station yards. **superelevation -** cant deficiency and negative cant – numerical, Curves – necessity, types. **Self-study component: Students shall visit nearby Railway station and discuss with the railway staff regarding track maintenance, ruling gradient, speed of train, prepare a report and submit.**	
MODULE-3	**10 Hrs.**
Harbour Engineering: Water transportation – inland and ocean. Harbour – components, classification, requirements and site selection. Wave – origin, wave action and coastal protection works. **Airport Planning:** Air transportation – role, advantages and limitations. **Airport** – components, site selection, classification and regional planning. Aircraft characteristics **Self-study component: Students shall collect the material from the internet on typical details of a Harbour and Airport and identify various components and other relevant details, prepare a report and submit**	
MODULE-4	**10 Hrs.**
Runway Design: Analysis of wind data by wind rose diagram to find out the best direction of runway. Basic patterns of runway, basic runway length – correction to runway length by ICAO and FAA specifications. Runway geometric design. **Taxiway Design**: Factors affecting layout of taxiway, Geometric design of Taxiway, turning radius of taxiways as per ICAO. Design of exit taxiway. Instrumental landing system. **Self-study component**: **Students shall collect the material from the internet on typical details of Airport markings, prepare a report and submit.**	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Railway Engineering	S C Saxena and Arora	8	Dhanpath Rai and Sons, New Delhi	2015
2.	Indian Railway Track	M M Agarwal	5	Oxford Publications, Bombay	2018

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Principles of Railway Engineering	Rangawala	10	Charotar Publishing House, New Delhi	2017
2	Railway Engineering	Sathish Chandra	55	Oxford University Press,New Delhi	2013

EBooks and online course materials:

1. **https://https://onlinecourses.nptel.ac.in/noc24_ce37/preview**

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 - Students shall submit the detailed report on self study components, mentioned in each module. 2) Details of activity 2 - Quiz and Assignments	20
Total		**50**

Course Articulation Matrix

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

Course Title	EARTHQUAKE RESISTANT DESIGN OF STRUCTURES		
Course Code	22CV752	**(L-T-P) C**	(3 - 0 - 0) 3
Exam	3 Hours	**Hours/Week**	3 Hours
SEE	100 Marks	**Total Hours**	40

Course Objective: To understand the nature of earthquakes, behavior of structures under the ground motion, and learn the analysis and design of structures subjected to earthquake ground motions.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Comprehend the importance of earthquakes, seismic hazards, waves, faults, vibrations, and structural response to seismic events.	PO1	PSO1
2	Analyze lateral load resisting systems, including diaphragms, frames, shear walls, and their impact on building behavior	PO2	PSO1
3	Apply earthquake-resistant design principles, analysis methods, drift checks, torsion effects, and code provisions.	PO3	PSO2
4	Demonstrate knowledge of ductile design, earthquake-resistant detailing, and behavior of concrete and masonry structures.	PO3	PSO2

MODULE-1	12 Hrs.

Seismological Aspects:
Causes of earthquakes, Theory of plate tectonics, Faults and fault mechanism, Seismic waves, Measures of earthquake, Seismic hazards, Types of vibration, Response of structures to vibration.

Earthquake Ground Motion:
Attenuation Laws, Ground motion parameters, Local site effects, Soil amplification, Duhamel Integral for SDOF for earthquake ground motion, Liquefaction effect, Response Spectrums of Earthquakes, Seismic zoning, Seismic hazard analysis.

Self Study Component: Magnitude (energy released) by Richter scale and Moment magnitude and its Intensity (effects) by Modified Mercalli Intensity (MMI) scale

MODULE-2	08 Hrs.

Lateral Load Resisting Systems for Buildings:
Different structural systems for lateral loads, Floor diaphragms, Lateral load distribution with rigid floor diaphragms, Moment resisting frames, Lateral load distribution in frame buildings, Shear walls, Shear wall with openings, Frame-shear wall dual system, Building configuration implications.

Self Study Component: Sketch a plan and elevation of a building with centrally placed shear walls and analyze qualitatively how forces will flow.

MODULE-3	08 Hrs.

Methods of Analysis for Earthquake Resistant Design:

Principles of earthquake resistant design, Equivalent lateral load procedure, Dynamic analysis procedure, Drift evaluation and verification, Diaphragm effect, Torsional response, and major code provisions.

Self Study Component: Analyze simple building plans to identify potential torsional irregularities.

MODULE-4	12 Hrs.

Design of Structures for Earthquakes:

Plastic design of structures for earthquakes, Ductility and energy absorption in buildings, Reinforced concrete for earthquake resistance, Confinement of concrete for ductility, Ductile detailing of reinforced concrete structures, Effect of infill masonry walls on frames, Problems of soft and weak stories, Capacity design procedures, Behavior of masonry buildings during earthquakes, Failure mechanisms of masonry walls, Strength of masonry in shear and flexure, Concepts for earthquake resistant masonry buildings.

Self Study Component: Understand the critical role of vertical and horizontal bands in controlling failure.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Dynamics of Structures: Theory and Applications to Earthquake Engineering	Chopra A. K	5th	Prentice Hall	2019
2	Earthquake Resistant Design of Structures	Pankaj Aggarwal	1st	Prentice.Hall.	2016

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Fundamentals of Earthquake Engineering	Newmark, N. M., and Rosenblueth, E	1st	Prentice.Hall	1971
2	Earthquake Resistant Design and Risk Reduction	Dowrick D.	2nd	John Wiley & Sons	2011

EBooks and online course materials:

1. https://bmtpc.org/DataFiles/CMS/file/Publication/EQ_TIPS_2015.pdf

Online Courses and Video Lectures:

1. https://archive.nptel.ac.in/courses/105/101/105101004/
2. https://onlinecourses.nptel.ac.in/noc23_ce108/preview

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 Details of activity 1-Draw a plan and elevation of a masonry house with and without reinforcement bands Details of activity 2- Identify non-compliant features per IS 13828 and propose retrofitting measures.	20
Total		**50**

Course Articulation Matrix

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

Course Title	FINITE ELEMENT ANALYSIS		
Course Code	22CV753	**(L-T-P) C**	(3-0-0) 3
Exam	3 Hours	**Hours / Week**	3 Hours
SEE	100 Marks	**Total Hours**	40

Course Objective: To learn and apply finite element solutions to structural, thermal, dynamic problems to develop the knowledge and skills needed effectively to evaluate finite element concepts

Course Outcomes:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Comprehend the importance & scope of finite element method of structural analysis.	PO1, PO3	-
2	Comprehend finite element modeling, displacement functions, Element coordinates & global coordinates for one dimensional element.	PO2, PO3	-
3	Apply the concept of two-dimensional truss element & solution of 2D truss problems & Comprehend beam element & analysis of continuous beams.	PO2, PO3	-
4	Comprehend the application of 2D frame elements & the analysis of 2D plane stress & plane strain problems.	PO3, PO4	-

MODULE-1	10 Hrs

Introduction: Basic concepts and background review – stress-strain relations and strain displacement relations– matrix displacement formulation – energy concepts – equilibrium and energy methods for analyzing the structures – Rayleigh-Ritz and Galerkin's methods – simple applications in structural analysis.

Fundamentals of Finite Element Method: Introduction, Finite Element modeling - Displacement functions–element coordinates- Global co- ordinates. Displacement functions for 1-D element and simple element.

Self study component*: Students shall recapture the concept of stress strain displacement relations from theory and learn energy methods of structural analysis.*

MODULE-2	10 Hrs

Analysis of Pin Jointed Frames: 2-D truss element and its application to simple truss problems; **Continuous Beams and Stiff Jointed Frames:** Euler – Bernouli's beam element – Hermitian interpolation function – generation of stiffness matrix and nodal load vector – Analysis of Continuous beams.

Self-study component: Students shall recapture the matrix methods of analysis of pin jointed trusses,

continuous beams and frames.	
MODULE-3	**10 Hrs**
2 D Frame Element: 2 D Frame Elements- Solution of simple stiff jointed Frames (maximum of three kinematic degrees of freedom); **Analysis of 2-Dimensional Plane stress / Plane Strain Problems:** Introduction – finite element modeling – different types of triangular and quadrilateral elements, characteristics and suitability for applications – polynomial shape functions – Lagrange's interpolation - compatibility and convergence requirements of shape functions– element strain and stresses – element stiffness matrices, nodal load vector - application of CST, LST and quadrilateral elements. Simple Problems ***Self-study component: Students shall attempt to run a FEM package for the analysis of 2D frames and trusses.***	
MODULE-4	**10 Hrs**
Isoparametric Elements, Numerical Integration and Higher Order Elements: Isoparametric, super parametric and sub parametric elements – necessity – description of solution process using Isoparametric elements – characteristics of Isoparametric quadrilateral elements –computation of stiffness matrix – numerical integration – convergence criteria for Isoparametric elements. ***Self-study component: Students shall attempt to run a FEM package for the analysis of Axi- symmetric structural problems.***	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Finite Element Analysis	Krishnamurthy C.S	2nd	Laxmi Publications	2014
2	Finite Element Analysis	Rajashekaran	3rd	Wheeler Publications	2018

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Finite Element Analysis	Chandrupatla T.R Belegundu A.D	3rd	IBH Publishers	2009
2	Finite Element Analysis	Mukhopadyaya.M	2nd	Oxford Publications	2014

Online Courses and Video Lectures:

Introduction to Finite Element Analysis (FEA): 1 Hour Full Course | Free Certified | Skill-Lync

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	Two activities will be conducted	20
Total		**50**

Course Articulation Matrix

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

Course Title	INDUSTRIAL WASTEWATER TREATMENT		
Course Code	22CV754	**(L-T-P) C**	(3-0-0) 3
Exam	3 Hours	**Hours/Week**	3 Hours
SEE	100 Marks	**Total Hours**	40

Course Objective: Apply principles of process optimization, resource recovery, and waste minimization to enhance the sustainability and efficiency of industrial wastewater treatment practices.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Analyse the concept of industrial quality and Impact of untreated effluents on the receiving environment	PO1.PO2	
2	Analyze the different treatment options based on technical feasibility, cost effectiveness, and environmental impact.	PO1.PO2	
3	Accomplish environmental audits effectively and recommended improvements to enhance environmental sustainability.	PO1.PO2	
4	Assess the impact of industrial activities on the environment, economy, and society, considering sustainability and ethical implications	PO1,PO6	

MODULE-1	**10 Hrs..**

Introduction: Difference between Domestic and Industrial Wastewater, Effect on Streams and on Municipal Sewage Treatment Plants. Stream quality, Dissolved Oxygen Sag curve in Stream, StreeterPhelps formulation and problems, Stream Sampling, effluent and stream Standards and Legislation to Control Water Pollution.

Self-study component: The Students shall visit an industrial plant and learn about the effluent treatment method adopted by the industry. They shall witness the effect of flow of treated effluent on stream quality.

MODULE-2	10 Hrs..
Treatment Methods: Volume Reduction-classification of waste, conservation of wastewater, change in production to decrease the waste, reusing both municipal and industrial effluents, elimination of batch or slag discharges, Strength Reduction-process changes, equipment modification, segregation of waste,Equalization of waste and by-product recovery, Neutralization-, Equalization and Proportioning. Removal of Inorganic suspended solids, Removal of Organic Solids. **Self-study component**: The Students shall visit the effluent treatment plant and learn about the method of treatment adopted.	
MODULE-3	**12 Hrs..**
Advanced Wastewater Treatment And Reuse: Chemical oxidation, Ozonation, wet air oxidation, evaporation, nutrient removal, management of RO rejects. Process flow sheet showing origin/sources of waste water, Characteristics of waste, alternative treatment methods, disposal, reuse and recovery along with flow sheet. Effect of disposal on receiving bodies like sewers, streams and land: Cotton Textile Industry, Tanning Industry, Sugar Industry. Dairy Industry, pulp and paper industry. **Self-study component: The Students shall visit different industries and learn the specific method of effluent treatment adopted**	
MODULE-4	**10 Hrs..**
Environmental Audit: Effects of waste addition on physical and chemical properties of soil, Bioremediation. Environmental Auditing- Introduction, Cost of pollution, Financial and managerial opportunities, tangible and intangible factors, waste disposal and water supply as a critical factor. **Self-study component: students shall learn wastewater treatment technologies, and sustainable water resource management practices**	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	"Wastewater Treatment"	M.N Rao . A.K Datta' "	Edison–Wesley 1980 (Ch.1, 3, 5, 6, 7 & 8)	Oxford & IBH Publishing Company Pvt Ltd.ISBN: 9878117120 Nemerow, N.L. "Industrial)	1980
2.	, "Wastewater Engineering : Treatment, Disposal & Reuse" –	Metcalf & Eddy	Third Ed. 1998 (Ch.2 & 4)	Tata McGraw Hill Publishing Company,	1998

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Environmental Engineering	Haward. S Peavy, Donald R Rowe,	Ed. - 1987	l George Tchnobanglous McGraw Hill International	1987
2.	"Wastewater treatment for pollution control"	Arceivala S.J.	1990	-	1990
3.	, "Industrial Wastewater Treatment, Recycling and Reuse"	Vivek Ranade, Vinay Bhandari	ISBN: 9780080999685	Reuse". ISBN: 9780080999685	-

EBooks and online course materials:

1. https://https://onlinecourses.nptel.ac.in/noc24_ce53/preview

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 Details of activity 1 Details of activity 2	20
Total		**50**

Course Articulation Matrix

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

Course Title	ADVANCED DESIGN OF RC STRUCTURES		
Course Code	22CV755	**(L-T-P) C**	(3-0-0) 3
Exam	3 Hours	**Hours/Week**	3 Hours
SEE	100 Marks	**Total Hours**	40

Course Objective: To equip students with the skills to design more complex reinforced concrete elements, such as flat slabs, deep beams, shear walls, and foundations, ensuring structural stability and safety.

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

COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Design of Ground Water tanks as per relevant IS code.	PO1,PO3, PO7	
2	Illustrate bar bending details and determine total quantity of steel for RC Retaining walls as per relevant IS code	PO1,PO3, PO7	
3	Evaluate various types of combined footings	PO1,PO3, PO7	
4	Design of Bunkers and silos	PO1,PO3, PO7	

MODULE-1	9 Hrs.

Design of RC Water tanks – Introduction – Classification-Basis of design- Permissible stresses in concrete and steel – Joints in tanks - Design of Circular water tanks resting on ground with fixed base and without top cover. Design of Rectangular water tanks resting on ground with fixed base and without top cover -shall be designed as per relevant IS guidelines.

Self-study component: The Students shall Create a Design sheet and build prototype a Rc water tank using MS Excel

MODULE-2	10 Hrs.

Design of RC Retaining walls- Introduction – Classification -Stability and safety considerations -Design loads -Design of cantilever retaining wall – Wall proportion – Stability of retaining wall – Pressure distribution- Design of Toe and Heel slabs – Design of Stem. Design of Counterfort retaining wall - Wall proportion – Stability of retaining wall – Pressure distribution- Design of Toe and Heel slabs – Design of Stem – Design of Counterfort , by the limit state design method.

Self-study component: The Students shall Create a Design a Rc*Retaining walls *using MatLab and prepare a model according to the design.

MODULE-3	10 Hrs.

Design of RC Combined footings - Introduction – Rectangular footing,Trapezoidal footing - Design loads – Code requirements for concrete reinforcements – Load on foundation –Design of rectangular combined footing (slab and beam type), Design of trapezoidal combined footing (slab and beam type) by the limit state design method.

Self-study component: The Students shall Create a Design a Rc* Combined footings *using Python and prepare a model according to the design.	
MODULE-4	**11 Hrs.**
Design of Bunkers and silos using Janssen's Theory-IS: Code Specifications, Calculation of Loads as Per IS Code,Factors Increasing the Bin Loads,Analysis of Bunkers,Procedure for Design of Bunkers,Design Problem. ***Self-study component: The Students shall Create a Design a* Bunkers and silos *using Python and prepare a model according to the design.***	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	RCC Designs	Dr. B. C. Pumnia,	11th edition	Lakshmi Publications, New Delhi	2022
2.	Design of Reinforced Concrete Structures	Ramamrutham.S	17th edition	Dhanpath Rai & Sons	2015

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Reinforced Concrete Design	S Unnikrishna Pillai, Devdas Menon	5th Edition	TMH	2024
2.	Advanced Reinforced Concrete Design	P C Vargheese	2nd Revised	PHI Learning Private Limited	2014

EBooks and online course materials:

1. Reinforced Concrete Structures volume II
2. Bunkers and silos

Online Courses and Video Lectures:

1. Design of RC Retaining wall

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 Details of activity 1 Designing of RC Structures using different Tools -10 Marks Details of activity 2 Model Preparation of RC Structures as per the design and presentation on it - 10 Marks	20
Total		**50**

Course Articulation Matrix

Course Outcomes	ProgramOutcomes												
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	COMPOSITE & SMART MATERIALS		
Course Code	22CV756	**(L-T-P) C**	(3 - 0 - 0) 3
Exam	3 Hours	**Hours/Week**	3 Hours
SEE	100 Marks	**Total Hours**	40

Course Objective: To enable students to understand the behavior, analysis, and applications of composite and smart materials.

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 properties and mechanical behavior of composite materials in different directions	PO1	
2	Apply laminate theory and micromechanical models to study single and multi-layer composite materials behavior and its failures	PO1	
3	Analyze the role of smart materials like sensors and actuators in enhancing structural performance	PO2	
4	Analyze smart, sustainable materials to address industry-specific problems, and work in teams to evaluate their performance and communicate their practical benefits	PO6, PO8 PO9	

MODULE-1	10 Hrs.

Introduction to Composite materials: Classifications and applications of fibers, matrix and Composite materials, Weight and Volume fraction and load distribution among constituents, minimum & critical volume fraction, Compliance & Stiffness matrices.

Self-Study component: Students shall gain knowledge about the innovative composite materials and their applications in the Civil engineering domain.

MODULE-2	10 Hrs.

Anisotropic elasticity - Unidirectional and anisotropic lamina, thermo- mechanical properties, micromechanical analysis, classical composite lamination theory.Cross and angle–ply laminates, symmetric, antisymmetric and general asymmetric laminates, mechanical coupling and laminate stacking.

Self-Study component: Students shall explore appropriate websites to observe the behaviour of composite material subject to varying temperature.

MODULE-3	10 Hrs.
Analysis of simple laminated structural elements - Ply-stress and strain, lamina failure theories - first fly failure, environmental effects and manufacturing of composites-Hand layup technique, Pressure bag and Vacuum bag technique, Resin transfer moulding, Injection Moulding and Pultrusion. ***Self-Study component: Students shall learn different types of composite materials and their application in aircraft design***.	
MODULE-4	**10 Hrs.**
Smart materials - Introduction, Types of smart structures, actuators & sensors, embedded & surface mounted actuators and sensors, piezoelectric coefficients, phase transition, piezoelectric constitutive relation. ***Self-Study component: Students shall learn about self-healing materials used in the aircraft industry etc.***	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Analysis and Performance of Fiber Composites	Bhagwan D. Agarwal, Lawrence J. Broutman, K. Chandrashekhara	4th	John Willy and Sons	2017
2	Mechanic of Composite Materials	Robart M Jones	2nd	McGraw Hill Publishing Co.	1999

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	An Introduction to Composite Principles of Composite Material MechanicsMaterials	Clyne, T. W., & Hull, D.	2nd	Cambridge University Press	2019
2	Principles of Composite Material Mechanics	Gibson, R. F.	4th	CRC Press	2016
3	Analysis and Performance of Fiber Composites	Agarwal, B. D., Broutman, L. J., & Chandrashekhara, K.	3rd	Wiley India	2006

EBooks and online course materials:

1. https://www.academia.edu/93600895/Smart_Structures_Theory
2. https://dokumen.pub/composite-materials-science-and-engineering-4th-ed-2019-978-3-030-28982-9-978-3-030-28983-6.html?utm_source=chatgpt.com

Online Courses and Video Lectures:

1. https://archive.nptel.ac.in/courses/105/108/105108124/
2. https://nptel.ac.in/courses/112104173

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 activity to be conducted Work in a team to choose a smart material and explain how it can be used to solve a problem in a specific industry (like automobiles, space, medical, or construction). Describe how it works, why it's better than regular materials, and what benefits it offers.	20
Total		**50**

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						2		2	2				

Course Title	URBAN DESIGN AND REGENERATION		
Course Code	22CV757	**(L-T-P) C**	(3-0-0) 3
Exam	3 Hrs.	**3 Hrs.**	3 Hrs.
SEE	100 Marks	**Total Hours**	40

Course Objective: The course in Urban Design and Regeneration, aims to explore sustainable urban regeneration processes considering all dimensions (including environmental and socioeconomic) with an integrated and multidisciplinary framework approach.

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 strategies involved in Urban regeneration.	PO6, PO7	
2	Interpret the various planning tools regarding the urban assets	PO6, PO8	
3	Review the public and private sector roles and relationships and project phasing in the implementation of the urban regeneration projects	PO7, PO8	
4	Report on the translation of the concepts of urban regeneration in a case study project.	PO9,PO10, PO12	

MODULE-1	10 Hrs..

Definition and fundamentals: The three orientations, the interrelated groups of spaces in the domain of urban design, the eight elements of urban design. The process of urban regeneration projects. The fundamental first phase– Scoping: The key components, macro and microlevel scoping. The Planning Process: defining the planning framework, master planning, developing design standards, Setting the scene, defining the implementation process and Institutional arrangements, partnering arrangements with the private sector, defining early wins.

The Financial tools: Municipal finance tools, land specific financial and regulatory tools for public land. Financial tools for private lands (non capital markets and capital markets), Regulatory tools for private lands (policy and fiscal).

Self-study component: Study of the Review of the Book "The Urban Design Process" by Hamid Shirvani.

MODULE-2	10 Hrs..
Urban assets – First asset land: ownership regimes, tools for land assembly (voluntary and involuntary), land tools for public asset management, land regulatory frameworks. Second asset community: Tools for community participation, charrettes, using technology for public participation.. Third asset: Environment: Site assessment, site investigation, EIA and site remediation plan. ***Self-study component: Examine the tools for public participation in case studies from the world Bank report Regenerating Urban Land: A Practitioner's Guide to Leveraging Private Investment.***	
MODULE-3	**10 Hrs..**
Social equity aspects of regeneration- Interventions for a more socially equitable regeneration project. The potential undesirable impacts of urban regeneration: Gentrification and Loss of social capital. Tools to mitigate the undesirable social impacts: resettlement, principle of minimizing displacement, compensation, Inclusionary zoning and housing vouchers. ***Self-study component: Reading of the book "Uses of Disorder" by Richard Senett and short review writing on any one chapter of the book.***	
MODULE-4	**10 Hrs..**
Implementation Phase: Political leadership, Public and private sectors roles and responsibilities, phases of implementation, Framework for assessing and mitigating risks : political, financial, technical environmental, Land ownership and regulation, stakeholders, fiduciary and commercial risks. The parameters that influence the urban regeneration strategy: Land use and zoning, historical preservation, environmental features, open spaces, building form, people participation, economic base, infrastructure and transportation networks, urban planning policies and political leadership. case study for each parameter ***Self-study component: Collect information and read about Government of India strategies like Swachh Bharat Mission - Urban (SBM-U), Pradhan Mantri Awas Yojana - Urban (PMAY-U), Smart Cities Mission (SCM), Atal Mission for Rejuvenation and Urban Transformation***	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	"The Urban Design Process" Van Nostrand Reinhold, 1985	Hamid Shirvani,		Van Nostrand Reinhold,	1985
2.	Regenerating Urban Land: A Practitioner's Guide to Leveraging Private Investment.	Amirtahmasebi, Rana, Mariana Orloff, Sameh Wahba, and Andrew Altman.	doi: 10.1596/978-1-4648-0473-1. License: Creative Commons Attribution CC BY 3.0 IGO	Urban Development Series. Washington, DC: World Bank.	2016.

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Urban Regeneration, A Handbook,	edited by Peter Roberts and Hugh Skyes.		Sage Publications Limited	2008
2	"Transforming Urban Landscape" 2014-19	Ministry of Housing and Urban Affairs,		Government of India,	2019

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc21_ar12/preview
2. https://archive.nptel.ac.in/courses/124/107/124107158/

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 Details of activity 1 Details of activity 2	20
Total		**50**

Course Articulation Matrix

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

Course Title	WATERSHED MANAGEMENT		
Course Code	22CV758	**(L-T-P) C**	(3-0-0) 3
Exam	03 Hrs.	**Hours/Week**	3
SEE	100 Marks	**Total Hours**	40

Course Objective: To develop an understanding of the availability and occurrence of freshwater, its uses, and problems related to water resources management

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand and analyze the impact of human activities on surface and groundwater resources	PO1	
2	Apply Principles of Water Resources System in Arid and Semi Arid Regions in Watershed Management	PO1	
3	Analyze Conservation the Water Resources and synthesize the augmentation	PO2	
4	Apply watershed management principles and modern tools such as GIS and remote sensing to address real-world challenges on water resources	PO6, PO11	

MODULE-1	10 Hrs.

Principles of Watershed Management: Basics concepts, hydrology and water availability, surface water, Ground water, conjunctive use, Human influences in the water resources system

Water resources systems: Integrated water resources system, river basin morphometric analysis of watersheds for watershed management, Watershed management practices in arid and semi-arid regions, Watershed management through wells, management of water supply, Short term and long-term strategic planning.

Self-study component: Students shall collect the information from the internet on water resource Planning, interstate river disputes, international problems. submit a report.

MODULE-2	10 Hrs.

Conservation of Water: Perspective on recycle and reuse, Social aspects of watershed management and community participation, Institutional issues, socio-economy, Integrated development, water legislation and implementations, Rainwater management, conservation, storage and effective utilization of rainwater,

Sustainable Watershed Approach: Sustainable integrated watershed management, Agricultural practices, integrated farming, Farming, soil erosion and conservation

Self-study component:Students shall collect information from the internet on causes of flood- estimation of design flood-economics of multipurpose projects-capital budgeting, submit a report.	
MODULE-3	**10 Hrs.**
Planning for Water Resources Development: Definition of Planning, Levels and Phases of planning, Objectives of Project Planning. Formulation Project evaluation, Environmental aspects in planning, System analysis, Pitfalls in Planning; **Multi-purpose Projects :** Functional requirements, Compatibility of multipurpose uses, Cost Allocation to various uses in multipurpose projects planning, Components of a multipurpose river basin development, Operation of multipurpose reservoirs ***Self-study component: Students shall collect the information from the internet on objectives of planning-cost allocation in multipurpose projects-watershed management-visit small dams, submit a report.***	
MODULE-4	**10 Hrs.**
Applications of RS and GIS in Watershed management: Role of decision support system in watershed management, Watershed characteristics of coastal regions, Coastal aquifer for management, uniqueness of coastal water resources. ***Self-study component: Students shall collect the information from the internet on integrated and conjunctive use of water –water resource development of peninsular and Himalayan rivers-visit water resource department and collect details on the organizational setup.***	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Engineering Hydrology	Subramanya. K	5th	Tata McGraw-Hill Publishing Company Ltd., New York	2022
2	Water Resources Engineering	Linsley.K& Frozini.J.B	4th	International Students Edition, McGraw-Hill Kogakusha Ltd.	2008

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Hydrology and Water Resources Engineering	S.K Garg.	Vol 1	”Khanna Publishers, New Delhi,India	2015
2	Water Resources Systems and Management	Gupta.B.L& Amith Gupta	Vol 1	Standard Publishers & Distributors,Delhi	2008

EBooks and online course materials:

1. Handbook of Water Resources Management: Discourses, Concepts and Examples | SpringerLink

Online Courses and Video Lectures:

1. https://archive.nptel.ac.in/courses/105/108/105108081/

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. **ACTIVITY 1:** Apply watershed management principles and modern tools such as GIS and remote sensing to address real-world challenges on water resources	20
Total		**50**

Course Articulation Matrix

Course Outcomes	**ProgramOutcomes**												
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	ADVANCED FOUNDATION DESIGN		
Course Code	22CV759	**(L-T-P) C**	(3-0-0) 3
Exam	3 Hours.	**Hours/Week**	3 Hours
SEE	100 Marks	**Total Hours**	40

Course Objective: To learn and explore various foundation types and understand their suitability for diverse soil conditions, loading conditions, and learn the basics of machine foundation.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply foundation design principles to real-world scenarios, selecting suitable foundation types based on site conditions and structural needs.	PO1	
2	Analyze foundation systems considering soil properties, loads, and construction methods to determine optimal solutions for projects.	PO2	
3	Design diverse foundations (e.g., footings, piles, caissons, machine foundations) considering factors like bearing capacity, settlement, and soil dynamics for structural safety and stability	PO3	
4	Develop practical knowledge and observational skills in foundation engineering to critically assess real-world construction practices and apply theoretical concepts effectively.	PO9,PO11	

MODULE-1	**10 Hrs.**

Shallow Foundations- Presumptive bearing capacity according to BIS – Factors affecting bearing capacity and settlement – Factors influencing selection of depth of foundation – Problems on settlement-Principles of design of footings _ Design of Isolated footing – Combined footing – Strap footing – Strip footing and raft (proportioning only).Foundations on Expansive Soils-identification of expansive soils – foundation treatment for structures on expansive soils.

Self-study component:Students shall visit construction sites and observe the type of foundation adopted for a given design situations

MODULE-2	10 Hrs.
Deep Foundations - Pile groups – Number of piles and spacing – group capacity of piles – group efficiency of piles – settlement of piles – negative skin friction and under reamed piles. Drilled Piers: Introduction – Construction – Advantages and disadvantages of drilled piers. ***Self-study component:Students shall visit construction sites and observe pile driving, pile testing and drilled piers***	
MODULE-3	**10 Hrs.**
Caissons and well foundation- Caissons - Introduction – Types of Caissons – Design aspects of caissons – Construction of open, pneumatic and floating caissons – their advantages and disadvantages – Well Foundation: Shapes of wells – components of well foundation and their design aspects – forces acting on a well foundation – Sinking of wells– causes and remedies of tilts and shifts. ***Self-study component:Students shall visit a bridge construction site and observe the components of caissons and well foundation.***	
MODULE-4	**10 Hrs.**
Machine Foundations – Dynamic Soil Properties, Machine Foundations - Introduction – Types of machine foundations –Basic definitions – Degrees of Freedom of a block foundation – general criteria for design of machine Foundation - free and forced vibrations – vibration analysis of a machine Foundation – Determination of natural frequency –vibration isolation and control. ***Self-study component:Students shall visit a construction site and observe the behaviour of a typical expansive soil and the measures taken to treat the same - collect the material from the internet on behavior and performance of machine foundation.***	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Soil Mechanics and Foundation Engineering(Ch.1,2,3,4,5,6,8)	Arora,K.R.	Fifth edition	Standard Publishers Distributors New York	2001
2	Basic and Applied Soil Mechanics(Ch.1,2,3,6,7,8)	GopalRanjan & Rao.A.S.R	2nd edition	New Age International Publishers	2006

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Soil Mechanics and Foundations (Ch.1,2,3,6,8)	Punmia,B.C., Ashok Kumar Jain, Arun Kumar Jain	16th edition	Laxmi Publications (P) ltd	2008
2	Geotechnical Engineering(ch.1,2,3,5,6,8)	Venkataramaiah.C	3rd edition	New Age International Publishers	2006

EBooks and online course materials:

1. https://www.academia.edu/108877910/Geotechnical_Engineering

Online Courses and Video Lectures:

1. https://archive.nptel.ac.in/courses/105/104/105104162/

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 2. **ACTIVITY 1:** Students will form small groups to undertake a comprehensive project by visiting the construction site and analysing the site condition soil type and designing the different type of foundation 3. **ACTIVITY 2:** Quiz	20
Total		**50**

Course Articulation Matrix

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

Course Title	WATER SUPPLY AND SANITATION		
Course Code	22OECV761	**(L-T-P) C**	(3-0-0)3
Exam	3 Hours	**Hours/Week**	3 Hours
SEE	100 Marks	**Total Hours**	40

Course Objective: Prepare students to contribute to planning, implementation, and maintenance of water and sanitation systems in real-world community settings

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Estimate average and peak water demand for a community.	PO1, PO2	-
2	Evaluate water quality and plan suitable treatment system	PO1, PO6	-
3	Discuss various treatment methods available for treating drinking water	PO1, PO6	-
4	Evaluate wastewater quality and design suitable conveyance systems for sewage and design a comprehensive wastewater treatment system	PO1, PO6	PSO1

MODULE-1	10 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.
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. Physico Chemical characteristics (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 and factors for the selection of a pump
Water Treatment: Objectives and Treatment flowchart – significance of each unit.
Aeration – Principle and types of aerators.

Self Study Component: Visit nearby intake structure and submit a detailed report on it

MODULE-3	10 Hrs.
Sedimentation: Theory, settling tanks and types **Filtration:** Mechanism - theory of filtration, types of filters- slow sand, rapid sand and pressure filters **Disinfection**: Definition, Requirements, methods of disinfection. **Softening**: Definition, methods of removal of hardness by lime soda-process and zeolite process with merits and demerits **Water Conservation** – Rain Water Harvesting. ***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.**
Wastewater: Wastewater disposal - Necessity for sanitation, types of sewerage systems and their suitability. Quantification of sewage and estimation of storm water flow. **Sewer**: Sewer pipe materials, Shapes of sewers, laying of sewers, jointing and testing of sewers, ventilation and cleaning of sewer. **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 ***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: Volume I – Water Supply Engineering	Santosh Kumar Garg	28	Khanna Publisher	2022
2	Environmental Engineering – Vol. II: Sewage Disposal and Air Pollution Engineering	S.K. Garg	29th Edition	Khanna Publishers	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	Wastewater Engineering: Treatment and Resource Recovery	Metcalf & Eddy, George Tchobanoglous, H. David Stensel	5th Edition	McGraw-Hill Education	2014

EBooks and online course materials:

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

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

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**

Course Articulation Matrix

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

Course Title	COMPOSITE AND SMART MATERIALS		
Course Code	22OECV762	**(L-T-P) C**	(3 - 0 - 0) 3
Exam	3 Hours	**Hours/Week**	3 Hours
SEE	100 Marks	**Total Hours**	40

Course Objective: To enable students to understand the behavior, analysis, and applications of composite and smart materials.

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 properties and mechanical behavior of composite materials in different directions	PO1	
2	Apply laminate theory and micromechanical models to study single and multi-layer composite materials behavior and its failures	PO1	
3	Analyze the role of smart materials like sensors and actuators in enhancing structural performance	PO2	
4	Analyze smart, sustainable materials to address industry-specific problems, and work in teams to evaluate their performance and communicate their practical benefits	PO6, PO8 PO9	

MODULE-1	10 Hrs.

Introduction to Composite materials: Classifications and applications of fibers, matrix and Composite materials, Weight and Volume fraction and load distribution among constituents, minimum & critical volume fraction, Compliance & Stiffness matrices.

Self-Study component: Students shall gain knowledge about the innovative composite materials and their applications in the Civil engineering domain.

MODULE-2	10 Hrs.

Anisotropic elasticity - Unidirectional and anisotropic lamina, thermo- mechanical properties, micromechanical analysis, classical composite lamination theory. Cross and angle–ply laminates, symmetric, antisymmetric and general asymmetric laminates, laminate stacking.

Self-Study component: Students shall explore appropriate websites to observe the behaviour of composite material subject to varying temperature.

MODULE-3	10 Hrs.
Analysis of simple laminated structural elements - Ply-stress and strain, lamina failure theories - first fly failure, environmental effects and manufacturing of composites-Hand layup technique, Pressure bag and Vacuum bag technique, Resin transfer moulding, Injection Moulding and Pultrusion. ***Self-Study component: Students shall learn different types of composite materials and their application in aircraft design***.	
MODULE-4	**10 Hrs..**
Smart materials - Introduction, Types of smart structures, actuators & sensors, embedded & surface mounted actuators and sensors, piezoelectric coefficients, phase transition, piezoelectric constitutive relation. ***Self-Study component: Students shall learn about Shape Memory Alloy, actuators and sensors used in the aircraft industry.***	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Analysis and Performance of Fiber Composites	Bhagwan D. Agarwal, Lawrence J. Broutman, K. Chandrashekhara	4th	John Willy and Sons	2017
2	Mechanic of Composite Materials	Robart M Jones	2nd	McGraw Hill Publishing Co.	1999

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	An Introduction to Composite Principles of Composite Material MechanicsMaterials	Clyne, T. W., & Hull, D.	2nd	Cambridge University Press	2019
2	Principles of Composite Material Mechanics	Gibson, R. F.	4th	CRC Press	2016
3	Analysis and Performance of Fiber Composites	Agarwal, B. D., Broutman, L. J., & Chandrashekhara, K.	3rd	Wiley India	2006

EBooks and online course materials:

1. https://www.academia.edu/93600895/Smart_Structures_Theory
2. https://dokumen.pub/composite-materials-science-and-engineering-4th-ed-2019-978-3-030-28982-9-978-3-030-28983-6.html?utm_source=chatgpt.com

Online Courses and Video Lectures:

1. https://archive.nptel.ac.in/courses/105/108/105108124/
2. https://nptel.ac.in/courses/112104173

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 Work in a team to choose a smart material and explain how it can be used to solve a problem in a specific industry (like automobiles, space, medical, or construction). Describe how it works, why it's better than regular materials, and what benefits it offers.	20
Total		**50**

Course Articulation Matrix

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

Course Title	HAZARDOUS WASTE MANAGEMENT		
Course Code	22OECV763	**(L-T-P) C**	(3-0-0)3
Exam	3 Hours	**Hours/Week**	3 Hours
SEE	100 Marks	**Total Hours**	40

Course Objective: Foster critical thinking, problem-solving, and ethical decision-making skills necessary for addressing the complex challenges and ethical dilemmas associated with hazardous waste engineering and environmental protection

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Summarize the fundamentals of hazardous waste, relevant regulations, and the magnitude of the problem because of its improper management	PO1,PO2	
2	Explain various physical, chemical & biological methods of treating hazardous wastes and remediation of polluted sites	PO1,PO2	
3	Estimate the concentrations of hazardous pollutants in different phases & engineering design of treatment units and disposal facilities	PO1,PO2	
4	Assess risks for toxic substances and their adverse effects on living organisms, environment and human health	PO1,PO6	

MODULE-1	**10 Hrs.**

Fundamentals of Hazardous Waste Management- Definition of hazardous waste, properties and characteristics of hazardous wastes, past waste management practices, Partitioning coefficients, Conceptual Site Model, Source – Pathway – Receptor Analyses. Environmental legislation for hazardous waste disposal land transport.

Self-study component: Students shall have a deeper understanding of hazardous waste management principles and practices.

MODULE-2	**10 Hrs.**

Risk Assessment and Waste Handling- Concept of risk and hazard, exposure pathway, calculation of risk, hazard identification, toxicity assessment, carcinogenic effects and non- carcinogenic effects, exposure assessment, applications of risk assessment, and Uncertainties. Waste minimization – factors & case studies, Solutions to major problems associated with hazardous wastes

Self-study component: students shall understand the risk assessment and waste handling	
MODULE-3	**10 Hrs.**
Treatment of Hazardous Wastes- Physico – chemical treatment - Stabilization, Sorption, Volatilization – Air stripping, Soil Vapor Extraction, Advanced Oxidation Process, Permeable Reactive Barrier Biological treatment - Difference between biological treatment of solid waste with hazardous waste, Composting, Bioremediation – growth kinetics, inhibition, in situ and ex situ bioremediation - Reductive dehalogenation, Bioreactors, and Constructed Wetlands ***Self-study component: students shall know different advanced treatment methods to reduce the toxic waste.***	
MODULE-4	**10 Hrs..**
Storage & Disposal of Hazardous Wastes- Treatment, Storage and Disposal Facilities (TSDFs) - Facility Design & Operation - Hazardous waste landfills – landfill design parameters, Landfill gases and leachate generation, Air strippers – operating requirements and their design aspects, Incinerators - types of devices, operating & regulatory requirements and their design aspects ***Self-study component: students shall gain insights into current practices and emerging trends in hazardous waste storage and disposal.***	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	.Waste Management Practices: Municipal, Hazardous, and Industrial.	Pichtel, J	2014	CRC Press.	2014
2	Hazardous Waste Management.	La Grega, M. D., Buckingham, P. L., & Evans, J. C.	2010	WavelandPress.	2010

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Handbook on Chemicals and Hazardous waste manageWaste Management and Handling in India.	Bhat, S.	2019	Ministry of Environment, Forests & Climate ChangeNew Delhi & National Law School of India University,Bengaluru	2019
2.	Hazardous and Other Wastes (Management & Transboundary Movement) Rules.	Govt. of India	2016	Ministry of Environment, Forests & Climate Change, New Delhi.	2016

Online Courses and Video Lectures:

1. **https://archive.nptel.ac.in/content/syllabus_pdf/105106**

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 Details of activity 1 Details of activity 2	20
Total		**50**

Course Articulation Matrix

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

Course Title	SUSTAINABILITY IN ENGINEERING SYSTEMS		
Course Code	22OECV764	**(L-T-P) C**	(3-0-0)3
Exam	3 hours	**Hours/Week**	3 Hours
SEE	100 Marks	**Total Hours**	40

Course Objectives:

1. Learn about the principles, indicators and general concept of sustainability.
2. Student shall be able to apply the sustainability concepts in engineering

Course Outcomes: On completion of this course, students are able to

#	Course Outcomes	Mapping of POs	Mapping of PSOs
1	Interpret the sustainability concepts; understand the role and responsibility of engineers in sustainable development.	PO1,PO2	
2	Utilize scientific approach to quantify and rationalize sustainability and resource availability.	PO1,PO2	
3	Make use of sustainability concepts in construction practices, designs, product developments and processes across various engineering disciplines.	PO2,PO7	
4	Develop green engineering concepts and become a lifelong advocate of sustainability in society.	PO6,PO7	

MODULE-1	10 Hrs

Sustainability-Introduction, Need and impact, Glimpse into History-Millennium Development Goals and Sustainable Development Goals, Principles of Sustainable Development Goals, Current practices in SDG in Global and Indian perspective- Policy and programs.Environmental legislations in India-Related to Water and Air Act.

Self-study component: Sustainable development goals.

MODULE-2	10 Hrs

Global Environmental Issue: Resource degradation, Climate change, Regional and Local Environmental Issues. Carbon credit and carbon trading, carbon footprint Carbon sequestration – Carbon capture and storage (CCS), CO2 calculation. Environmental management standards, ISO 14000 series, Life Cycle Analysis (LCA) - Scope and Goal, Bio-mimicking.

Self-study component: Risk assessment methods, LCA frameworks.

MODULE-3	10 Hrs
Sustainable design: Basic concepts of sustainable habitat, Green buildings,Passive solar design technique, Thermal storage, Cooling strategies, high performance insulation. Sustainable cities, Sustainable Transport.Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Industrial symbiosis. **Energy sources:** Basic concepts-Conventional and non-conventional, solar energy, Fuel cells,Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans, Geothermal energy. ***Self-study component: Green economy, Community Solutions for Sustainable Development.***	
MODULE-4	**10 Hrs**
SDG Solutions: Implementing the SDGs Solutions and best practices at the individual, local, national, and international level, Measuring SDG success-Indicators, Monitoring, Evaluation, and Reporting,Challenges in implementing SDGs, Thinking beyond sustainability-Changing world-views and perspective through radical transformation. **AI & ML For sustainability:** Energy Efficiency-Smart Grids,Building Management Systems, Water Resource Management- Leak detection, demand forecasting, Sustainable Construction- Material optimization, Predictive maintenance, Climate Change Mitigation-Carbon Emission Monitoring, Environmental Impact Assessment ***Self-study component: Investigate successful state-level projects like Kerala's healthcare model and community-driven efforts such as the Sundarbans mangrove conservation project to learn about effective strategies for achieving SDGs***	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	The Role of Agriculture and Small Farms in Economic Development, Washington	Hazell P. and Diao X	1st edition	International Food Policy Research Institute	2005
2	The End of Poverty: Economic Possibilities for Our Time	Sachs J	1st edition	Penguin	2006

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Sustainable Development for Engineers: A Handbook and Resource Guide	Karel Mulder	1st edition	Routledge	2006
2	Sustainable Design and Eco Technologies for Infrastructure: Select Proceedings of CECAR 9	Rajinder Ghai, Luh-Maan Chang, Raju Sharma, Anush K. Chandrappa	1st edition	Springer Nature	2024

EBooks and online course materials:

1. https://nptel.ac.in/courses/127105018
2. https://archive.nptel.ac.in/courses/109/106/109106200/
3. https://nptel.ac.in/courses/112104225
4. Urbanization in Western Ghats and Biodiesel: https://www.youtube.com/watch?v=uvSBN3nX2z0
5. Environmental sustainability : https://www.youtube.com/watch?v=Crd3CFq5B4s

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 Details of activity 1: Group activity on different environmental issues due to anthropogenic activity. Details of activity 2 : Group activity on case study related to Sustainable solutions around the world with presentation.	20
Total		**50**

Course Articulation Matrix

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

Course Title	RAILWAY ENGINEERING		
Course Code	22OECV765	**(L-T-P) C**	(3 - 0 - 0) 3
Exam	3 Hours	**Hours/Week**	3 Hours
SEE	100 Marks	**Total Hours**	40

Course Objective: The objective of this course is to provide students with a comprehensive understanding of the principles, construction, operation and maintenance of railway systems

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Illustrate the role of railways, comparing with other modes and highlight the initiatives by Indian railways towards tourism.	PO1, PO2	–
2	Explain the various key elements of a railway track, their types and methods of surveying.	PO1, PO2	–
3	Summarize the various methods of construction, types of gradients and superelevation concept.	PO1, PO2	–
4	Suggest the methods of maintenance of track, modernization concepts and methods of reducing railway expenses.	PO1, PO2	–

MODULE-1	10 Hrs.

Introduction: Role of railways in transportation, Classifications of modes, Comparison with other modes of transportation. Historical development of railways in India. Advantages of railways. Selection of routes-preliminary and locations surveys. Classifications of Indian Railway lines, Organization of Indian Railways & production units. Initiatives by Indian Railways for development of tourism sector.

Self-study component: Students shall visit nearby Railway station, discuss with the staff regarding the zone of that particular station. Also, collect details on number of trains operating, financial aspects, prepare a report and submit.

MODULE-2	10 Hrs.

Permanent way: Rail – functions, classifications and types. Sleepers – functions, classifications and requirements. Ballast – functions, requirements and types. Gauges – types. Cross section of permanent way, Coning of wheel, Creep of rail, Calculation of quantity of materials needed for laying of tracks.

Self-study component: Students shall visit nearby Railway station and observe the components of railway track, rail joints, sleepers and other details, prepare a report and submit.

MODULE-3	10 Hrs.

Modernization of Railways and High Speed Trains: Modernization of Railways, Effect of High-speed Track, Ballastless Track, Metro trains, High speed Vande Bharath Trains, Vistadome coaches, Tejas Rajadhani trains, SMART coaches, NMGHS coaches, Railway electrification.

Administration of Railways: Nationalization of railways, advantages & disadvantages. Zonal administration, Railway expenses, rates & fares: Characteristics, measures to reduce expenses & railway budget. Typical railway problems,

Self-study component: Students shall visit nearby Railway station and discuss with the railway staff regarding steps taken towards modernization, zonal administration, prepare a report and submit.

MODULE-4	10 Hrs.

Maintenance of track: Necessity, Advantages. Maintenance of Surface of Rails, track alignment, gauge, proper-drainage, track components, Bridge and its Approaches, Rolling stock, Points and Crossings, level crossings and tunnels. Signaling during maintenance work, Speed restrictions during maintenance work, special measures for maintenance of high speed track.

Safety in Railways: Railway accidents, Classifications, Causes and prevention, Duties of railway staff in serious accidents, Emergency methods of restoring railway traffic.

Self-study component: Students shall visit nearby Railway station and discuss with the railway staff regarding track maintenance, steps taken towards safety aspects, prepare a report and submit

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Railway Engineering	SC Saxena and Arora	10	Dhanpath Rai and Sons, New Delhi	2015
2	Indian RailwayTrack	M M Agarwal	9	Oxford Publications, Bombay	2018

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Principles of Railway Engineering	Rangawala	5	Charotar Publishing House, New Delhi	2017
2	Railway Engineering	Sathish Chandra	8	Oxford University	2013

EBooks and online course materials:

1. **https://onlinecourses.nptel.ac.in/noc24_ce37/preview**

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 Details of activity 1 - Students shall submit a report regarding the activity mentioned in each module. Details of activity 2 - Quiz and Assignment	20
Total		**50**

Course Articulation Matrix

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

Course Title	REMOTE SENSING AND GIS		
Course Code	22OECV766	(L-T-P)C	(3-0-0) 3
Exam	3 Hours	Hours/Week	3 Hours
SEE	100 Marks	Total Hours	40

Course Objective: To develop Knowledge on RS and GIS technologies to collect, analyze and interpret spatial data for solving real life problems.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Comprehending remote sensing entails understanding of Energy interactions	PO1, PO2	-
2	Applying remote sensing in data collection and analysis through different types of sensors & platforms	PO1, PO2	-
3	Comprehend GIS : Managing , Analyzing ,Visualizing spatial data solutions	PO1, PO2	-
4	Develop a comprehensive report on different types of currently working satellites and their uses.	PO9, P10	-

MODULE-1	10 Hrs.

Introduction: Basics of Remote Sensing, Active and Passive Remote sensing (RS), Scope of remote sensing; Electromagnetic radiation and electromagnetic spectrum: Visible, Infra-Red (IR), Near IR, Middle IR, Thermal IR, and Microwave. Black body radiation and radiation laws; Interaction of EMR with atmosphere and Earth's surface features;

Types of Remote Sensing and Sensors Characteristics Platform and Orbits: Ground Based, Air Borne, Space borne. Orbits: Geo Stationary satellite, Polar Orbiting satellite. Types & characteristics of sensors, Sensor resolution, Concept of Swath and Nadir, Image referencing system, Remote sensing data products: IRS, LANDSAT, SPOT, IKONOS, Quick Bird

Self - study component: Students shall collect the information on space research organizational structure ,Types of Indian satellites, and data products

MODULE-2	10 Hrs..

Thermal Remote Sensing; Thermal properties of materials:

Emissivity of materials; thermal inertia of Earth surface features; Thermal data sets: LANDSAT and ASTER; Concept and Principles of microwave remote sensing; Microwave data sets SLAR. LIDAR and SAR;

Application of Thermal and Microwave data; Digital Image processing: Introduction to Image, Digital image Types of Data Products, Types of image interpretation, Basic elements of image interpretation, Visual interpretation keys, Digital Image Processing, Preprocessing, image enhancement techniques, multispectral image classification, Supervised and unsupervised.

Self-study component: Students shall collect the information on commercial and open-source Remote Sensing data for use in GIS. Download free DEM and LULC data.

MODULE-3	10 Hrs..

Introduction to GIS: Fundamentals of Geographic Information System: Basic Concepts: definition of GIS, Components of GIS, Variables - points, lines, polygon, Functionality of GIS, Recent trends and applications of GIS; GIS Softwares, Open-source GIS;

GIS Data base: Geographic data: Spatial and non-spatial; Data models: Raster and vector; Database Management System (DBMS): Geo-database. Data Structures: Relational, hierarchical and network; Data input and scale: Nature and Source of data, Digitization of maps and imageries, Attribute data generation; Data Editing: Coordinate systems, Coordinate transformation. Reprojection.

Self-study component: Students shall collect the information on different commercial and open-source GIS software.

MODULE-4	10 Hrs.

Integrated Applications of Remote sensing and GIS : Applications in land use land cover analysis , Change detection , Water resources , Urban planning, environmental planning, Natural resource management and Traffic Management , Location based services and its applications.

Introduction to Global Positioning System (GPS): GPS satellites constellations; GPS segments: Space, Control, User; GPS antennas, signals, and codes; GPS receivers; Modes of measurements and post processing of data; Accuracy of GPS measurements; Application of GPS.

Self-study component: Students shall collect the information on different GPS system in world and their working

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Remote Sensing and Image Interpretation, 7th Edition , ISBN: 978-1-118-34328-9	Thomas Lillesand, Ralph W. Kiefer, Jonathan Chipman	7th Edition	Wiley	January 2015
2.	Remote Sensing and GIS	Basudeb Bhatta	3rd Edition	OUP India	27 January 2021

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Remote sensing and Geographical information system	Anji Reddy M.	4TH EDITION	B. S. Publications 2	2012
2	Basics of remote sensing & GIS	S Kumar,	First Edition	Laxmi publications	2016
3	Remote sensing of the environment	John R. Jensen,	2nd Edition	Pearson Education	2013

EBooks and online course materials:

1. https://science.iirs.gov.in/wp-content/uploads/2024/09/Overview_of_Remote_Sensing_and_GIS_Applications_E-Book.pdf
2. https://www.gisresources.com/wp-content/uploads/2013/09/anji-reddy_GIS.pdf

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc22_ce84/preview
2. https://archive.nptel.ac.in/courses/105/103/105103193/
3. https://www.iirs.gov.in/pgdiplom

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 : **Analysis of Remote Sensing Data Sets**: Students explore and write about various types of remote sensing data sets (e.g., optical, microwave, thermal) and their applications, discussing the advantages and limitations of each. 2) Details of activity 2 : **GIS Theory and Case Study Presentation**: Students write a detailed case study on how GIS is used in real-world scenarios (e.g., environmental monitoring, urban planning) and present their findings	20
Total		**50**

Course Articulation Matrix

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

Course Title	WATER RESOURCES MANAGEMENT		
Course Code	22OECV767	**(L-T-P) C**	(3-0-0) 3
Exam	3 Hours	**Hours/Week**	3 Hours
SEE	100 Marks	**Total Hours**	40

Course Objective: To develop an understanding of the availability and occurrence of freshwater, its uses, and problems related to water resources management

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply your understanding of the Scope and Economics of Water Resources Engineering in assessing its importance	PO1	
2	Apply Principles of Engineering Economy and Optimization in Water Resources Management	PO1	
3	Analyze Integrated Water Resource Management (IWRM) Strategies for Sustainable Development	PO2	
4	Cultivate Environmental Sustainability and Lifelong Learning in Water Resources Engineering through Project-Based Initiatives	PO6, PO11	

MODULE-1	10 Hrs.

Introduction: Applications of water resources engineering, Economics in Water resource planning, social aspects, planning of water resources surveys, Water resources of the world, Water resources in India, Water demand for various purposes, Integrated Water Resources, Rejuvenation and conservation of water resources.

Water Law: Riparian right, Appropriative rights, Permit system, Water codes. Groundwater laws, Interstate problems,international problems

Self-study component: Students shall collect the information from the internet on water resource Planning, interstate river disputes, international problems. submit a report.

MODULE-2	10 Hrs.

Floods : Importance of flood studies, Definition of flood, causes of floods Factors affecting flood flow. Estimating the magnitude and frequency of floods, Empirical formulae, Rational method, Envelope curve, Unit hydrograph method and probability methods, Design floods, Standard project flood & probable maximum flood.

Engineering Economy in Water Resources Projects : Introduction, Steps involved in economy study, Economics of combined flood projects and multipurpose projects. Principle of Optimization in planning, Capital Budgeting.

Self-study component:Students shall collect information from the internet on causes of flood- estimation of design flood-economics of multipurpose projects-capital budgeting, submit a report.

MODULE-3	10 Hrs.

Planning for Water Resources Development: Definition of Planning, Levels and Phases of planning, Objectives of Project Planning. Formulation Project evaluation, Environmental aspects in planning, System analysis, Pitfalls in Planning;

Multi-purpose Projects : Functional requirements, Compatibility of multipurpose uses, Cost Allocation to various uses in multipurpose projects planning, Components of a multipurpose river basin development, Operation of multipurpose reservoirs, Watershed management, small dam's v/s big dams, Economic height of a dam.

Self-study component: Students shall collect the information from the internet on objectives of planning-cost allocation in multipurpose projects-watershed management-visit small dams, submit a report.

MODULE-4	10 Hrs.

Integrated Water Resource Development: Main Objectives, Secondary objectives like reclamation of waterlogged areas. Control of overdraft of groundwater, Salt-water intrusion etc. Aspects of integrated and conjunctive use of water & their constraints. A brief description of perspective water. resources development of Himalayan and Peninsular rivers of India.

Organization of Water Resources Development: Present administrative structures, problems involved therein, Organizational setup for execution of water resources development and river basin development.

Self-study component: Students shall collect the information from the internet on integrated and conjunctive use of water –water resource development of peninsular and Himalayan rivers-visit water resource department and collect details on the organizational setup.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Engineering Hydrology	Subramanya. K	5th	Tata McGraw-Hill Publishing Company Ltd., New York	2022
2	Water Resources Engineering	Linsley.K& Frozini.J.B	4th	International Students Edition, McGraw-Hill Kogakusha Ltd.	2008

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Hydrology and Water Resources Engineering	S.K Garg.	Vol 1	”Khanna Publishers, New Delhi,India	2015
2	Water Resources Systems and Management	Gupta.B.L& Amith Gupta	Vol 1	Standard Publishers & Distributors,Delhi	2008

EBooks and online course materials:

1. Handbook of Water Resources Management: Discourses, Concepts and Examples | SpringerLink

Online Courses and Video Lectures:

1. https://archive.nptel.ac.in/courses/105/108/105108081/

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. **ACTIVITY 1:** International and Interstate Water Disputes, Stating historical background, cause of conflict, Issue, geological aspects, present situation, importance, impacts, legal provision, conclusion 2. **ACTIVITY 2:** Students will form small groups to undertake a comprehensive project that focuses on designing a sustainable water management system for a given community or region. This project will assess students' abilities to apply theoretical knowledge to practical, real-world challenges, emphasizing sustainability, innovation, and adaptability.	20
Total		**50**

Course Articulation Matrix

Course Outcomes	ProgramOutcomes												
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	ENGINEERING OPTIMIZATION		
Course Code	22OECV768	**(L-T-P) C**	(3-0-0) 3
Exam	3 Hours	**Hours/Week**	3 Hours
SEE	100 Marks	**Total Hours**	40

Course Objective:
To train the students with the latest and the best in the rapidly changing fields of construction engineering technology and management.

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 concept and need of optimization in engineering	PO2, PO4	
2	Use conventional methods of optimization under constraints and the concept of linear programming to typical Engineering problems	PO3	
3	Apply the numerical methods for design optimization problems	PO3	
4	Apply genetic algorithms for optimum design of structural elements	PO4	

MODULE-1	10 Hrs

Classical Optimization Techniques: Engineering applications, Statement of optimization problem, Classification of optimization problems, Optimization techniques. Single variable optimization, Multivariable optimization with no constraints, with equality constraints - Lagrange multiplier - method, constrained variation method.

Self-study component: Students shall Study case studies that demonstrate the application of optimization techniques in different industries.

MODULE-2	10 Hrs

Linear Programming: Standard form of Linear programming problems, Methods of LPP-Multiple solution–graphical method, Principle of simplex method, two phase simplex method

Self-study component: Students shall Familiarize with software tools that can help solve linear programming problems, such as Microsoft Excel's Solver or Gurobi.

MODULE-3	10 Hrs

Design optimization of structural elements. Application Problems: Optimum design of steel structural elements. Algorithms for optimum designs.

Self-study component: Students shall explore and practice using any commercial software to perform structural analysis.

MODULE-4	10 Hrs
Genetic Algorithms: Introduction – Selection,Selection operator- fitness function, crossover-Encoding & Encoding Methods and mutation - Application problems. ***Self-study component:*** Students shall Develop a fitness function that accurately reflects the objective function of the optimization problem.	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Optimization Theory and Applications	Rao, S.S.	5th Edition	Wiley Eastern Limited	November 2019
2.	Optimization Methods for Engineering Design	Alan R. Parkinson, Richard J. Balling, and John D. Hedengren	2nd edition	Brigham Young University (BYU)	2018.

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
	Mathematical Foundations for Design: Civil Engineering Systems	**Robert M. Stark** and **Robert L. Nicholls**	Dover Ed edition	Dover Publications	**2005**
	The Practical Handbook of Genetic Algorithms: Applications, Second Edition	Lance D. Chambers		CRC Press,	2008

EBooks and online course materials:

1. Engineering Optimization
2. Introduction To Genetic Algorithms
3. Genetic Algorithm applications

Online Courses and Video Lectures:

1. Operations Research (2): Optimization Algorithms
2. Optimization methods for Civil engineering

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 Details of activity 1 Details of activity 2	20
Total		**50**

Course Articulation Matrix

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

Course Title	GREEN BUILDINGS		
Course Code	22OECV769	(L-T-P) C	(3-0-0) 3
Exam	3 Hours	Hours/Week	3 Hours
SEE	100 Marks	Total Hours	40

Course Objective:
To train the students with the latest and the best in the rapidly changing fields of construction engineering technology and management.

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

COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Illustrate the idea of green building with relevant to various key elements.	PO1, PO2, PO3	
2	Evaluate suitable materials for green buildings, and the impacts on the environment.	PO1, PO2, PO3	
3	Explain the various rating system adopted for green building.	PO1, PO2, PO3	
4	Explain the concept of built environment, safety aspects during construction stages.	PO1, PO2, PO3	

MODULE-1	10 Hrs

The need of green building: Sources of pollution, greenhouse gas emissions, climate change , Challenges of clir National action plan on climate change, ecological footprint, urban environmental issues, climate change,possible potential impacts on cities. Policy directions with relevant examples, conventional model and sustainable model.

Self-study component: Students shall collect the details regarding pollution factors, impacts of greenhouse gas environment.

MODULE-2	10 Hrs

Green building overview: Definition of green building, Material efficiency, sustainable city planning, enhancing biodiversity, green roof, reducing solar heat gain, materials with low environmental impacts, solid waste management, energy efficiency, water conservation, efficiency and recycling, life cycle assessment.

Self-study component: Students shall visit nearby houses constructed with green building concept and collect the details and submit the report on the same.

MODULE-3	10 Hrs
Green building rating system: LEED rating system, green rating system in India, GRIHA, SVAGRIHA, green roads rating system, green rating for business & industry. Building Environment: Climate sub systems, effect of sun on earth, wind rose, solar radiation, urban heat island, indoor & outdoor air quality. ***Self-study component: Students shall collect the various standards as per norms for various rating systems in India adopted for various buildings and submit the report on the same.***	
MODULE-4	**10 Hrs**
Built environment: City planning, transport safety, safety from disasters, safety of structures, occupational health and safety, materials for retrofitting of non – engineered buildings,key elements of safe construction, Conversion of existing buildings to green buildings. case studies on eco buildings. ***Self-study component: Students shall collect the information regarding various aspects of smart city, safe city concept and submit the report on the same.***	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	The idea of green building ISBN: 8174092560	A K Jain	5th Edition	Khanna publishers, NewDelhi	2014
2.	Green Building Fundamentals ISBN: 979-8886416091	Harhara Iyer G	2nd edition	Notion Press	2022

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Green Building: Principles & Practices ISBN: 1685866042	Dr. Adv. HarshulSavla		Notion Press Media Pvt Ltd,Chennai	2021

EBooks and online course materials:

1. https://archive.nptel.ac.in/courses/105/102/105102195/
2. Code_book

Online Courses and Video Lectures:

1. IGBC_programme
2. https://archive.nptel.ac.in/courses/105/102/105102195/
3. Swayam_Course

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 Details of activity 1:Poster-making, social media challenges, or a pledge wall to encourage sustainable living and building practices. Details of activity 2:Quiz	20
Total		**50**

Course Articulation Matrix

Course Outcomes	ProgramOutcomes												
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	PROFESSIONAL ELECTIVE (ONLINE COURSE)		
Course Code	22SW01	(L-T-P) C	
Exam		Hours/Week	
SEE		Total Hours	

Course Objective:

Course Outcomes:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1			
2			
3			
4			

MODULE-1	No. of Hrs..

MODULE-2	No. of Hrs..

MODULE-3	No. of Hrs..

MODULE-4	No. of Hrs..

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year

EBooks and online course materials:

https://_____
https://_____

Online Courses and Video Lectures:

2. **https://www.courseera.org/_____**
3. **https://nptel.ac.in/courses/_____**

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 Details of activity 1 Details of activity 2	20
Total		**50**

Laboratory Plan (if integrated course):

Lab Program	Program Details
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Course Articulation Matrix

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

Course Title	OPEN ELECTIVE (ONLINE COURSE)		
Course Code	22SW02	(L-T-P) C	
Exam		Hours/Week	
SEE		Total Hours	

Course Objective:

Course Outcomes:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1			
2			
3			
4			

MODULE-1	No. of Hrs..

MODULE-2	No. of Hrs..

MODULE-3	No. of Hrs..

MODULE-4	No. of Hrs..

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year

EBooks and online course materials:

https://_____
https://_____

Online Courses and Video Lectures:

4. **https://www.courseera.org/_____**
5. **https://nptel.ac.in/courses/_____**

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 Details of activity 1 Details of activity 2	20
Total		**50**

Laboratory Plan (if integrated course):

Lab Program	Program Details
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Course Articulation Matrix

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

Course Title	INTERNSHIP (RESEARCH/INDUSTRY)		
Course Code	22INT	(L-T-P) C	(0-0-12) 10
Exam	3 Hrs	Hours/Week	40
SEE	100 Marks	Total Hours	14-16 WEEKS

Course Objective:

It involves a short theoretical or experimental research project supervised by a researcher/ To bridge the gap between the theoretical knowledge obtained in the classrooms and the practical skills required in the actual workplace

Course Outcomes:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Get exposure to real world job environment and gain practical experience	3,4,5,6, 7,8,9,10,11	PSO1
2	Generate technical paper/s and publish in refereed journal/s and conferences	7,8,9,10,11	PSO2

Purpose	It involves a short theoretical or experimental research project supervised by a researcher.
Skills acquired	● Planning and scheduling. ● Documentation. ● Critical thinking. ● Data collection. ● Data analysis. ● Appreciating and practicing the ethical values
Expected Outcomes	● Generating technical paper/s and publish in refereed journal/s. ● Possibility of acquiring an intellectual ownership and patent. ● Build a prototype for an idea on which the research was carried out. ● File patent/s.
Selection	● In consultation with a researcher/ researchers working in MCE research Centre ● A research institute ● Company's R and D department.

Team Size	Can be carried out either individually or in a team(Up to 5 students)
Venue .	Laboratory of college A research institute Company's R and D department.
Supervision	Internship shall be carried out under the supervision of a faculty mentor* at the department level For all students attending in-house internship, the attendance should be maintained by the Faculty mentor
Parameters for Assessment	Diary Report Presentation skill Technical Paper Recommendation Letter from the guide
Evaluation	**CIE (100 Marks)–** The CIE marks shall be awarded by a committee* consisting of the faculty mentor and two faculty members of the Department, one of whom shall be the Guide (applicable for in-house interns). The schedule for evaluation will be announced by chairman BOE at the end of the semester. The Evaluation can be done in **phases as decided by the internal BOS of the department.** The contents of the report and the evaluation Rubrics will be set by the Department based on the assessment parameters **CIE + SEE (100 Marks)–** Contribution to the internship and the performance of each group member shall be assessed individually in semester end examination (CIE + SEE) conducted at the department. Marks shall be awarded based on the evaluation of the diary, report, presentation skill and viva voce
***For interdisciplinary internship its necessary to involve an expert from each discipline**	
Guidelines for Industry Internship III	
Purpose	To bridge the gap between the theoretical knowledge obtained in the classrooms and the practical skills required in the actual workplace
Skills acquired	● Applying the theoretical knowledge in a practical scenario ● Build confidence in applying the skills learnt ● Documentation ● Communication ● Appreciating and practicing the ethical values
Expected Outcomes	● Get exposure to a real world job environment and gain practical experience ● Build confidence in applying the skills learnt.

	● Enhances Placement Opportunity
Selection	● Can select individually ● Can CIE + SEE the help from the department
Team Size	Can be carried out either individually or in a team(not exceeding 5 students).
Venue	In a domain specific organization
Supervision	Internship shall be carried out under the supervision of a faculty mentor* at the department level. One faculty mentor can supervise a maximum of 20 students.
Parameters for Assessment	● Diary Report ● presentation skill ● Recommendation Letter from the guide
Evaluation	**CIE (100 Marks) -** The CIE marks shall be awarded by a committee* consisting of the faculty mentor and two faculty members of the Department, one of whom shall be the Guide (applicable for in-house interns). The schedule for evaluation will be announced by chairman BOE at the end of the semester. The Evaluation can be done **in phases as decided by the internal BOS of the department.** The contents of the report and the evaluation Rubrics will be set by the Department based on the assessment parameters **CIE + SEE (100 Marks)-** Contribution to the internship and the performance of each group member shall be assessed individually in semester end examination (CIE + SEE) conducted at the department. Marks shall be awarded based on the evaluation of the diary, report, presentation skill and viva voce
*For interdisciplinary internship its necessary to involve an expert from each discipline	

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three INTERNSHIP phase presentations will be conducted in presence of guide / Mentors , evaluator & coordinator and marks will be awarded based on the student's presentation	50
SEE	Contribution to the internship and the performance of each group member shall be assessed individually in semester end examination (CIE + SEE) conducted at the department. Marks shall be awarded based on the evaluation of the diary, report, presentation skill and viva voce	50
Total		**100**

Course Articulation Matrix

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