KUMARAGURU COLLEGE OF TECHNOLOGY

An autonomous Institution affiliated to Anna University, Chennai

COIMBATORE – 641 049

B.E. CIVIL ENGINEERING

REGULATION 2024

I to VIII Semesters

Department of Civil Engineering

VISION

The Department of Civil Engineering is striving to become a world class Academic Centre for quality education and research in diverse areas of Civil Engineering, with a strong social commitment

MISSION

The Mission of the department is to

- Producing highly competent and technologically capable professionals and motivated young Academicians
- Providing quality education in undergraduate and post graduate levels, with strong emphasis on professional ethics and social commitment.
- Developing a scholastic environment for the state – of –art research, resulting in practical applications.
- Undertaking professional consultancy services in diverse areas of Civil Engineering

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Our graduates will be able to

PEO1: Provide strong foundation for graduates to pursue a successful profession or higher studies and take part in providing feasible solutions for societal problems resulting in sustainable development of infrastructures.

PEO2: Enrich competence of graduates to implement emerging techniques for planning, analysis, design and execution of civil engineering projects through lifelong learning

PEO3: Imbibe ethics and professionalism among graduates that is to be practiced in their profession

PROGRAM SPECIFIC OUTCOMES (PSOs)

Our Graduates will be able to:

PSO 1: Plan, Analyze, Design and Prepare technical reports for Civil Engineering structures as per Standards.

PSO 2: Apply Technical and Management skills for the execution

PROGRAM OUTCOMES (POs)

Our Graduates will be able to:

PO1: **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering

problems.

PO2: **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: **Engineer and society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO7: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO8: **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO9: **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO10: **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO11: **Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

KUMARAGURU COLLEGE OF TECHNOLOGY

CIVIL ENGINEERING REGULATION 2024

B.E. Civil Engineering – Curriculum

(For students admitted from 2024-25 onwards)

Semester I - Engineering & Scientific Foundations

S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24HST101	Heritage of Tamils	Theory	HS	1	0	0	0	1
2	24HSP111	Holistic Wellness – 1	Practical	HS	0	0	2	0	1
3	24MAI111	Linear Algebra and Calculus	Embedded	BS	3	0	2	0	4
4	24CYI102	Material Chemistry for Sustainable Infrastructure	Embedded	BS	3	0	2	0	4
5	24ADP001	Basics of Artificial Intelligence	Practical	BS	0	0	2	0	1
6	24EET104	Foundations of Electrical and Electronics Engineering	Theory	ES	3	0	0	0	3
7	24INP102	Innovation Practicum - 1	Practical	ES	0	0	2	0	1
8	24MEI101	Engineering Graphics	Embedded	ES	2	0	2	0	3
9	24INO1--	FCLF - General Stack - 1	Practical	OE	0	0	2	0	1
10	24INP101	Design Thinking	Practical	ES	0	0	2	0	1
								Total Credits	**20**
								Total Contact Hours/week	**28**

Semester II - Engineering & Scientific Foundations

S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24HST102	Tamils and Technology	Theory	HS	1	0	0	0	1
2	24HST103 / 24HST104	Effective Communication / Professional Communication	Theory	HS	2	0	0	0	2
3	24PHI104	Applied Physics for Civil Engineering	Embedded	BS	3	0	2	0	4
4	24MAI121	Advanced Calculus and Laplace Transform	Embedded	BS	3	0	2	0	4
5	24MET104	Engineering Mechanics	Theory	ES	3	0	0	0	3
6	24CSI101	Logical thinking and Problem Solving	Theory	ES	3	0	2	0	4
7	24INP103	Innovation Practicum - 2	Practical	ES	0	0	2	0	1
8	24CEI101	Building Materials & Construction Practices	Embedded	ES	3	0	2	0	4
9	24HSP112	Holistic Wellness - 2	Practical	HS	0	0	2	0	1
10	24INO1--	FCLF - General Stack - 2	Practical	OE	0	0	2	0	1
								Total Credits	**25**
								Total Contact Hours/week	**32**

Semester III - Mechanics, Modelling & Smart Surveying									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24HSP005	Mastering Conversations	Practical	HS	0	0	2	0	1
2	24INM201	Universal Human Values II: Understanding Harmony	Theory	HS	1	0	0	0	1
3	24INP201	Innovation Practicum-3	Practical	ES	0	0	2	0	1
4	24INO____	FCLF General Stack - 3	Practical	OE	0	0	2	0	1
5	24CEJ205	Internship – I	Internship	PRJ	0	0	0	0	1
6	24MAT231	Partial Differential Equations and Transforms Techniques	Theory	BS	3	1	0	0	4
7	24CET201	Fluid Mechanics and Applied Hydraulics	Theory	PC	3	0	0	0	3
8	24CEI202	Solid Mechanics	Embedded	PC	2	1	2	0	4
9	24CEI203	Surveying	Embedded	PC	3	0	2	0	4
10	24CEP204	Building Information Modeling Lab	Practical	ES	0	0	4	0	2
								Total Credits	**22**
								Total Contact Hours/week	**28**

Semester IV - Strength of Materials, Fluids & Geomatics									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24HSP006	Mastering Group Discussion and Presentation Skills	Practical	HS	0	0	2	0	1
2	24MAI241	Applied Numerical Methods and Probability for Engineers	Embedded	BS	3	0	2	0	4
3	24INP202	Innovation Practicum-4	Practical	ES	0	0	2	0	1
4	24CEO001	FCLF Technical Stack -I	Practical	OE	0	0	2	0	1
5	24CEO301	FCLF Emerging Stack -I	Practical	OE	0	0	2	0	1
6	24INM102	Indian Knowledge Systems in Science and Engineering	Theory	HS	1	0	0	0	1
7	24INM202	Environmental Science and Sustainability	Embedded	HS	1	0	2	0	2
8	24CEP206	Fluid Mechanics Lab	Practical	PC	0	0	2	0	1
9	24CEI207	Remote Sensing & Geographic Information Systems	Embedded	PC	2	0	2	0	3
10	24CET208	Strength of Materials	Theory	PC	3	0	0	0	3
11	24CEI209	Highway Engineering	Embedded	PC	3	0	2	0	4
								Total Credits	**22**
								Total Contact Hours/week	**31**

Semester V- Geotechnical, Structural and Environmental Engineering Fundamentals									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1.	24HSP007	Building Professional Readiness	Practical	HS	0	0	2	0	1
2	24INO__	FCLF Technical Stack	Practical	OE	1	0	0	0	1
3	24INO__	FCLF Emerging Stack	Practical	OE	1	0	0	0	1
4	24CEJ306	Internship-II	Internship	PRJ	0	0	0	0	2
5	24CEE__	Professional Elective-1	Theory	PE	3	0	0	0	3
6	24CEI301	Environmental Engineering	Embedded	PC	3	0	2	0	4
7	24CEI302	Soil Mechanics	Embedded	PC	3	0	2	0	4
8	24CET303	Structural Analysis	Theory	PC	3	1	0	0	4
9	24CEP304	Survey camp	Practical	PC	0	0	0	2	1
10	24CEI305	Concrete Technology	Embedded	PC	3	0	2	0	4
								Total Credits	**25**
								Total Contact Hours/week	**30**

Semester VI - Smart Infrastructure, Design & Sustainability									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24HST302	Indian / Foreign Language	Theory	HS	2	0	0	0	2
2	24INO_____	FCLF Technical Stack	Theory	OE	1	0	0	0	1
3	24INO____	FCLF Emerging Stack	Theory	OE	1	0	0	0	1
4	24INM___	Indian Constitution	Theory	HS	2	0	0	0	0
5	24CEE___	Professional Elective-2	Theory	PE	3	0	0	0	3
6	24CEE___	Professional Elective-3	Theory	PE	3	0	0	0	3
7	24CEI307	Design Of Reinforced Concrete Elements	Embedded	PC	3	0	2	0	4
8	24CET308	Foundation Engineering	Theory	PC	3	0	0	0	3
9	24CET309	Design of Steel Structures	Theory	PC	3	0	0	0	3
10	24CEI310	Construction Project Management	Embedded	PC	3	0	2	0	4
11	24INM002	Disaster Management and Preparedness	Theory	HS	2	0	0	0	0
								Total Credits	**24**
								Total Contact Hours/week	**28**

Semester VII - Advanced Design & Industry Immersion									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24CET401	Construction Finance, Estimation and Valuation	Theory	HS	3	0	0	0	3
2	24CEE_____	Professional Elective - 4	Theory	PE	3	0	0	0	3
3	24CEE_____	Professional Elective - 5	Theory	PE	3	0	0	0	3
4	24CEE_____	Professional Elective - 6	Theory	PE	3	0	0	0	3
5	24CEJ401	Project Phase I	Project	PRJ	0	0	0	6	3
								Total Credits	**15**
								Total Contact Hours/week	**21**

Semester VIII - Capstone & Civil Engineering Leadership									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24CEJ402	Capstone Project / Research / Startup	Project	PRJ	0	0	0	24	12
								Total Credits	**12**
								Total Contact Hours/week	**24**

Total Credits	**165**

List of Mandatory Courses

S.No	Course Code	Course Title	Course Mode	CT	Sem
1	24INM202	Environmental Science and Sustainability	Embedded	HS	IV
2	24INM102	Indian Knowledge Systems (IKS)	Theory	HS	IV
3	24INM__	Indian Constitution	Theory	HS	VI
4	24INM002	Disaster Management and Preparedness	Theory	HS	VI

Summary

Category	**Guidelines Credit**	**R2024 Actual Credit**
Humanities & Social Sciences - HS	**18-24**	18
Basic Sciences - BS	**18-26**	25
Engineering Sciences - ES	**16-24**	24
Professional Cores – PC	**48-55**	53
Professional Electives – PE	**18-24**	18
Open Electives – OE	**9**	9
Internship	**3**	3
Project	**15-18**	15
Mandatory Courses (Indian Knowledge System, Indian constitution, UHV-I)	**0**	0
Total	**160-165**	**165**

Semester	**HS**	**BS**	**ES**	**PC**	**PE**	**OE**	**Intern**	**PRJ**	**Mandate**	**Total**
I	2	9	8			1				**20**
II	4	8	12			1				**25**
III	2	4	3	11		1	1			**22**
IV	4	4	1	11		2			0	**22**
V	1			17	3	2	2			**25**
VI	2			14	6	2			0	**24**
VII	3				9			3		**15**
VIII								12		**12**
Total	**18**	**25**	**24**	**53**	**18**	**9**	**3**	**15**	**0**	**165**

Professional Electives

Vertical I: Structural Engineering									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24CEE001	Augmented & Virtual Reality in Civil Engineering	Theory	PE	3	0	0	0	3
2	24CEE002	Design of Prestressed Concrete Structures	Theory	PE	3	0	0	0	3
3	24CEE003	Precast Construction	Theory	PE	3	0	0	0	3
4	24CEE004	Sustainable Construction Practices and Methods	Theory	PE	3	0	0	0	3
5	24CEE005	Advanced Design of Reinforced Concrete Structures	Theory	PE	3	0	0	0	3
6	24CEE006	Earthquake Engineering	Theory	PE	3	0	0	0	3
7	24CEE007	Smart Interiors and Automation	Theory	PE	3	0	0	0	3
8	24CEE008	Maintenance And Rehabilitation of Structures	Theory	PE	3	0	0	0	3
9	24CEE009	Design of Steel Concrete Composites	Theory	PE	3	0	0	0	3

Vertical II: Environmental & Water Resources Engineering									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24CEE013	Environmental Impact Assessment and Life Cycle Analysis	Theory	PE	3	0	0	0	3
2	24CEE014	Surface water Hydrology	Theory	PE	3	0	0	0	3
3	24CEE015	Air and Noise Pollution Control	Theory	PE	3	0	0	0	3
4	24CEE016	Industrial Wastewater Treatment	Theory	PE	3	0	0	0	3
5	24CEE017	Climate change and Sustainable Management	Theory	PE	3	0	0	0	3
6	24CEE018	Waste Management	Theory	PE	3	0	0	0	3
7	24CEE019	Irrigation and Water Resource Management	Theory	PE	3	0	0	0	3

Vertical III: Infrastructure Engineering & Management									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24CEE025	Construction Personnel Management	Theory	PE	3	0	0	0	3
2	24CEE026	Building Information Management	Theory	PE	3	0	0	0	3
3	24CEE027	Construction Methods and Equipment Management	Theory	PE	3	0	0	0	3
4	24CEE028	Construction Safety Management	Theory	PE	3	0	0	0	3
5	24CEE029	Railways, Airports, and Harbour Engineering	Theory	PE	3	0	0	0	3
6	24CEE030	Intelligent Transportation System	Theory	PE	3	0	0	0	3
7	24CEE031	Mass Transit Management	Theory	PE	3	0	0	0	3
8	24CEE032	Ground Improvement Techniques	Theory	PE	3	0	0	0	3
9	24CEE033	Geothermal Engineering	Theory	PE	3	0	0	0	3
10	24CEE034	Slope stability and retaining structures	Theory	PE	3	0	0	0	3

LIST OF HONOR COURSES

Vertical I: Structural Engineering - Honor Courses									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24CEE061	Design of Bridges	Theory	PE	3	0	0	0	3
2	24CEE062	Offshore Structures	Theory	PE	3	0	0	0	3
3	24CEE063	Finite Element Method	Theory	PE	3	0	0	0	3
4	24CEE064	Structural Rehabilitation and Heritage Conservation	Theory	PE	3	0	0	0	3
5	24CEE065	Pre-Engineered Buildings	Theory	PE	3	0	0	0	3
6	24CEE066	Energy Efficient Buildings	Theory	PE	3	0	0	0	3

Vertical II: Environmental & Water Resources Engineering - Honor Courses									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24CEE067	Environmental Social and Governance	Theory	PE	3	0	0	0	3
2	24CEE068	Carbon Sequestration	Theory	PE	3	0	0	0	3
3	24CEE069	Blue Economy	Theory	PE	3	0	0	0	3

4	24CEE070	Sustainable Technology & Circular Economy	Theory	PE	3	0	0	0	3
5	24CEE071	Occupational Health Safety and Well Being	Theory	PE	3	0	0	0	3
6	24CEE072	Sustainable Water Management for Smart Cities	Theory	PE	3	0	0	0	3

Vertical III Infrastructure Engineering & Management - Honor Courses									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24CEE073	Total Quality Management	Theory	PE	3	0	0	0	3
2	24CEE074	Housing Planning and Management	Theory	PE	3	0	0	0	3
3	24CEE075	Sustainable Infrastructure Development	Theory	PE	3	0	0	0	3
4	24CEE076	Metro Rail Engineering	Theory	PE	3	0	0	0	3
5	24CEE077	Geoenvironmental Engineering	Theory	PE	3	0	0	0	3
6	24CEE078	Soil exploration and instrumentation	Theory	PE	3	0	0	0	3

SEMESTER I

24HST101	தமிழர் மரபு / HERITAGE OF TAMILS (Common to all Departments)	L	T	P	J	C
		1	0	0	0	1
HS		SDG	4, 11, 16			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	தமிழ் மொழி மற்றும் இலக்கியத்தின் அடிப்படை அம்சங்களை அறிமுகப்படுத்துதல், அதன் தொன்மைக்காலம் முதல் நவீனகாலம் வரையிலான வளர்ச்சியை விளக்கம் செய்யுதல். Introduce students to the foundational aspects of Tamil language and literature, tracing its evolution from ancient to modern times.
2	தமிழகத்தின் செழுமையான கலாச்சார பாரம்பரியத்தை அறிமுகப்படுத்துதல், பாறை ஓவியக் கலையிலிருந்து நவீன சிற்ப கலையின்படி அதன் கலை வெளிப்பாடுகளை ஆராய்தல். Familiarize students with the rich cultural heritage of Tamil Nadu, exploring its artistic expressions from rock art paintings to contemporary sculptures.
3	தமிழகத்தின் நாட்டுப்புறக் கலைகள் மற்றும் வீரவிளையாட்டுகளை அறிதல்- தினணக்கோட்பாடுகளை ஆராய்தல்- இந்திய தேசிய இயக்கத்தில் தமிழர்களின் பங்கினை அறிதல். To know the folk arts and heroic ames of Tamilnadu-explore the concept of thinai -to know the role of Tamils in Indian National movement.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	தமிழ் மொழி மற்றும் இலக்கியத்தின் அடிப்படை அறிவை மேம்படுத்துதல். மொழி பண்பாட்டில் எவ்வாறு இணைந்துள்ளது என்பதை உணர்தல். Enhance the fundamental knowledge of Tamil language and literature	U
CO2	பழங்கால பாறை ஓவியங்கள், சிற்பம் என கலைகள் நவீன காலம்வரை எவ்வாறு பயணிக்கிறது என்பதை புரிந்துகொள்ளுதல். Understand the heritage, rock art paintings to modern art sculpture	U
CO3	நாட்டுப்புறக் கலைகள் தற்காப்புக் கலைகளாகவும், உடல் ஆரோக்கியத்தை மேம்படுத்தும் விதமாகவும் அமைவதை அறிந்து கலைகள் மீதான ஆர்வத்தை அதிகரிக்கச் செய்தல்- தமிழர்களின் அகத்திணை, புறத்திணை கோட்பாட்டினை புரிந்து கொள்ளுதல். இந்திய பண்பாட்டில் தமிழர்களின் பங்களிப்பை அறிதல். Acquire essential knowledge in the folk and martial arts-understanding the Agam and puram concept- to know the contribution of Tamils in Indian culture.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3

1							3	2	2		2			
2							3	3	2		2			
3							3	2	2		2			

Course Content	
மொழி மற்றும் இலக்கியம் இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தொடக்கம் -பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு. **LANGUAGE AND LITERATURE** Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.	**3 Hours**
மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக்கலை நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புற தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு. **HERITAGE – ROCK ART PAINTINGS TO MODERN ART SCULPTURES** Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.	**3 Hours**
நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள். **FOLK AND MARTIAL ARTS** Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Ciabatta, Valari, Tiger dance - Sports and Games of Tamil	**3 Hours**
தமிழர்களின் திணைக்கோட்பாடுகள் தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பொடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறைமுகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் தமிழர்களின் வெற்றி. **THINAI CONCEPTS OF TAMIL** Flora and Fauna of Tamils & Aham and Puram Concept from Tolkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.	**3 Hours**
இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில்	

தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு. **CONTRIBUTIONS OF TAMIL TO INDIAN NATIONAL MOMENT AND INDIAN CULTURE** Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.	**3 Hours**

Theory Hours:	**15**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**15**

Learning Resources

Reference books:

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Textbook and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)

Online Educational Resources:

1. https://www.youtube.com/watch?v=IKPwEmsmuZc&list=PLMMrJE4pHZmc0iJZIE6lBpFoPK_9Y325e
2. https://www.youtube.com/watch?v=j6_ddjn_gLc&list=PLMMrJE4pHZmc0iJZIE6lBpFoPK_9Y325e&index=2
3. https://docs.google.com/presentation/d/1pf0jbyuDTNdvlcKMnOfoPjbqha7JqdOc/edit#slide=id.p1
4. https://www.youtube.com/watch?v=IKPwEmsmuZc&list=PLMMrJE4pHZmc0iJZIE6lBpFoPK_9Y325e&index=1

Assessment (Theory course)

SAI, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE), Assignments, Quiz, Library Record

Course Curated by

Expert from Industry	Expert(s) from Higher Education Institutions	Internal Expert
Mr.Vijayan Ramanathan ,	Dr. Aninditha Sahoo,	Suriya Prakash

Project manager, Toppan Merrill. Technologies, Coimbatore	IIT, Madras Dr.P.R.Sujatha Priyadharshini, Anna University, Chennai Dr. E. Justin Ruben, CIT, Coimbatore	Department of Language	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24HSP111	HOLISTIC WELLNESS-1 (Common to all Department)	L	T	P	J	C
		0	0	2	0	1
HS		SDG	2, 3			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	introduce first-year students to the foundational concepts of holistic wellness, emphasizing the integration of physical, mental, emotional, and Internal well-being.
2	create a balanced lifestyle that promotes overall health and happiness through practical activities.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	understand the basic principles of holistic wellness.	U
CO 2	apply strategies for maintaining physical health, including nutrition and exercise	Ap
CO 3	practice mindfulness techniques to enhance mental and emotional well-being.	Ap
CO 4	develop a personal wellness plan incorporating various aspects of holistic health.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1						2		1						
2						2								
3						1					3			
4						2					3			

Course Content

INTRODUCTION TO HOLISTIC WELLNESS: • Overview of holistic wellness: physical, mental, emotional, and internal health. • The importance of balance in overall well-being. • Hands-on activity: Self-assessment of current wellness status.	**4 Hour**
PHYSICAL WELLNESS: • Importance of physical activity and exercise. • Understanding nutrition and its role in health. • Sleep hygiene and its impact on well-being. • Hands-on activity: Designing a personalized fitness and nutrition plan.	**14 Hours**
MENTAL AND EMOTIONAL WELLNESS: • Stress management techniques. • The role of Yoga, mindfulness and meditation in mental health. • Emotional intelligence and its impact on relationships. • Hands-on activity: Practicing Yoga, mindfulness and emotional regulation	**6 Hours**

exercises.	
INTERNAL WELLNESS: • Exploring the concept of Internal wellness. • The role of purpose and meaning in life. • Introduction to meditation and reflective practices. • Hands-on activity: Developing a personal reflection, Yoga and meditation routine.	**4 Hours**
INTEGRATING WELLNESS PRACTICES: • Combining physical, mental, emotional, and Internal wellness practices into daily life. • Developing a balanced wellness plan. • Hands-on activity: Creating a comprehensive personal wellness plan.	**2 Hours**

Theory Hours: 0	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 30

Learning Resources

Textbooks:

1. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
2. Rosenberg, Marshall Bertram., Nonviolent Communication: A Language of Life., Puddle Dancer Press, Encinitas, CA (2015).

References:

1. B.K.S Iyengar., Yoga: The Path to Holistic Health., Dorling Kindersley Limited, City of Publication (2001)
2. Goleman Daniel., Emotional Intelligence., Bloomsbury India, India, (2021).
3. James Allen., As a Man Thinketh., Maple Press, Noida, (2010)
4. Swami Budhanandha., Will power and its development., Advaita Ashrama Mayavati, Pithoragarh, Himalayas from its Publication Department, Calcutta. (2001)
5. Kalderdon Adizes Ichak., What Matters in Life: Lessons I Learned from Opening My Heart ., WS Press, Newtown, PA (2023)

Online Resources (Weblinks)

1. Learning Suryanamskar
2. Yoga for well-being
3. Nutritional Educational contents
4. Introduction to Psychology
5. Guided Meditation
6. Simplified physical exercises instructions
7. Simplified Physical Exercises
8. Life skills and value education
9. James Allen Library

Assessment (Practical course)

Participation, Practical activities and assignments, personal wellness plan and reflection.

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
		Dr. Ezhilarasi Principal- KCT

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24MAI111	LINEAR ALGEBRA AND CALCULUS (Common to AE, AU, CE, ME, MR)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	understand matrix theory for diagonalization, transformations, and their applications in engineering.
2	solve optimization problems using differential calculus.
3	apply partial differentiation for constrained optimization and numerical evaluation.
4	use integral calculus, including double and triple integrals, to solve engineering problems.
5	implement mathematical concepts using MATLAB to solve practical engineering problems.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	apply eigenvalues for matrix diagonalization and transformations and analyse results using computational tools.	Ap
CO2	apply differentiation for solving optimization problems and enhance solutions through computational tools.	Ap
CO3	Analyse and solve unconstrained and constrained optimization problems using the Lagrange multiplier method and determine the maxima and minima of functions with two or more variables relevant to engineering application	An
CO4	apply integral calculus and computational tools to solve engineering problems.	Ap
CO5	apply double integrals and computational tools for solving engineering problems.	Ap
CO6	apply triple integrals techniques and computational tools to solve complex problems.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2	2		1	1									
2	1	2		1	1									
3	1	1		1	1									
4	1	1		1	1									
5	1	1		1	1									
6	1	1		1	1									

Course Content:	
MATRICES	
Eigenvalues and Eigenvectors of a real matrix - Properties of eigenvalues and eigenvectors - Orthogonal matrices - Orthogonal transformation of a symmetric matrix to diagonal form - Reduction of quadratic form to canonical form by orthogonal transformation. **Practical Component** • Use MATLAB to compute Matrix Operations - Addition, Multiplication, Transpose, Inverse and Rank of a matrix. • Determining Eigenvalues and Eigenvectors of Matrices.	**9 Hours** **6 Hours**
DIFFERENTIAL CALCULUS Representation of Functions – Limit and Continuity – Differentiation – Rolles Theorem and Mean Value Theorem-Maxima and Minima **Practical Component** • Evaluating Limits and Derivatives • Determining Maxima and Minima of a function of one variable.	**9 Hours** **6 Hours**
PARTIAL DIFFERENTIALS Total derivative – Taylor's series expansion – Maxima and minima of functions of two variables – Constrained maxima and minima: Lagrange's multiplier method with single constraints – Jacobians. **Practical Component** • Function Approximations with Taylor Series • Determining Maxima and Minima of a function of two variables.	**9 Hours** **6 Hours**
INTEGRAL CALCULUS Definite and Indefinite integrals - Techniques of Integration: Substitution rule, Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction. **Practical Component** • Integration of Rational Functions • Integration of Trigonometric Functions	**9 Hours** **6 Hours**
MULTIPLE INTEGRALS Double integration in Cartesian coordinates – Change of order of integration - Triple integration in Cartesian coordinates – Area as double integral and Volume as triple integral. **Practical Component** • Evaluating double integral with constant and variable limits. • Evaluating triple integral with constant and variable limits.	**9 Hours** **6 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 75

Learning Resources

Textbooks

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2023.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill Publishing Company Limited., New Delhi, 2018.
3. Kreyzig E., "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, 2023.

Reference books

1. Veerarajan T., "Engineering Mathematics (for First Year)", Tata McGraw Hill Pub. Co. Ltd., New Delhi, Revised Edition, 2008.

2. Joel R. Hass, Christopher E. Heil, Maurice D. Weir, Przemyslaw Bogacki, George B. Thomas, "Thomas' Calculus", Pearson education 15th Edition, 2024.
3. G.B. Thomas and R.L. Finney, "Calculus and Analytical Geometry", 11th Edition, Pearson Education, 2010.
4. James Stewart, Daniel Clegg, Saleem Watson, "Calculus: Early Transcendentals", Cengage Learning, New Delhi, 9th Edition, 2020.
5. William J. Palm III, "MATLAB for Engineers: Global Edition", McGraw-Hill Education, 5th Edition, 2018.

Online Resources (Web Links)

1. Linear Algebra | Mathematics | MIT Open Courseware https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/
2. Matrix Algebra for Engineers | Coursera https://www.coursera.org/learn/matrix-algebra-engineers
3. Differential Calculus | Khan Academy https://www.khanacademy.org/math/calculus-1
4. Multivariable Calculus | Mathematics | MIT Open Courseware https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/
5. Integral Calculus | Khan Academy https://www.khanacademy.org/math/calculus-2
6. Multivariable Calculus | Khan Academy https://www.khanacademy.org/math/multivariable-calculus
7. Brilliant | Learn Interactively https://www.brilliant.org/

Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr. Ramesh V.S., STEPS Knowledge Services Private Limited, Coimbatore. Mr.Jayakumar Venkatesan, Valles Marineras International Private Limited- Chennai. Mr. Imran Khan, GE Transportation Company, Bangalore	Dr.T.Govindan, Government College of Engineering, Srirangam, Trichy. Dr.C.Porkodi, PSG College of Technology, Coimbatore. Dr.P.Paramanathan, Amrita Vishwa Vidyapeetham, Coimbatore.	1. Dr. N.Anitha, 2. Ms. S. Sivasakthi, 3. Dr. S.Selvanayaki, Department of Mathematics

Recommended by BoS on	16.8.2024		
Academic Council Approval	No: 27	**Date**	24.8.2024

24CYI102	MATERIAL CHEMISTRY FOR SUSTAINABLE INFRASTRUCTURE	L	T	P	J	C
		3	0	2	0	4
BS		SDG	9, 11, 12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	acquire knowledge of sustainable construction materials, advanced engineering materials, and protective coatings to promote eco-friendly infrastructure development.
2	develop skills to analyse the properties and performance of cementitious materials, fiber-reinforced composites, and corrosion prevention techniques in various environmental conditions.
3	gain competency in applying the principles of corrosion mechanisms and protective coatings to enhance the durability and longevity of civil infrastructure.
4	evaluate and recommend advanced engineering materials and sustainable technologies for modern construction projects, including the use of recycled and upcycled materials.
5	enhance analytical and problem-solving abilities through hands-on laboratory experiments, integrating theoretical concepts with practical applications in sustainable construction and material chemistry.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	apply the concepts of sustainable construction materials to select appropriate materials for infrastructure projects.	Ap
CO2	analyse the properties of cementitious materials to evaluate their performance in different environmental conditions.	An
CO3	apply knowledge of corrosion mechanisms in civil infrastructure to suggest preventive measures.	Ap
CO4	analyse the types of Fiber-reinforced composites to assess their suitability for high-performance construction applications.	An
CO5	analyse the properties and applications of protective coatings to identify suitable options foivil engineering projects.	An
CO6	evaluate sustainable solutions using advanced engineering materials and techniques for eco-friendly infrastructure.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Team Collaborative	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	2	2		2		2				2			
2		2		2			3				2			
3			2			2	2							
4				2		2				2				
5				2							2	2		
6	2		2			2	3					2		

	CONSTRUCTION MATERIALS Introduction to Sustainable Construction Materials -Aggregates: Classification and Properties (Physical and chemical) -Cement and Concrete: Types of cement (Ordinary Portland Cement, Blended cements, Geopolymer cement) – Setting: Role of Chemical composition of cement and Bogue compounds - Hydration mechanisms and kinetics-Supplementary Cementitious Materials (SCMs): Fly ash (Classification, chemical composition, and pozzolanic reactions), Silica Fume-High-Performance Building Materials: Engineered stone (Composition, properties, and applications) **Practical Component:** • Determination of iron in cement using spectrophotometer • Assessing the Impact of Acid Exposure on Concrete Durability
	ADVANCED ENGINEERING MATERIALS High-Performance Refractories and Ceramics: Nano-engineered refractories (Composition and properties) - Ultra-high temperature ceramics (UHTCs) (Synthesis and applications). Fiber-Reinforced Composites: Carbon fiber reinforced polymers (CFRP) - Glass fiber reinforced polymers (GFRP) - Basalt fiber reinforced polymers (BFRP) (Properties and applications) - Interfacial chemistry in fiber-matrix bonding Polymer: High-performance polymers (PEEK, PPS, and their properties) - Self-healing polymers (Intrinsic and extrinsic healing mechanisms) - Polymer degradation and stabilization in construction environments. **Practical Component:** • Determination of molecular weight of polymer by viscometry method • Determination of Chemical Resistance of Refractory Materials by immersion method
	CORROSION IN CIVIL INFRASTRUCTURE Introduction - Forms of corrosion: Uniform corrosion, Galvanic corrosion, Pitting corrosion, Crevice corrosion, Stress corrosion cracking, Microbially induced corrosion - Corrosion mechanisms: Dry chemical and electrochemical corrosion - Corrosion in Reinforced Concrete: Carbonation (Mechanism and factors affecting rate) - Chloride-induced corrosion (Critical chloride threshold) – Corrosion Inhibitors-Corrosion prevention strategies: Cathodic protection - anodic protection - protective nano coatings - Failure analysis and prevention **Practical Component:** • Determination of corrosion rate on mild steel by Weight loss method • Analysis of pH for determining soil samples.
	PROTECTIVE COATINGS AND SURFACE ENGINEERING Introduction to Coating Technology – Classification of Coatings and uses: Protective Coatings (Paints, Sealants and Varnishes) - Decorative Coatings (Aesthetic finishes: Colour theory and pigmentation in decorative coatings) - Functional Coatings (Anti-slip coatings, Fire-resistant coatings) -Coating Materials: Binders, pigments, solvents, and additives - Properties of Common Coating Materials - Epoxy-based coatings (Chemistry and curing mechanisms) - Polyurethane coatings (Types and performance characteristics) **Practical Component:** • Colour Theory and Its Application for Aesthetic Design • Evaluation of Colour Fastness for coating resistance

SUSTAINABLE TECHNOLOGIES AND EMERGING TRENDS Green chemistry principles applied to material development. - Recycled and upcycled materials in construction - Sustainable Building Materials: Natural fibers in construction (Sisal, jute, and coir) - Green cement alternatives (Calcium sulfoaluminate cement, Alkali-activated materials)-Smart Coatings: Self-healing coatings (Mechanisms and materials) - Stimuli-responsive coatings (thermochromic, electrochromic) - Self-cleaning coatings: (Hydrophobic and photocatalytic coatings)- 3D – Printing Building Material : Introduction to 3D Printing in Construction - Advantages and limitations - 3D Printing Materials - Environmental impact - Examples of sustainable infrastructure projects - Future trends and research areas in material chemistry for sustainability. **Practical Component:** • Estimation of hardness in grey water sample • Estimation of Dissolved oxygen in grey water sample	**9 Hours** **6 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 75

Learning Resources

References:

1. Rangwala, S. C. (2009), Engineering materials. Charotar Publishing House.
2. Rajput, R. K. (2006). Engineering materials. S. Chand & Company Ltd.
3. Butinski, K. G. (). Engineering material. Prentice-Hall of India.ehta, P. K., & Monteiro, P. J. M. (2017). Concrete: Microstructure, properties, and materials. McGraw-Hill Education.
4. Mukhopadhyay, A. K., & Pandey, K. N. (2010). Composite materials: Science and engineering. Narosa Publishing House.
5. Jain, P. C., & Jain, M. (2015). Engineering chemistry. Dhanpat Rai Publishing Company (P) Ltd.
6. Syed Shabudeen, P. S. (2015). Engineering chemistry II. Inder Publications.
7. Rao, S. S. (2010). Engineering materials: Properties and applications of metals and alloys. Narosa Publishing House.
8. Callister, W. D., & Rethwisch, D. G. (2020). Materials science and engineering: An introduction (10th ed.). Wiley.
9. Fontana, M. G. (2005). Corrosion engineering. Tata McGraw-Hill Education.
10. Srinivasan, S., & Baskar, V. (2011). Protective coatings for steel structures. Tata McGraw-Hill Education.
11. Vyas, N., & Chauhan, M. S. (2020). Sustainable construction: Green building design and delivery. Narosa Publishing House.
12. Kibert, C. J. (2016). Sustainable construction: Green building design and delivery (4th ed.). Wiley.

Online Resources (Weblinks)

1. https://www.youtube.com/watch?v=ULt4aEst4mM&list=PLyqSpQzTE6M_RfjEQMK7_L-UvxAMhplUT&index=2
2. https://www.youtube.com/watch?v=5ur7kMCXnnk
3. https://www.youtube.com/watch?v=CJSgJssj4mc
4. https://www.youtube.com/watch?v=6ObSmW8fYL0
5. https://www.youtube.com/watch?v=08j-uyrCg6Q

Assessment (Embedded course)

SA-I , Activity and Learning Task(s) (Concept Map, Think-Pair-Share, Jigsaw), MCQ, End Semester Examination (ESE).Lab Workbook, Model Exam, Viva-Voce.

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Dr. Muthuraja Perumal General Manager - Research & Development Rohith Industries, APIIC Industrial Park, Andhra Pradesh	Dr. Venkatakrishnan Professor, School of Chemical Sciences Indian Institute of Technology (Mandi) Himachal Pradesh India		Dr R Mayildurai, Dr. R Mahalakshmi, Department of Chemistry
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24ADP001	BASICS OF ARTIFICIAL INTELLIGENCE (Common to all Departments except CS, IT, AD)	L	T	P	J	C
		0	0	2	0	1
ES		SDG	8, 9, 16			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	introduce students to the fundamentals of Artificial Intelligence (AI) and Generative AI, and its key concepts
2	enable students to explore and experiment with common generative AI models and tools for generating text, images, audio, video, and code
3	equip students with the techniques and best practices for crafting effective prompts for AI models

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	understand the fundamentals of AI and generative AI, including its potential impact, issues, limitations, and ethical concerns and its practical use cases in real-world scenarios.	U
CO 2	explore common generative AI models and tools for text, code, image, audio, and video generation.	E
CO 3	apply common prompt engineering techniques and approaches for writing effective prompts.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Team Collaborative	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2						2							
2	2		2											
3					2					2				

Course Content

Introduction to Artificial Intelligence (AI) **Practical Component** Introduction to Artificial Intelligence (AI) - Generative AI Overview and Use Cases - Impact and Examples of AI - Application Domains for AI - Generative AI Applications. AI Concepts, Terminology - Cognitive Computing (Perception, Learning, Reasoning) - Terminology and Related Concepts of AI- Machine Learning Techniques and Training - Deep Learning - Neural Networks - Natural Language Processing, Speech, Computer Vision - Self Driving Cars. AI: Issues, Concerns and Ethical Considerations - AI Ethics, Regulations, Governance, and ESG. The evolution and future of AI - The AI Ladder - The Journey for Adopting AI Successfully - Hotbeds of AI Innovation.	**8 Hours**
Generative AI: Introduction and Applications	

Practical Component Introduction and Capabilities of Generative AI - Applications of Generative AI - Tools for Text Generation - Tools for Image Generation - Tools for Audio and Video Generation - Tools for Code Generation	**6 Hours**
Generative AI: Prompt Engineering Basics **Practical Component** Introduction to Prompt and Prompt Engineering - Best Practices for Prompt Creation - Common Prompt Engineering Tools - Hands on Lab: Getting to Know Our AI Prompting - Experimenting with Prompts - Naive Prompting and Persona Pattern. Prompt Engineering Techniques and Approaches - Text-to-Text Prompt Techniques - Interview Pattern Approach - Chain-of-Thought Approach - Tree-of-Thought Approach - Future of Human-Crafted Prompts - Text-to-Image Prompt Techniques - Hands-on Lab: Effective Text Prompts for Image Generation.	**7 Hours**
Project and Wrap Up **Practical Component** Graded Quiz Final Project: Generating Text, Images, and Code.	**9 Hours**

Theory Hours: 0	**Tutorial Hours: 0**	**Practical Hours: 30**	**Project Hours: 0**	**Total Hours: 30**

Learning Resources

Textbooks:

1. George F. Luger "Artificial Intelligence: Structures and Strategies for Complex Problem Solving" (6th Edition), Pearson, 2021.
2. Anna Jordan, Robert S. Menzies, Kristine P. Schwab, "AI-Powered Creativity: Generative AI and the Future of Content Creation" Routledge, 2023.

References:

1. https://platform.openai.com/docs/overview
2. https://towardsdatascience.com/
3. https://gemini.google.com/

Online Resource (Weblinks)

1. Introduction to Artificial Intelligence (AI) | Coursera
2. Generative AI: Introduction and Applications | Coursera
3. Generative AI: Prompt Engineering Basics | Coursera

Assessment (Practical course)

MCQ, Mini project and viva-voce

Course Curated by

Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**
-	-	Dr. S. Sangeetha, Associate Professor Department of AI&DS

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24EET104	FOUNDATIONS OF ELECTRICAL AND ELECTRONICS ENGINEERING (Common to CE & TT)	L	T	P	J	C
		3	0	0	0	3
ES		SDG	7, 9, 12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	impart knowledge on power system structure, apparatus and its operation
2	familiarize the students about the operation of Electrical and Electronic circuits
3	provide significance of energy conservation and safety in Electrical Installations

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	analyse the components of electrical power system and interconnections.	An
CO2	apply Ohm's Law and Kirchhoff's Laws to solve basic problems in electrical circuits.	Ap
CO3	compare the structure and principle of operation of Electrical motors and choose the motor for suitable applications.	Ap
CO4	analyse the operation of electronic devices, circuits and instrumentation systems.	An
CO5	apply Electrical safety and energy conservation measures.	An

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	2	2											
2	2	2											
3	2	2	1										
4	1	1	1										
5				1	1	1							

Course Content

ELECTRIC POWER SYSTEM Structure of Power system: Single line diagram, Generation of power: Layouts of Hydro power station, Thermal power station, Solar power plant, Wind energy conversion system. Types of substations -Types of wires and cables, Domestic wiring.	**9 Hours**
ELECTRIC CIRCUITS Basic circuit elements and sources, Ohms law, Kirchhoff's laws, Series and Parallel connection of circuit elements (simple problems), Single phase AC series circuit: Voltage, Current, Power, Energy, Power factor in R-L series circuit.	**9 Hours**

ELECTRICAL MACHINES (Qualitative treatment Only) Single phase Transformers - Separately Excited DC motor - PM DC motor - Single phase Capacitor start and run induction motor - Three phase squirrel cage induction motor - PM Stepper motor - BLDC motor drive.	**9 Hours**
ELECTRONIC CIRCUITS PN junction diode - Full wave rectifier – Bipolar Junction transistors – Single phase bridge inverter (VSI) - Block diagrams of Online UPS, Digital Energy meter - Types of transducers- Introduction to smart sensors and automation systems.	**9 Hours**
ELECTRICAL SAFETY AND ENERGY CONSERVATION Earthing, Protective devices: Switch fuse unit - Miniature circuit breaker - Earth leakage circuit breaker-Lightning arrester - Safety precautions - PPE and First Aid - Energy conservation measures in domestic and industrial facilities.	**9 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 45

Learning Resources

Textbooks

1. S. Salivahanan, N. Suresh Kumar, A. Vallavaraj - Basic Electrical and Electronics Engineering, 3rd Edition, McGraw Hill Education, 2021
2. S.L. Uppal, G.C. Garg - Electrical Wiring, Estimating and Costing, 6th Edition, Khanna Publishers, 2022

Reference books

1. P.S. Bimbhra - Electrical Machinery, 8th Edition, Khanna Publishers, 2023
2. V.K. Mehta, Rohit Mehta - Principles of Electrical Engineering, 2nd Edition, S. Chand Publishing, 2022
3. B.L. Theraja, A.K. Theraja - A Textbook of Electrical Technology - Vol. 2: AC & DC Machines, 25th Edition, S. Chand Publishing, 2023
4. Adel S. Sedra, Kenneth C. Smith - Microelectronic Circuits, 8th Edition, Oxford University Press, 2023
5. Robert L. Boylestad, Louis Nashelsky - Electronic Devices and Circuit Theory, 12th Edition, Pearson, 2023

Online Resources (Web Links)

1. https://www.coursera.org/learn/electronics
2. https://archive.nptel.ac.in/courses/108/105/108105053/

Assessment (Theory course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr. S. Jaya kumar Swagat Industries Ltd, CBE Mr. Lakshmiprasad Bosch Global Software Technologies, CBE	Dr.N.Senthilnathan Professor/EEE Kongu Engineering College Dr. S. Balamurugan Professor - EEE Amrita Vishwa Vidyapeetham	Dr. P. Thirumoorthi Professor Department of EEE

Recommended by BoS on	14.08.2024		
Academic Council Approval	27	**Date**	24.08.2024

24INP102	INNOVATION PRACTICUM – 1 (Common to all Departments)	L	T	P	J	C
		0	0	2	0	1
ES		SDG	9, 11, 12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	analyse the effectiveness of systems thinking and problem-solving methodologies in applying data-driven insights for innovative solution design.
2	evaluate the impact of transdisciplinary collaboration on creating functional hardware prototypes through fabrication techniques.
3	understand the future trends and implications of technology in developing innovative products.

Course Outcomes:

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	recall the fundamental principles of custom hardware design.	R
CO2	understand the appropriate tools and their applications for solving hardware-related problems.	U
CO3	apply systems engineering concepts to real-world hardware design challenges.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2		1											
2	2				1									
3		2	2	1										

Course Content

Engineering Fundamentals and Innovation Why engineering? The concept of street fight engineering - Real-world design process and problem-solving methodology - Data-driven insights and concept generation - Case studies of successful engineering innovations.	**3 Hours**
Transdisciplinary Systems and Manu'Futuring Transdisciplinary systems to accelerate innovation - Manu'Futuring: Technology in hardware manufacturing and manufacturing of hardware technologies - Future scopes with product case studies.	**6 Hours**
Building Custom Hardware How to build a basic custom hardware - Electronics fundamentals and components - Software for hardware control - Fabrication techniques.	**6 Hours**
System Thinking and Engineering Introduction to system thinking - Real world as a system - Concept of system engineering and its application – iLenSys.	**7 Hours**

Creativity Time and Tech Teardown Creativity exercise: Apply system thinking to a real-world problem - Tech teardown: Analyse a product or system to understand its engineering principles - Presentation: Present your creative project and tech teardown with an engaging title	**8 Hours**

Theory Hours:	0	Tutorial Hours:	0	Practical Hours:	30	Project Hours:	0	Total Hours:	30

Learning Resources

Textbooks:

1. Sanjoy Mahajan - Street Fighting Mathematics
2. Donald Knuth - The Art of Computer Programming
3. Think like a programmer: An introduction to creative problem solving
4. Thinking in Systems: A Primer

References:

1. Learning to code: How to think like a programmer
2. How to find innovative ideas: Ramesh Raskar's note
3. Case study: How Tesla changed the auto industry
4. Ultimate Guide: How to develop a new electronic hardware product

Online Resources (Weblinks)

1. https://www.ifixit.com/Teardown?srsltid=AfmBOorwzDG9RhJoL3L5tlZ_Dr4sVcey-vPC-pkKTj2E0mWJWtFYlikY
2. https://www.symmetryelectronics.com/technology-teardowns/

Assessment (Practical course)

Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert from Industry	Expert from Higher Education Institutions	Internal Expert
Dr. Mahesh Veezhinathan Director - Innovation Practicum Associate VP - Forge. Innovation	-	Dr. Samuel Ratna Kumar P S Assistant Professor – III Department Mechanical Engineering

Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24MEI101	ENGINEERING GRAPHICS (Common to AE, AU, CE, FT, ME, MR, TT)	L	T	P	J	C
		2	0	2	0	3
ES		SDG		4, 9, 11		

Pre-requisite courses	–	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	understand the importance of graphics in the design process, including visualization, communication, and documentation.
2	develop proficiency in constructing various curves, orthographic projections, and using drafting tools.
3	gain the ability to project and section simple solids and develop lateral surfaces and isometric projections.
4	learn to use AutoCAD for sketching, editing objects, and creating detailed engineering drawings.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the construction of curves such as ellipses, parabolas, and hyperbolas to accurately visualize and communicate design ideas using drafting tools.	Ap
CO 2	Analyze the projections of points, lines, and planes to determine true lengths and inclinations for effective representation of objects in design.	An
CO 3	Evaluate the projections and sections of solids like prisms, pyramids, cylinders, and cones to create accurate sectional views and true shapes in engineering drawings.	An
CO 4	Create developments of surfaces for simple solids and construct isometric projections to enhance the design process with three-dimensional visualizations.	An
CO 5	Design free-hand sketches of orthographic views using AutoCAD.	Ap
CO 6	Apply AutoCAD commands to demonstrate object selection and editing techniques, enabling precise modifications in engineering drawings.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2	2			2									
2		2		2						2				
3		2	2				2							
4	2		2		2									
5	2				2					2				
6	2				2					2				

Course Content	
PLANE CURVES, PROJECTION OF POINTS, LINES AND PLANES • Importance of graphics in design process, visualization, communication, documentation and drafting tools, Construction of curves - ellipse, parabola, and hyperbola by eccentricity method only. Orthographic projection of points.	**6 Hours**

• Construction of cycloid — Construction of spirals - Construction of involutes of square and circle. • Drawing of tangents and normal to the above curves. • Projections of straight lines located in first quadrant - determination of true length and true inclinations. • Projections of plane surfaces - polygonal lamina and circular lamina, located in the first quadrant and inclined to one reference plane.	**6 Hours**
PROJECTION AND SECTION OF SOLIDS • Projection of simple solids - prism, pyramid, cylinder and cone. Drawing views when the axis of the solid is inclined to one reference plane. • Sectioning of simple solids - prisms, pyramids, cylinder and cone. Obtaining sectional views and true shape when the axis of the solid is vertical and cutting plane inclined to one reference plane.	**6 Hours** **6 Hours**
DEVELOPMENT OF SURFACES, ISOMETRIC PROJECTIONS • Development of lateral surfaces of truncated prisms, pyramids, cylinders and cones. • Isometric projection, Isometric scale, Isometric views of simple solids, truncated prisms, pyramids, cylinders and cones.	**6 Hours** **6 Hours**
FREE-HAND SKETCHING AND INTRODUCTION TO AUTOCAD • Free hand sketching techniques, sketching of orthographic views from given pictorial views of objects, including free-hand dimensioning. Free hand sketching of isometric views from orthographic views. • Introduction to Drafting Software (AutoCAD) & its Basic Commands. Introduction to coordinate systems, object selection methods, selection of units and precession. Annotation and dimensions, Object properties.	**6 Hours** **6 Hours**
DRAWING ORGANIZATION AND HOUSE PROJECT AutoCAD - Sketching – line, circle, arc, polygon, rectangle and ellipse. Working with object snaps, layers and object properties. Editing the objects – copy, move, trim, extend, working with arrays, mirror, scale, hatch, fillet and chamfer. Isometric views of simple solid blocks.	**6 Hours** **6 Hours**

Theory Hours:	**30**	**Tutorial Hours:**	**0**	**Practical Hours:**	**30**	**Project Hours:**	**0**	**Total Hours:**	**60**

Learning Resources

Textbooks:

1. Basant Agrawal and CM Agrawal, Engineering Drawing, McGraw-Hill, New Delhi, First Edition, 2008.
2. Venugopal K. and Prabhu Raja V., Engineering Graphics, New Age International (P) Limited, New Delhi, 2008.

References:

1. Nataraajan K.V., Engineering Drawing and Graphics, Dhanalakshmi Publisher, Chennai, 2005.
2. Warren J. Luzadder and Jon. M. Duff, Fundamentals of Engineering Drawing, Prentice Hall of India Pvt Ltd., New Delhi, Eleventh Edition, 2005.
3. Gopalakirishna K.R., Engineering Drawing (Vol. I & II), Subhas Publications, 2001.
4. James Leach, AutoCAD 2017 Instructor, SDC Publications, 2016.

Online Resources (Open sources):

1. https://www.khanacademy.org/math/differential-calculus
2. https://nptel.ac.in/courses/106105171
3. https://swayam.gov.in/nd1_noc19_cs42/preview

Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE),
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert from Industry	**Expert from Higher Education Institutions**		**Internal Expert**
Mr. G. Vergin Vino Design Engineer TANCAM, Chennai	Dr. V. Prabhuraja Professor Department of Mechanical Engineering PSG College of Technology, Coimbatore		Dr. K. M Senthil Kumar Associate Professor Department of Mechanical Engineering
Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24INP101	DESIGN THINKING (Common to all Department)	L	T	P	J	C
		0	0	2	0	1
ES		SDG	9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	introduces first-year engineering students to Design Thinking, focusing on practical, user-centered problem-solving techniques
2	empathize with users, generate ideas, and create models to test and refine their solutions
3	understand iteration, empathy, and critical reflection to cultivate a creative mindset

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	apply problem-solving techniques and the Design Thinking process to engineering problems using simple models	Ap
CO 2	understand user needs through various empathy techniques and develop/refine models iteratively based on user insights.	U
CO 3	reflect critically on their learning journeys and the emotional demands of problem-solving. Collaborate effectively in teams to develop innovative solutions	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	1		2			2		2			1			
2	1							2			1			
3	1		2			2		1			1			

Course Content

Introduction to Problem Solving and Ground Rules Introduction to problem-solving strategies without mentioning Design Thinking-Emphasize problem-solving attitudes, mindsets, and behaviours necessary for iterative problem solving (e.g., openness to failure, patience, empathy)-Set ground rules for the course, including incentives for creative risk-taking and penalties for non-participation or lack of reflection-Overview of the Design Thinking process and its importance.	**6 Hours**
Empathy and Problem Definition Techniques for understanding user needs, including observation, interviews, **surveys** and **focus groups-**Importance of secondary research as a complement for the above-mentioned methods-Introduction to empathy cycles: involve students in two empathy cycles before and after problem definition-Finetuning problem definition based on user insights.	**6 Hours**

Ideation and Concept Modelling Brainstorming ideas and selecting feasible solution-Creating concept modelling to visualize ideas-Include an empathy cycle after students propose solutions, allowing them to revisit and reshape their solutions based on further insights from users.	**6 Hours**
Prototyping and Testing with Models Building basic prototypes using simple materials (e.g., cardboard, clay)- Introduction to different prototyping methods (e.g., **low-fidelity** vs **high-fidelity models**) for different contexts: product design, space design, policy, and digital/e-commerce solutions-Conduct an empathy cycle after the prototype is developed to gather user feedback and refine the prototype.	**6 Hours**
Iteration and Final Modelling Project Students refine their prototypes based on feedback from the empathy cycle-Finalize prototypes for presentation based on consistent feedback loops.	**6 Hours**
Presentation, Reflection, and Learning Summaries Students present their final projects and reflect on their learning journeys, including how their understanding of problem-solving and empathy evolved during the course-**Learning Summary Activity:** Each student presents their individual journey and learning outcomes from the empathy cycles and iterations-Peer review and group discussions.	**6 Hours**

Theory Hours: 0	**Tutorial Hours: 0**	**Practical Hours: 30**	**Project Hours: 0**	**Total Hours: 30**

Learning Resources

Textbooks:

1. Handbook of Design Thinking, Christian Muller – Roterberg, Kindly Direct Publishing
2. The Art of Innovation, Tom Kalley
3. E Balaguruswamy (2022), Developing Thinking Skills (The way to Success), Khanna Book Publishing Company

Online Resources (Weblinks)

1. Survey and focus group design guides
2. Guidance on Designing, Administering and Analyzing Focus Groups and Interviews
3. Empathy mapping tools
4. How to Make a Concept Model
5. Brainstorming Techniques: 15 Creative Activities
6. 10 Brainstorming Techniques for Developing New Ideas
7. Brainstorming templates
8. 5 Common Low-Fidelity Prototypes and Their Best Practices
9. UX Prototypes: Low Fidelity vs. High Fidelity
10. Low-fidelity vs. High-fidelity Design Prototypes (and when to use which)

Case study 1: Iterative Design and Prototype Testing of the NN/g Homepage
Case study 2: Using iterative design to optimise the user flow of a product

11. Reflective practice toolkit

Assessment

Formative: Assignments, Mini project

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institutions	Internal Expert(s)
		Dr. Padhmanand Sudhagar R Department of Bio-Tech Dr. Arul H Department of Physics

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

SEMESTER II

24HST102	தமிழரும் தொழில்நுட்பமும்/ TAMILS AND TECHNOLOGY	L	T	P	J	C
		1	0	0	0	1
HS		SDG	4, 8			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	தமிழர்களின் நெசவு மற்றும் பானைத் தொழில்நுட்பத்தை அறிமுகப்படுத்துதல், சங்க கால கட்டிட தொழில்நுட்பத்தை விளக்குதல், கோயில்கள் மற்றும் சிற்பக்கலைகளை ஆராய்தல். introducing weaving and pottery technology of Tamils -Explaining the building technology of the Sangam Period-Explore temples and sculptures.
2	கப்பல், இரும்பு, நாணயங்கள், மணி உருவாக்கும் தொழிற்சாலைகள், ஆகியவற்றை விளக்கம் செய்தல், தமிழகத்தின் தொல்லியல் சான்றுகளின் பழமையை உணர்த்துதல். explain Ship, Iron, Coins, Beads Making Factories. Realizing the Antiquity of Archaeological Evidence of Tamil Nadu
3	வேளாண்மை மற்றும் அறிவியல் தமிழைப் பற்றி அறிதல், இணையத்தில் தமிழின் தேவையை உணர்த்துதல்,தமிழ் மென்பொருள்களை அறிமுகம் செய்தல். knowledge of Agricultural and Scientific Tamil, Realizing the need for Tamil on the Internet, Introducing Tamil software.

Course Outcomes:		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	தமிழர்களின் நெசவு மற்றும் பானைத் தொழில்நுட்பத்தின் முக்கியத்துவத்தினை அறிந்து கொள்ளுதல். சங்ககால தமிழர் வளர்த்த அழகுக் கலைகளைத் தெரிந்து கொள்ளுதல். know the importance of weaving and pottery technology of Tamils-To know the Aesthetics arts developed by Sangam Tamils	U
CO 2	கப்பல் கட்டும் கலை, இரும்புத் தொழிற்சாலை, நாணயங்கள் அச்சடித்தல்,மணி உருவாக்கும் தொழிற்சாலைகள், சிலப்பதிகாரத்தில் உள்ள மணிகளின் வகையை அறிதல். knowledge of ship building, ironworks, coinage, minting, and beads making factories,Knowing the types of beads in Silapathikaram.	U
CO 3	வேளாண்மை மற்றும் நீர்ப்பாசன தொழில்நுட்பத்தை அறிந்து கொள்ளல். அறிவியல் தமிழ் மற்றும் கணினித் தமிழைப் புரிந்து கொள்ளுதல். know agriculture and irrigation technology. Understanding Scientific Tamil and Computer Tamil.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2		2				3	2	2		2			

2	2		2				3	2	2		2			
3	2		2				3	2	2		2			

Course Content	
நெசவு மற்றும் பானைத் தொழில்நுட்பம்: சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள். Weaving Industry during Sangam Age - Ceramic technology - Black and Red Ware Potteries (BRW)-Graffiti on Potteries.	**3 Hours**
வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் ரூ சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் -சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை. Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.	**3 Hours**
உற்பத்தித் தொழில் நுட்பம்: கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எ.ுகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள்- நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள். Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel- Copper and gold- Coins as source of history - Minting of Coins - Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidence - Gem stone types described in Silappathikaram.	**3 Hours**
வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம்- கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள்- வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம். Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries - Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.	**3 Hours**
அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள்- சொற்குவைத் திட்டம். Development of Scientific Tamil - Tamil computing- Digitalization of Tamil Books- Development of Tamil Software - Tamil Virtual Academy - Tamil Digital Library - Online Tamil Dictionaries - Sorkuvai Project.	**3 Hours**

Theory Hours: 15	**Tutorial Hours: 0**	**Practical Hours: 0**	**Project Hours: 0**	**Total Hours: 15**

Reference books

1. தமிழக வரலாறு மக்களும் பண்பாடும் கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).

2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL- (in print)
6. Social Life of the Tamils the Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tarnils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Textbook and Educational Services Corporation> Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation> Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) - Reference Book.

Online Resources

1. https://www.youtube.com/watch?v=Gp1ratX2sOE&list=PLtyn2o7hocf40PtPibRqJTf_dQL3eOtLl
2. https://www.youtube.com/watch?v=jteRvnNiD6w

Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
-	-		-
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24HST103	EFFECTIVE COMMUNICATION	L	T	P	J	C
		2	0	0	0	2
HS		SDG	4, 8			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to

1	enhance students' abilities to communicate ideas effectively, both orally and in writing, by developing skills in organizing thoughts clearly and logically and expressing them through well-structured paragraphs and concise summaries.
2	enable students to critically evaluate and synthesize information from multiple sources and utilize suitable writing techniques and formats to produce professional-quality content tailored to various contexts.
3	foster active listening, critical reading, and reflective thinking, empowering students to create engaging, relevant, and informative content by applying effective communication strategies across diverse platforms.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	demonstrate proficiency in delivering ideas effectively, both in speaking and writing, with a deeper understanding of the content and the ability to convey complex ideas through well-structured paragraphs and summaries.	Ap
CO2	create and present original content by evaluating information from multiple sources and employing appropriate formats and writing strategies across various professional contexts.	C
CO3	produce engaging and informative content through active listening, reading, reflection, and effective communication skills.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1							2	2	3		3			
2							2	2	3		3			
3							2	2	3		3			

Course Content

Text Analysis Composition of Coherent Paragraphs (Expository, Descriptive, Narrative, Evaluative) - Loud Reading (Reading Extracts will be given where students	**6 Hours**

identify the main idea of paragraphs or sections and debrief)	
Visual & Written Analysis Process writing (Drafting effective introduction, process and conclusion using appropriate transition words and phrases) - Describing Visuals (Line graph, Bar Chart, Flow Chart, Pie Chart, Table, Tree diagram) - Note Making & Summarizing	**6 Hours**
Professional Correspondence Crafting Professional Emails - Writing Instruction for Manuals - Reading technical documents (Reading extracts will be given to construct sentences from the new words found in the document)	**6 Hours**
Research and Documentation Library Reading (Identify at least three sources and extract information, Summarize the main ideas and key findings from each source, compile them findings into a brief report that includes the main points, sources, and relevance to the topic)- Report Writing (Title Page, Abstract, Introduction, Methodology, Results, Discussion, Conclusion and recommendation)	**6 Hours**
Talk Analysis and Podcast Skills Listening to and analyzing TED talks – Preparing Podcast-PRISM (Professional Rhetoric Improvement and Speech Mastery) to share facts, opinions and experiences - Writing Reviews on products.	**6 Hours**

Theory Hours: 30	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 30

Learning Resources

References:

1. Swamy, V. R. Narayana. Strengthen Your Writing. Orient Longman, 2003.
2. Sasikumar, V., and P. V. Dhamija. Spoken English: A Self-Learning Guide to Conversation Practice. Tata McGraw Hill, New Delhi (1993).
3. Maison, Margaret M. Examine Your English. Orient Longman, 1999.
4. Rizwi, Ashraf. Effective Technical Communication. Tata McGraw Hill, 2005.
5. Pickett, Nell Ann, and Ann A. Laster. Technical English: Writing, Reading, and Speaking.
6. Harpercollins College Div, 1993.

Online Resources (Weblinks)

1. https://owl.purdue.edu/owl/general_writing/academic_writing/paragraphs_and_paragraphing/index.html
2. https://learnenglish.britishcouncil.org/skills/writing/upper-intermediate b2/describing-trends
3. https://hbr.org/2016/07/how-to-write-email-with-military-precision
4. https://owl.purdue.edu/owl/subject_specific_writing/professional_technical_writing/reports and_memos/index.html

Assessment

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Mr.Vijayan Ramanathan , Project manager, Toppan Merrill. Technologies, Coimbatore	Dr. Aninditha Sahoo, IIT, Madras Dr.P.R.Sujatha Priyadharshini, Anna University, Chennai Dr. E. Justin Ruben, CIT, Coimbatore		Dr. Arokia Lawrence Vijay Dr. Sreejana Dr. Tissaa Department of English
Recommended by BoS on	16.08.2024		
Academic Council Approval	No:27	**Date**	24.08.2024

24HST104	PROFESSIONAL COMMUNICATION (Common to all Departments)	L	T	P	J	C
		2	0	0	0	2
HS		SDG	4, 8			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to

1	develop students' abilities to craft clear, concise, and well-structured technical content and professional communications
2	enhance students' communication skills in team settings
3	equip students with cross-cultural communication skills and effective listening techniques

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	demonstrate proficiency in crafting clear, concise, and well-structured technical content and professional communications, including emails that meet industry standards.	Ap
CO2	communicate effectively in team settings, showcasing collaboration, conflict resolution, and leadership skills, while employing creative writing techniques to convey complex ideas.	An
CO3	apply principles of cross-cultural communication and effective listening techniques to engage successfully in diverse, globalized professional environments.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1						2	1	3	1		3			
2						2	3	3	2		3			
3						1	1	3	1		3			

Course Content

Mastering Professional Communication Industry-specific terminology (Business / Technical Register) - Crafting professional emails - Essential elements of an effective email (subject line, salutation, body, closing) - reading and responding to email communication – Networking Emails - Analyzing and interpreting technical texts (Loud Reading).	**6 Hours**
Navigating Digital Media Introduction to Digital media and online communication tools (instant messaging, video conferencing, social media, blogs, forums) - Listening and analyzing advanced audio materials - Creative & Blog Writing (General & Technical).	**6 Hours**

Technical Writing Techniques Writing Reflective Essays / Experience Sharing, Process writing, Transcoding graphics (interpreting technical texts), Writing Reviews (Research Articles & Books).	**6 Hours**
Building a Professional Digital Presence Creating Digital Profile - Overview of different digital platforms (LinkedIn, GitHub, personal websites) - Setting Up a LinkedIn Profile – Crafting a Video Resume – Digital Etiquette and Professionalism - Cross-cultural communication and diversity awareness.	**6 Hours**
Social Responsibility in Practice Environmental and social responsibilities - Case studies and real-world applications - Project Work - Writing Project reports.	**6 Hours**

Theory Hours: 30	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 30

Learning Resources

Reference books

1. Baker, W., & Ishikawa, T. Transcultural Communication Through Global Englishes: An Advanced Textbook for Students. Routledge, 2021.
2. Bodnar, O., Fedak, S., Hinsirovska, I., Denysiuk, N., Perenchuk, O., Plavutska, I., ... & Shchur, N. English for Study and Work: A Coursebook In-class Activities. 2017.
3. Doff, A., Thaine, C., Puchta, H., Stranks, J., & Lewis-Jones, P. Cambridge English Empower Advanced Student's Book. Cambridge University Press, 2016.
4. Hewings, M., Thaine, C., & McCarthy, M. Cambridge Academic English C1 Advanced Student's Book: An Integrated Skills Course for EAP. Cambridge University Press, 2012.
5. Beer, D. F., & McMurrey, D. A. A Guide to Writing as an Engineer. John Wiley & Sons, 2019.

Online Resources (Web Links)

1. https://hbr.org/2016/07/how-to-write-email-with-military-precision
2. https://ocw.mit.edu/courses/comparative-media-studies-writing/21w-732-scientific-and-technical-communication-spring-2015/
3. https://www.coursera.org/learn/digital-media
4. https://owl.purdue.edu/owl/subject_specific_writing/professional_technical_writing/reports_and_memos/index.html

Assessment (Theory course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by

Expert from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr.Vijayan Ramanathan , Project manager, Toppan Merrill. Technologies, Coimbatore	Dr. Aninditha Sahoo, IIT, Madras Dr.P.R.Sujatha Priyadharshini, Anna University, Chennai Dr. E. Justin Ruben, CIT, Coimbatore	Dr. Arokia Lawrence Vijay Dr. Hema Department of English

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24PHI104	APPLIED PHYSICS FOR CIVIL ENGINEERING	L	T	P	J	C
		3	0	2	0	4
BS		SDG	7, 9			

Pre-requisite courses	High School Education	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	explaining quantum tunnelling, material strength, and advanced engineering techniques.
2	exploring practical applications of laser technology in imaging, holography, and laser gyroscopes for various engineering and technological fields.
3	gaining foundational knowledge of green energy technologies and their significance in sustainable development.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	apply the principles of quantum mechanics to explain phenomena such as wave-particle duality and quantum tunnelling in civil engineering contexts.	Ap
CO 2	analyse the interactions between light and matter to determine the applications of lasers in civil engineering, such as in imaging and measurement.	An
CO 3	evaluate different renewable energy technologies like solar and wind energy to recommend sustainable energy solutions for civil engineering projects.	E
CO 4	analyse the thermal properties of materials and their impact on building performance to optimize the thermal design of civil structures.	An
CO 5	apply Hooke's Law and understand various elastic moduli and their relationships, including Poisson's Ratio.	An
CO 6	analyse by comparing the mechanical properties of materials, such as elasticity and bending, to assess their suitability for use in civil engineering applications.	An

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative Team work	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3													
2	3	2												
3	3	2									2			
4	3	2									2			
5	3	2									2			
6	3													

Course Content

QUANTUM PHYSICS	9 Hours

Necessity of quantum mechanical picture- Planck's concept (hypothesis) - Wave-particle duality - de-Broglie waves - Physical significance of wave function - Schrodinger equation- Time independent and time dependent equation - Particle in a box- Eigen values and Eigen function- Superposition Principle- Quantum mechanical tunnelling through a barrier. **Practical Component** 1. Determination of Planck's constant – Electroluminescence method. Determination of magnetic susceptibility of a solid material – B-H curve apparatus	**6 Hours**
LASERS Interaction of light and matter - Quantization of electromagnetic radiation – Absorption, Spontaneous emission and Stimulated emission - Einstein's theory of stimulated emission- Population inversion - Sources of excitation - Active medium - Laser beam output- Nd-YAG laser - CO2 laser - Applications – Laser Imaging and Holography- Laser gyroscopes. **Practical Component** 1. Semiconductor laser: a. Determination of wavelength of laser b. Determination acceptance angle and numerical aperture of an optical fibre. c. Determination of particle size 2. Spectrometer – Determination of wavelength of mercury source using grating	**9 Hours** **6 Hours**
GREEN ENERGY Introduction to Green energy – Solar energy: Energy conversion by photovoltaic principle – Solar cells – Efficiency measurements – Types (First, Second and Third Generation) of Solar Cells - Wind energy: Basic components and principle of wind energy conversion systems – Ocean energy: Wave energy – Wave energy conversion devices. Futuristic Energy: Hydrogen – Methane Hydrates – Carbon capture and storage (CCS). **Practical Component** 1. Determination of efficiency of solar cell Determination of band gap of a semiconductor	**9 Hours** **6 Hours**
THERMAL PHYSICS Principles of heat transfer, steady state of heat flow - heat transfer through fenestrations, thermal insulation and its benefits - heat gain and heat loss estimation - factors affecting the thermal performance of buildings, thermal measurements, thermal comfort, indices of thermal comfort, climate and design of solar radiation, shading devices - central heating **Practical Component** 1.Lee's disc – Determination of thermal conductivity of a bad conductor	**9 Hours** **6 Hours**
PROPERTIES OF MATTER Hooke's Law - Elastic moduli - Relation between elastic constants - Poisson's Ratio – Stress - Strain Diagram and its uses – factors affecting elastic modulus – Bending of beams – Expression for bending moment and depression - Cantilever - Depression of a cantilever - experimental determination of Young's modulus by Non uniform bending – I shape girders. **Practical Component** 1. Non-uniform bending – Determination of Young's modulus 2. Compound pendulum – Determination of acceleration due to gravity 3. Melde's string – Determination of frequency of a tuning fork	**9 Hours** **6 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 75

Learning Resources

Textbooks:

1. M N Avadhanulu, P.G. Kshirsagar, and TVS Arun Murthy. A Textbook of Engineering Physics, 11th Edition. S. Chand Publications (2018).
2. R.K. Gaur and S.L. Gupta. Engineering Physics, 10th Edition. Dhanpat Rai Publications (P) Ltd., New Delhi (2016).
3. Arthur Beiser, Shobhit Mahajan, and S. Rai Choudhury. Concepts of Modern Physics, 7th Edition. McGraw Hill Education, New Delhi (2017).
4. V. Rajendran. Applied Physics. Tata McGraw Hill Publishing, New Delhi (2017).

References:

1. Brij Lal and Subrahmanyam. Properties of Matter. S. Chand & Co Ltd., New Delhi (2014).
2. Satya Prakash. Quantum Mechanics. Pragati Prakashan Publishers (2015).
3. K. Thiagarajan and Ajoy Ghatak. Lasers: Fundamentals and Applications. Springer Science & Business Media (2010).
4. Marcel Dekker. Ultrasonics: Fundamentals, Technology, Applications, Second Edition. New York (1988).
5. William Silfvast Hill. Laser Fundamentals. Cambridge University Press (2018).
6. S.O. Pillai. Solid State Physics, Ninth Edition. New Age International Press (2020). Godfrey Boyle. Renewable Energy: Power Sustainable Future, Second Edition. Oxford University Press, UK (2019).
7. Chetan Singh Solanki. Solar Photovoltaics – Fundamentals, Technologies and Applications. PHI Learning Private Limited (2019).

Online Resources (Weblinks)

1. https://www.khanacademy.org/science/physics/forces-newtons-laws/hookes-law-and-elasticity
2. https://ocw.mit.edu/courses/1-050-solid-mechanics-fall-2004/
3. https://ocw.mit.edu/courses/8-04-quantum-physics-i-spring-2016/
4. https://ocw.mit.edu/courses/ec-s07-photovoltaic-solar-energy-systems-fall-2004/

Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
		Dr. R.G. Sethuraman Dr. R. Prakasam Department of Physics

Recommended by BoS on	16.08.2024		
Academic Council Approval	No:27	**Date**	24.08.2024

24MAI121	ADVANCED CALCULUS AND LAPLACE TRANSFORMS (Common to AE, AU, CE, ME, MR)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	7, 9			

Pre-requisite courses	24MAI111/ Linear Algebra and Calculus	Data Book / Codes books (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	utilize gradient, divergence, and curl, along with Green's, Stokes', and Gauss' theorems to solve complex vector calculus problems.
2	focus on first order and higher-order linear ordinary differential equations, including Bernoulli's and Leibniz's equations, relevant to engineering contexts.
3	use Laplace transforms to solve linear ordinary differential equations of second order and understand the behavior of simple and periodic functions.
4	explore Cauchy-Riemann equations for analytic functions and construct these functions using the Milne-Thomson method
5	employ the residue theorem to determine complex integrals and resolve real definite integrals effectively.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	apply gradient, divergence, and curl to solve vector calculus problems using Green's, Stokes', and Gauss' theorems.	Ap
CO 2	analyse first-order linear ordinary differential equations like Leibnitz's and Bernoulli's equations and higher-order linear homogeneous ordinary differential equations in engineering applications.	An
CO 3	apply the properties of Laplace transforms to solve simple and periodic functions	Ap
CO 4	apply Laplace transforms to solve linear ordinary differential equations of second order.	Ap
CO 5	analyse analytic functions using Cauchy-Riemann equations and construct analytic functions using Milne-Thomson method.	An
CO 6	determine complex integrals and apply the residue theorem to solve real definite integrals.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	2			2									
2	2	3	1		1									
3	2	2			2									
4	2	2		1	2									
5	3	2		2	2									

6	3	2			2									

Course Content

VECTOR CALCULUS Gradient, divergence, and curl, Line integrals, Green's theorem –Stoke's theorem – Gauss divergence theorem (without proofs)	**9 Hours**
Practical Component • Evaluating gradient, divergence and curl. • Evaluating line integrals and work done. • Verifying Green's theorem in the plane.	**9 Hours**
ORDINARY DIFFERENTIAL EQUATIONS Leibnitz's equation – Bernoulli's equation – Linear equations of higher order with constant coefficients – Euler's and Legendre's linear equations – Method of variation of parameters.	**9 Hours**
Practical Component • Solving of second and higher order ordinary differential equations.	**3 Hours**
LAPLACE TRANSFORMS Definition - Properties: Superposition, Shift in t or Time Delay, Shift in s, Time Derivatives, Time Integral – Initial Value Theorem – Final Value Theorem - Transform of periodic functions - Inverse transforms – Convolution theorem – Solution of linear ordinary differential equations of second order with constant coefficients.	**9 Hours**
Practical Component • Evaluating Laplace transforms and inverse Laplace transforms of functions. • Applying the technique of Laplace transform to solve differential equations.	**6 Hours**
ANALYTIC FUNCTIONS Functions of a complex variable – Analytic functions – Necessary and sufficient conditions in Cartesian coordinates, Cauchy – Riemann equations (excluding proofs) – Properties of analytic function – Construction of analytic function by Milne Thomson method	**9 Hours**
Practical Component • Verifying the analyticity of a function. • Construction of analytic functions by Milne Thomson method.	**6 Hours**
COMPLEX INTEGRATION Cauchy's integral theorem – Cauchy's integral formula –Taylor's and Laurent's series –Singularities and zeros –Residues –Residue theorem –Application of residue theorem for evaluation of real definite integrals.	**9 Hours**
Practical Component • Verification of Cauchy's integral formula and integral theorem. • Evaluation of real definite integrals using Complex integration.	**6 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**30**	**Project Hours:**	**0**	**Total Hours:**	**75**

Learning Resources

Textbooks

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 45th Edition, 2020.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2018.
3. Kreyzig E., "Advanced Engineering Mathematics" International students' version, 10th Edition, John Wiley and sons, 2023.

Reference books

1. Veerarajan T., "Engineering Mathematics (for First Year)", Tata McGraw Hill Pub. Co. Ltd., New Delhi, Revised Edition, 2008.
2. Weir, MD, Hass J, Giordano FR, "Thomas' Calculus", Pearson education 15th Edition, 2022.
3. G.B. Thomas and R.L. Finney, "Calculus and Analytical Geometry", 11th Edition, Pearson Education, 2006.
4. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 9th Edition, New

Delhi, 2020.

Online Resources (Weblinks)

1. Multivariable Calculus by MIT OpenCourseWare (Free)
   https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/
   Khan Academy: Multivariable Calculus (Free)
   https://www.khanacademy.org/math/multivariable-calculus
2. Coursera: Introduction to MATLAB Programming by Vanderbilt University
   https://www.coursera.org/learn/matlab

Assessment

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr. Ramesh V.S., STEPS Knowledge Services Private Limited, Coimbatore. Mr. Jayakumar Venkatesan, Valles Marineris International Private Limited- Chennai. Mr. Imran Khan, GE Transportation Company, Bangalore.	Dr. T. Govindan, Government College of Engineering, Srirangam, Trichy. Dr. C. Porkodi, PSG College of Technology, Coimbatore. Dr. P. Paramanathan, Amrita Vishwa Vidyapeetham, Coimbatore.	Dr. S.MeenaPriyadarshini Dr.K.Maheswari Ms.A.Shamugavadivu Department of Mathematics

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24MET104	ENGINEERING MECHANICS (Common to AE, AU, CE, ME, MR)	L	T	P	J	C
		3	0	0	0	3
ES		SDG	9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	apply principles of equilibrium to analyse rigid body systems in 2D space
2	calculate geometry-dependent properties such as centroid and moments of inertia
3	analyse the effects of friction in mechanical systems
4	understand the kinematics and kinetics of rigid bodies in plane motion

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	analyze the principles of transmissibility and moments to determine equilibrium conditions in rigid bodies.	Ap
CO 2	evaluate the geometry-dependent properties like center of gravity and moment of inertia to assess their impact on mechanical systems	Ap
CO 3	examine the laws of friction to distinguish between different types of friction in practical scenarios.	An
CO 4	analyze and solve problems related to the kinematics of rigid bodies in plane motion	An
CO 5	apply Newton's laws and principles of kinetics to solve problems involving the motion of rigid bodies.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3					2								
2	3					2								
3	3					2								
4	3					2								
5	3					2								

Course Content

STATICS OF RIGID BODIES Resolution of a Force into Components, Free body diagram. Equivalent systems of forces acting on a rigid body in 2D space: Principle of transmissibility – Moment of force about a point – Varignon's theorem – Moment of a couple – Equivalent couple – Moment of force about an axis – Coplanar non-concurrent forces acting on rigid bodies – Resultant and equilibrium – Resolution of a given force into force couple system – Equilibrium of a rigid bodies 2D space – Reactions and supports. Analysis of	**9 Hours**

structures.	
GEOMETRY DEPENDENT PROPERTIES Centre of gravity, Centre of mass and Centroid – Moment of Inertia of simple and complex areas – Transfer formula – Radius of gyration – Polar moment of inertia – Product of inertia - Mass moment of Inertia of simple solids, thin plates, composite bodies.	**9 Hours**
FRICTION Laws of friction – coefficient of friction – Dry friction – wedge friction – ladder friction – rolling resistance. Applications of friction by analytical approach in belt drives (open belt drive), clutches (plate and cone clutches), brakes (single shoe brake)	**9 Hours**
KINEMATICS OF RIGID BODIES - PLANE MOTION Kinematics of rigid bodies: Plane motion, translation and rotation General plane motion: Absolute velocity, relative velocity, instantaneous centre of rotation, absolute acceleration, relative acceleration.	**9 Hours**
KINETICS OF RIGID BODIES - PLANE MOTION Equations of motion of a rigid body - angular momentum, D'Alembert's principle; Principle of work and energy for a rigid body, work of forces acting on a rigid body, kinetic energy of a rigid body in plane motion, conservation of energy; Impulse-momentum principle for the plane motion of a rigid body; Overview of Lagrange's equations of motion.	**9 Hours**

Theory Hours: 45	**Tutorial Hours: 0**	**Practical Hours: 0**	**Project Hours: 0**	**Total Hours: 45**

Learning Resources

Textbooks

1. Ferdinand P. Beer, Jr. Johnston, E. Russell, Mechanics for Engineers: Statics and Dynamics, McGraw-Hill Inc.,US (1987).
2. Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 15th edition, Prentice Hall, 2022

Reference books

1. Beer, Ferdinand P., E. Russell Johnston, David Mazurek, Phillip Cornwell, and Brian Self. Vector Mechanics for Engineers: Statics and Dynamics. 2024 ed. New Delhi: Tata McGraw-Hill, 2024. ISBN 9781260710892.
2. James L. Meriam, L. G. Kraige, J. N. Bolton: Engineering Mechanics Statics , 9th edition, Wiley student edition, 2020.
3. James L. Meriam, L. G. Kraige, J. N. Bolton: Engineering Mechanics: Dynamics, 9th edition, Wiley student edition, 2020.
4. P. Boresi & J. Schmidt, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
5. Irving H. Shames, G. Krishna Mohana Rao, Engineering Mechanics - Statics and Dynamics, Fourth Edition – PHI / Pearson Education Asia Pvt. Ltd., 2006.
6. Rajasekaran S and Sankarasubramanian G, "Engineering Mechanics-Statics and Dynamics", Vikas Publishing House Pvt. Ltd., New Delhi, 2006

Assessment (Theory course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by

Expert from Industry	Expert from Higher Education Institution	Internal Expert
Mr. Babin. T, Design Engineer Lead |Mechanical Product Design Engineer-III at SLB, Singapore.	Dr S Parimala Murugaveni Associate Professor, Department of Mechanical Engineering, Government College of Technology, Coimbatore.	Dr. N. Sangeetha, Associate Professor, Department of Mechanical Engineering

Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24CSI101	LOGICAL THINKING AND PROBLEM SOLVING (Common to all Programmes)	L	T	P	J	C
		3	0	2	0	4
ES		SDG	8, 9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	gain a comprehensive understanding of computing systems, including their classification, processing units, memory structures, storage hierarchies, and the essential functions and types of operating systems
2	develop strong logical and analytical thinking skills, enabling the systematic analysis and solution of computational problems using reasoning techniques, algorithms, and flowcharts.
3	acquire a solid foundation in C programming, mastering the use of data types, operators, control structures, and input/output operations to create efficient and effective programs.
4	apply advanced programming techniques, including the use of arrays, structures, pointers, and functions, to solve complex real-world problems with a focus on modular and efficient coding practices.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	understand the basic concepts of hardware, software, Operating systems, and the logic behind the functioning of the Computing systems.	U
CO2	apply logical thinking and reasoning to solve computing problems using tools like algorithms and flowcharts.	Ap
CO3	understand the structured programming paradigms, memory organization and how the language can be used as a tool to solve problems.	U
CO4	develop simple programs using data types, operators, control structures, pointers, and functions as appropriate in real world applications.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	
1	2													
2	3	2	1									3		
3		1										2		
4	3	2	1									3		

Course Content

FUNDAMENTALS OF COMPUTERS AND COMPUTING	6 Hours
Generations of computers, and classification of computers (supercomputers, mainframes, minicomputers, microcomputers). Processing Units (CPU, GPU, TPU),	

memory (RAM, ROM), storage devices and hierarchy, input / output and peripheral devices. System software, application software. Operating Systems - Functions (process management, memory management, file system management, device management, security), types of operating systems (desktop, mobile, networking, distributed, real-time, embedded). **Number Systems**: Introduction to different number systems (binary, octal, decimal, hexadecimal), conversions between number systems, and binary arithmetic (addition, subtraction, multiplication, division). **Practical Component** Exploring hardware and software components	**4 Hours**
LOGICAL THINKING, REASONING AND TOOLS Problem Analysis – Logical Thinking vs Critical Thinking vs Design Thinking - Inference – Inductive Reasoning – Deductive Reasoning – **Logical Thinking Tools: Algorithms**: Definition and importance, characteristics of algorithms (finite, clear and unambiguous, well-defined inputs and outputs, feasible). Algorithm representation Techniques: Pseudocode, stepwise refinement, and top-down design. **Flowcharts**: Symbols used in flowcharts, creating flowcharts, and examples of flowchart-based problem-solving. **Practical Component** Algorithm writing and Flowcharts,	**8 Hours** **4 Hours**
PROGRAMMING PARADIGMS AND INTRODUCTION TO C PROGRAMMING **Programming Paradigms**: Structured programming - functional programming - object-oriented programming. **Introduction to C Programming**: History of C - features of C - structure of a C program – input / output statements. **Data Types**: Primitive data types (int, char, float, double) - derived data types, typecast. **Operators**: Arithmetic operators - relational operators - logical operators - bitwise operators - assignment operators - operator precedence. **Conditional Statements**: If - if-else - nested if - switch-case. **Looping Statements**: For loop - while loop - do-while loop. Pre-processor Directives and Command line arguments, Storage Classes. **Practical Component** Programs on Operator precedence, Decision Making, Iterations	**11 Hours** **10 Hours**
ARRAYS AND STRUCTURES **Collections**: Arrays – 2D Arrays – String Manipulation. **Structures and Unions**: Definition - declaration - accessing members - differences between structures and unions - applications. **Practical Component** Programs on Arrays, Structures, Union,	**10 Hours** **6 Hours**
POINTERS AND FUNCTIONS **Pointers**: Definition - declaration - pointer arithmetic - pointers and arrays. **Functions**: Definition - declaration - types of functions (user-defined, library functions) - parameter passing (by value, by reference) pointers and functions, recursion. **Practical Component** Pointers and Functions. Additional programs on Files to be discussed.	**10 Hours** **6 Hours**
Theory Hours: 45 **Tutorial Hours: 0** **Practical Hours: 30** **Project Hours: 0** **Total Hours: 75**	

Learning Resources

Textbooks:

1. Kanetkar, Yashavant. Let Us C. BPB Publications, New Delhi (2023).
2. Rajaraman, V. Fundamentals of Computers. PHI Learning, New Delhi (2020).
3. Dromey, R.G. How to Solve it by Computer. Prentice Hall International, New York (2008).

Reference
1. Cormen, Thomas H., Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. Introduction to Algorithms. MIT Press, Cambridge (2022). 2. Balagurusamy, E. Programming in ANSI C. McGraw Hill Education, New York (2021). 3. Kernighan, Brian W., and Dennis M. Ritchie. The C Programming Language. Prentice Hall, New York (2017). 4. Patterson, David A., and John L. Hennessy. Computer Organization and Design: The Hardware/Software Interface. Morgan Kaufmann, San Francisco (2017).
Online Resources (Weblinks)
1. https://nptel.ac.in/courses/106105214 2. https://www.coursera.org/learn/computer-fundamentals 3. https://www.khanacademy.org/computing/computer-science/algorithms 4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/ 5. https://www.geeksforgeeks.org/c-programming-language/

Assessment (Embedded course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
-	-		Dr. S. Kavitha, Department of Information Technology
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24INP103	INNOVATION PRACTICUM – 2 (Common to All branches)	L	T	P	J	C
		0	0	2	0	1
ES		SDG	9, 11, 12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	equip students with essential tools and techniques for leveraging open-source technologies to develop proof-of-concepts and prototypes
2	provide hands-on experience and participants will gain a comprehensive understanding of the entire product development process
3	final prototyping, empowering them to transform their ideas into tangible outcomes

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	analyse the effectiveness of various electronic tools and techniques in product development processes	An
CO 2	develop and implement functional software prototypes using open-source tools	Ap
CO 3	design and fabricate 3D models using digital fabrication techniques	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative Team work	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	2	2	2	2									
2	2	2	2		2									
3	2	2	3	2	2									

Course Content	
INTRODUCTION TO OPEN-SOURCE TOOLS AND TECHNIQUES Explore the concept of open-source, its underlying principles and its contrast with proprietary software, Discuss the advantages of using open-source tools, such as lower costs, increased innovation, educational value, and community support, walk through to the commonly used open-source tools for electronics design (KiCad, FreeCAD), software development (Python, Eclipse), and fabrication (Cura, LinuxCNC).	**3 Hours**
ELECTRONICS FUNDAMENTALS AND TOOLS Introduction to basic electronic components (resistors, capacitors, transistors, etc.), Understanding of electronic circuits and their functions, Hands-on practice with CircuitJS and Falstad, Simulating and analysing electronic circuits, Introduction to Arduino and Raspberry Pi, exploring their capabilities and applications, Designing PCBs using KiCad and EasyEDA, Understanding PCB fabrication processes	**6 Hours**
SOFTWARE PROTOTYPING AND TOOLS Benefits of rapid prototyping in product development, Iterative design and testing,	**6 Hours**

Wireframing tools (Balsamiq, Figma), UI design tools (Sketch, Figma), Programming languages (Python, JavaScript), Testing frameworks (Selenium), No-code platforms (Bubble, Adalo, Wix, AppGyver), Building functional prototypes without extensive coding	
FABRICATION AND PROTOTYPING Overview of fabrication techniques (3D printing, laser cutting, CNC machining), Prototyping methods for physical products, using tools like Blender, TinkerCAD, or Fusion 360, Creating 3D models for physical prototypes, Hands-on experience with laser cutting and engraving, Understanding their applications and limitations	**7 Hours**
SIMULATION & DEMONSTRATION Integrated project demonstration, explaining the design process, technical choices, and outcomes, simulation showcase to demonstrate their understanding of various technical tools and prototyping techniques	**8 Hours**

Theory Hours: 0	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 30

Learning Resources

Textbooks:

1. Damir Godec, Joamin Gonzalez-Gutierrez, Axel Nordin, Eujin Pei, Julia Ureña Alcázar, A guide to additive manufacturing, Springer – 2022. https://doi.org/10.1007/978-3-031-05863-9
2. Introducing SolidWorks, Dassault Systems.

References:

1. Insight into Electronics
2. Microcontroller Programming with Arduino and Python
3. Fundamentals of 3D modelling

Online Resources (Weblinks)

1. Google Play store apps:
   a. https://play.google.com/store/apps/details?id=com.electronicslab
   b. https://play.google.com/store/apps/details?id=it.android.demi.elettronica
2. https://engservices-ece.sites.olt.ubc.ca/files/2020/01/SolidWorks-3D-Printing-Tutorial-R2.pdf

Assessment (Practical course)

Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert from Industry	Expert(s) from Higher Education Institution	Internal Expert
Dr. Mahesh Veezhinathan- Director - Innovation Practicum Associate VP - Forge. Innovation		Dr. Samuel Ratna Kumar P S Assistant Professor – III Department Mechanical Engineering

Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24CEI101	BUILDING MATERIALS AND CONSTRUCTION PRACTICES	L	T	P	J	C
		3	0	2	0	4
ES		SDG		9,11		

Pre-requisite courses	Material Chemistry for Sustainable Infrastructure	Data Book / Codebook (If any)	-

Course Objectives:	
After successful completion of this course, the students should be able to	
1	Ability to select appropriate building materials for different construction scenarios.
2	Proficiency in applying advanced construction technologies in real-world projects.
3	Understanding of sustainable practices and their integration into construction projects.
4	To Explore Innovative Construction Techniques and technologies
5	Capability to analyse and implement innovative construction techniques and emerging technologies to enhance structural performance and sustainability.

Course Outcome:		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Identify and select appropriate building materials based on structural, environmental, and economic considerations for various construction scenarios.	R
CO 2	Demonstrate proficiency in utilizing advanced construction technologies to optimize efficiency, durability, and sustainability in real-world projects.	U
CO 3	Apply sustainable construction practices by integrating eco-friendly materials, energy-efficient techniques, and waste reduction strategies into construction projects.	AP
CO 4	Investigate and implement innovative construction techniques and emerging technologies to enhance construction efficiency, durability, and sustainability.	AP
CO 5	Analyze and apply innovative construction techniques and emerging technologies to improve structural performance, efficiency, and sustainability in construction projects.	AP

Course Outcomes (CO)	Program Outcomes (PO)(Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Environment & Sustainability	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	2	2	2		2						3	
2	3	2	2	2	2								3	
3	3	2		2	2		2	2					3	
4	3	3	2	2	2		2						2	3
5	3	3	2	2	2		2	2					2	3

Course Content	
INTRODUCTION TO BUILDING MATERIALS Classification of Stones–Properties of Stones in structural requirements. Composition of Good Brick Earth, Manufacturing of bricks. Cement and Manufacturing process, Types of cement - Tests for Cement. Sustainable Materials: Introduction to Green Building Materials and their importance, Energy-Efficient Building Materials- Limestone Calcined Clay Cement (LC3) **Practical** • Determine the Fineness of Cement • Determine the Consistency Test on Cement • Determine the Initial Setting Time of Cement	**9 Hours** **6 Hours**
INNOVATIVE CONSTRUCTION MATERIALS Concrete Ingredients, Manufacturing, Types of Special Concrete. 3D Printing of Concrete, Nanotechnology in Concrete, Utilization of recycled aggregates, fly ash, and slag in construction. Applications of bio-based materials in sustainable construction. Classification of timber, plywood, fiberboard, masonite and its manufacturing- Timber used for interior design. Finishes, painting & varnishes – MEP in Construction. **Practical** • Determine the Specific Gravity of Fine Aggregate • Determine the Specific Gravity of Coarse Aggregate • Determine the Crushing Strength on Aggregates	**9 Hours** **6 Hours**
SUSTAINABLE CONSTRUCTION USING MODERN TOOLS Vasthu Science for Civil Engineers, Types of Constructions - Load Bearing, Framed& Composite Structure, Construction of Substructure - Job Layout, Foundation -Plinth. - DPC – Superstructure - Brick masonry- Stone Masonry- Flooring-Roofing- Scaffolding - Advanced Formwork Systems - Digital Tools for Monitoring and Management. **Practical** • Determine the Compressive Strength on Cement Mortar Concrete • Determine the Workability of Concrete Using Slump Test • Determine the Workability of Concrete Using Compaction Factor Test	**9 Hours** **6 Hours**
DIGITAL CONSTRUCTION TECHNOLOGIES Prefabrication - Building Information Modeling (BIM) - Automation and Robotics in Construction- Use of drones, automated machinery, and robotics in construction processes. Augmented Reality (AR) and Virtual Reality (VR) **Practical** • Determine the Workability of Concrete Using Flow Table Test • Determine the Compressive Strength of Concrete • Determine the Impact Strength on Aggregates	**9 Hours** **6 Hours**
EMERGING TRENDS IN CONSTRUCTION Smart Cities and Smart Buildings- Integration of IoT and AI in building design and construction - Digital tools for site management, safety, and quality control. Case Studies- Zero-Energy and Passive Houses **Practical** • Determine the Tensile Strength of Concrete • Determine the Flexural Strength of Concrete	**9 Hours** **6 Hours**

Theory Hours:	**30**		**Tutorial Hours:**	**0**	**Practical Hours:**	**30**	**Project Hours:**	**0**	**Total Hours:**	**60**

Learning Resources

Textbooks:

1. B.C.Punmia, "Building Construction", Laxmi Publications, New Delhi. 2016.
2. G.S.Birdie, T.D.Ahuja, "Building Construction and construction materials", Dhanpatrai publishing company, New Delhi, 2012

References:

1. SK Duggal, "Building Materials," New Age Publications 4th Edition, April, 2014
2. Varghese. P.C. "Building Construction", prentice hall of India Pvt. Ltd. New Delhi,2015.
3. Shah M.G. Kalec M. & Palki SY Building Drawing, Tata McGraw Hill, New Delhi,2000.
4. .M.S.Shetty. "Concrete Technology", S Chand and Company Limited, New Delhi, 2017.

Online Educational Resources:

1. https://archive.nptel.ac.in/courses/105/102/105102088/
2. https://archive.nptel.ac.in/courses/105/102/105102088/
3. https://archive.nptel.ac.in/courses/105/102/105102088/

Assessment (Embedded course)

SAT, Activity and Learning Task(s) MCQ, End Semester Examination (ESE).Lab Workbook, Model Exam, Viva-Voce.

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Er.Vijayakumar Founder Mannoviyum Institute of Training /SKV Constructions Coimbatore	Dr.M.P.Muthuraj HOD Coimbatore Institute of Technology Coimbatore	Dr.A.Vennila Assistant Professor -II Kumaraguru College of Technology Coimbatore

Recommended by BoS on	14/08/2024		
Academic Council Approval	No.	**Date**	24/08/2024

24HSP112	HOLISTIC WELLNESS-II (Common to all Department)	L	T	P	J	C
		0	0	2	0	1
HS		SDG	3, 4			

Pre-requisite courses	Holistic Wellness-I	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	build on the foundation laid in Holistic Wellness -I and deepening into the practices and principles of holistic wellness.
2	explore advanced techniques in mental, emotional, and spiritual well-being, with an emphasis on creating sustainable wellness habits.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	apply advanced techniques in mindfulness, meditation, and stress management.	Ap
CO 2	understand the role of community and social connections in wellness.	U
CO 3	develop resilience and adaptability in maintaining wellness.	E
CO 4	refine and sustain a personalized holistic wellness plan.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative Team work	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2	PSO-3
1						2		2						
2						2								
3						2					3			
4						2					3			

Course Content

ADVANCED MINDFULLNESS AND MEDITATION: • Deepening mindfulness practices for enhanced mental clarity. • Exploring different forms of meditation (e.g., guided, transcendental, movement-based). • Hands-on activity: Daily meditation practice and journaling reflections.	**6 Hours**
EMOTIONAL RESILIENCE AND MENTAL HEALTH: • Building emotional resilience through positive psychology practices. • Cognitive-behavioural strategies for managing stress and anxiety. • Hands-on activity: Developing and practicing a resilience toolkit.	**6 Hours**
SOCIAL AND ENVIRONMENTAL WELLNESS: • The impact of social connections and community on wellness. • Creating a supportive environment for personal growth. • Hands-on activity: Building a community wellness project or group activity.	**6 Hours**
INTERNAL GROWTH AND PURPOSE:	**6 Hours**

• Exploring the deeper aspects of internal wellness and self-actualization. • Reflective practices for discovering life purpose and meaning. • Hands-on activity: Creating a vision board or personal mission statement.	
SUSTAINING WELLNESS PRACTICES: • Strategies for maintaining wellness habits over the long term. • Adapting wellness plans to life changes and challenges. • Hands-on activity: Revising and finalizing a long-term personal wellness plan.	**6 Hours**

Theory Hours: 0	Tutorial Hours: 0	Practical Hours: 30	Project Hours:	Total Hours: 30

Learning Resources

Textbooks:

1. Hanh, Thich Nhat. The Miracle of Mindfulness: An Introduction to the Practice of Meditation. Beacon Press, Boston (1975).
2. Tolle, Eckhart. The Power of Now: A Guide to Spiritual Enlightenment. New World Library, Novato (1997).
3. Patel, Kamlesh. Heartfulness Way: Heart-Based Meditations for Spiritual Transformation, Kamlesh Patel, 2018.

References:

1. Goleman Daniel., Emotional Intelligence., Bloomsbury India, India, (2021).
2. James Allen., As a Man Thinketh., Maple Press, Noida, (2010)
3. Swami Budhanandha., Will power and its development., Advaita Ashrama Mayavati, Pithoragarh, Himalayas from its Publication Department, Calcutta. (2001)
4. Rosenberg, Marshall Bertram., Nonviolent Communication: A Language of Life., Puddle Dancer Press, Encinitas, CA (2015).
5. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
6. Lipton, Bruce., The Biology of Belief 10th Anniversary Edition: Unleashing the Power of Consciousness, Matter & Miracles, Hay House, Carlsbad (2015).
7. Kalderdon Adizes Ichak., What Matters in Life: Lessons I Learned from Opening My Heart
8. ., WS Press, Newtown, PA(2023).
9. Murphy, Joseph., The Power of Your Subconscious Mind [Original Edition (Complete)], Prentice-Hall, Englewood Cliffs (1963).
10. Kamlesh D. Patel., Designing Destiny: The Heartfulness Way, Heartfulness Institute, Chennai (2021)

Online Resources (Weblinks)

- Introduction to Psychology
- Guided Meditation
- Life skills and value education
- James Allen Library

Assessment (Practical course)

Participation, Practical activities and assignments, personal wellness plan and reflection.

Course Curated by		
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**
		Dr. Ezhilarasi Principal- KCT

Recommended by BoS on			
Academic Council Approval	No: 27	**Date**	24.08.2024

24HSJ102	FLUENCY THROUGH PRACTICE (Common to all Programmes)	L	T	P	J	C
		0	0	0	4	2
HS		SDG	4, 9, 12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	develop professional communication skills, including technical writing, public speaking, and collaborative discourse.
2	foster creativity and critical thinking by producing real-world academic and professional outputs such as book chapters, journal articles, and intellectual property.
3	instil awareness of global and ethical communication practices, contributing to sustainability and social impact.
4	enhance students' language fluency through project-based learning relevant to engineering

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	analyse and apply effective communication techniques in professional contexts.	An
CO2	collaborate in teams to design and execute language-based projects with real-world applications.	Ap
CO3	develop critical thinking and problem-solving skills through research, analysis, and presentation of technical content.	An
CO4	produce publishable-quality written and spoken outputs, such as book chapters, journal articles, and copyrighted content.	C

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1		2	2	1			3	2	2	1	2			
2		3	2	1			3	2	2	1	2			
3		2	2	2			3	2	2	1	2			
4		3	1	1			3	2	2	1	1			

Course Content

- Introduction to Activity Based Learning
- Research and Initial Project Planning
- Technical Writing and Documentation
- Creative Writing
- Drafting and Editing Techniques
- Teamwork and Peer Collaboration
- Public Speaking and Presentation Skills
- Challenges to Opportunities

60 Hours

• Cross-Cultural Communication and Global Ethics Intellectual Property and Copyrighting Publication – English for research Writing Digital Communication & Social Responsibility	

Theory Hours: 0	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 60	Total Hours: 60

Learning Resources

Reference books

1. Mahesh Kumar, Dr.Soma. Soft Skills: Enhancing Personal and Professional Success, McGraw Hill,2023.
2. Maxwell, John C. Developing the leader within you, Harper Collins, 2018.
3. Ansarian, Loughman, and Teoh, Mei Lin. Problem-based Language Learning and Teaching: An Innovative Approach to Learn a New Language. Singapore, Springer Nature Singapore, 2018.
4. Savin Baden, M., Major, C. H. (2004). Foundations of Problem Based Learning. United Kingdom:
5. McGraw-Hill Companies, Incorporated.

Online Resources (Weblinks)

1. https://www.sciencedirect.com/science/article/pii/S2590291123002735
2. https://www.cal.org/adultesl/pdfs/problem-based-learning-and-adult-english-language-learners.pdf
3. https://www.apu.ac.jp/rcaps/uploads/fckeditor/publications/polyglossia/Polyglossia_V16_Ng.pdf

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr.Vijayan Ramanathan , Project Manager, Toppan Merrill. Technologies, Coimbatore	Dr. Aninditha Sahoo, IIT, Madras Dr.P.R.Sujatha Priyadharshini, Anna University Chennai Dr. E. Justin Ruben, CIT, Coimbatore	Dr. Arokia Lawrence Vijay Dr. SG Mohanraj Department of English

Recommended by BoS on	16.08.2024		
Academic Council Approval	No:27	**Date**	24.08.2024

SEMESTER -III

24HSP005	Mastering Conversations	L	T	P	J	C
		0	0	2	0	1
HS		SDG	4, 8			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Demonstrate understanding of different perspectives by analyzing complex personal and professional situations.
2	Engage in thoughtful dialogue and discussions about complex, real-world issues, utilizing critical thinking to assess different viewpoints.
3	Apply role-playing as a tool to enhance understanding of workplace dynamics, conflict resolution, and team collaboration.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Empathize with and understand people in both professional and personal contexts, reflecting on situations from multiple perspectives and participating in activities that mirror career-related scenarios	Ap
CO 2	Analyse and converse critically on complex subjects, demonstrating the ability to approach and deal with various social contexts effectively	An
CO 3	Exhibit skills in role-playing and enacting given situations to navigate diverse social interactions and career-related contexts.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1		3						3	3		3			
2		3						3	3		3			
3		2						3	3		3			

Course Content

Roleplays Dynamics Introduction to Role play - Benefits of role plays - Importance of gesture, tone, and modulation-Skill development through role play activities - Types of role plays - Conversation Building through communicative functions-Initiating a dialogue- Framing questions- Receiving feedback	**6 Hours**
Roleplays on Social Skills Social Interactions: - (Ordering food at a restaurant- Making a reservation at a hotel-- Shopping at a store-- Attending a party or social gathering) Travel and Tourism:(Asking for directions- Booking a flight or hotel-- Exploring a new city- Interacting with local people) Community and Volunteering:(Participating in a charity event- Volunteering at a local organization- Discussing community issues- Organizing a community project)	**6 Hours**
Roleplays on Education and Technology	

Education and Personal Growth:(Setting goals-(Short term & Long term)- Creating a study plan- Participating in a workshop- Reflecting on personal growth) Technology and Online Interactions:(Participating in an online meeting Creating a social media post- Writing an email or text message- Making an online purchase) Technology and Science:(Explaining a scientific concept- Discussing emerging technologies- participating in Hackathons- Presenting a research paper)	**6 Hours**
Roleplays on Strategic Insights Critical Thinking :(Evaluating a news article-solving a moral dilemma-Decision with incomplete information-Assessing a historical event) Problem-Solving:(Resolving a conflict- Negotiating a deal - Making a complaint- Apologizing for a mistake) Business and Entrepreneurship:(Pitching an idea- Negotiating a contract Conducting a market Research- Presenting a product launch)	**6 Hours**
Roleplays on Cultural Exchange Cultural Exchange:(Sharing customs and traditions- Discussing cultural differences- Exploring historical events- Participating in a cultural festival) Media and Entertainment:(Event planning- Creating an advertisement-Digital Marketing-Conducting interviews- Creating news broadcast- Writing and Performing a script- Enacting one act plays) Arts and Culture:(Visiting an art gallery - Attending/ organizing a concert or play Discussing literature- Creating a piece of art)	**6 Hours**

Theory Hours:	**0**	**Tutorial Hours:**	**0**	**Practical Hours:**	**30**	**Project Hours:**	**0**	**Total Hours:**	**30**

Learning Resources

References:

1. Bonwell, C. C., & Eison, J. A. (1991). Active learning: Creating excitement in the classroom. Washington, DC: The George Washington University.
2. Harbour, E., & Connick, J. (2005). Role playing games and activities rules and tips. Retrieved from https://www.businessballs.com/roleplayinggames.htm
3. Lebaron, J., & Miller, D. (2005). The potential of jigsaw role playing to promote the social construction of knowledge in an online graduate education course. Retrieved from http://paws.wcu.edu/jlebaron/Jigsaw-FnlTCRpdf_050812.pdf
4. Davies, A. (2018). Teaching and learning through role-play: A practical guide. Maidenhead, UK: McGraw-Hill Education.
5. Young, K. C. (2016). The art of role play: Developing realistic scenarios for skill development. Boston, MA: Pearson.
6. Yardley-Matwiejczuk, K. M. (1997). Role play: Theory and practice. London, UK: SAGE Publications Ltd.

Assessment (Practical course)

Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr.Vijayan Ramanathan, Project manager, Toppan Merrill. Technologies, Coimbatore	1. Dr. Aninditha Sahoo, IIT, Madras 2. Dr.P.R.Sujatha Priyadharshini, Anna University Chennai 3. Dr. E.Justin Ruben, CIT, Coimbatore	1. Dr. Arokia Lawrence Vijay 2. Dr. Tissaa Tony Department of Languages and Communications

Recommended by BoS on	16.08.2024		
Academic Council Approval	No:27	**Date**	24.08.2024

24INM201	Universal Human Values II: Understanding Harmony (Common to All Branches)	L	T	P	J	C
		1	0	0	0	1
HS		SDG	3, 14, 15			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Introduce the concept and significance of value education in shaping a meaningful and fulfilling life.
2	Enable students to understand the human being as a co-existence of self and body and the harmony within.
3	Develop an understanding of harmony in relationships, family, and society.
4	Help students appreciate the interconnectedness and harmony in nature and existence.
5	Instill the importance of ethical behaviour in personal, professional, and social contexts.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Understand the foundational concepts of value education and human aspirations.	U
CO2	Analyze the human being as a holistic entity comprising self and body.	An
CO3	Evaluate and cultivate harmonious relationships within the family and society.	E
CO4	Interpret the interconnectedness in nature and recognize harmony in existence.	U
CO5	Apply holistic understanding to professional ethics and sustainable living.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative Team work	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2	PSO-3
1						3	3	3	3		3			
2						3	3	3	3		3			
3						3	3	3	3		3			
4						3	3	3	3		3			
5						3	3	3	3		3			

Course Content

Introduction to Value Education Value Education- Self-exploration as the Process for Value Education- Basic Human Aspirations and their Fulfilment- Right Understanding, Relationship and Physical Facility- Happiness and Prosperity – Current Scenario- Method to Fulfil the Basic Human Aspirations.	**3 Hours**
Harmony in the Human Being Human Being as Co-existence of the Self and the Body- Distinguishing between the Needs of the Self and the Body- The Body as an Instrument of the Self- Understanding Harmony in the Self- Harmony of the Self with the Body- Programs to Ensure Self-regulation and Health.	**3 Hours**

Harmony in the Family and Society Harmony in the Family –The Basic Unit of Human Interaction-'Trust' – The Foundational Value in Relationship-Respect – As the Right Evaluation- Other Values in Human-to-Human Relationship- Understanding Harmony in the Society Lecture Vision for the Universal Human Order.	**3 Hours**
Harmony in the Nature (Existence) Understanding Harmony in Nature- Interconnectedness, Self-regulation and Mutual Fulfilment among the Four Orders of Nature- Realizing Existence as Co-existence at All Levels- The Holistic Perception of Harmony in Existence.	**3 Hours**
Implications of the Holistic Understanding- A Look at Professional Ethics Basis for Universal Human Values-Definitiveness of (Ethical) Human Conduct - professional Ethics in the Light of Right Understanding-A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order-Holistic Technologies, Production Systems-and Management Models-Typical Case Studies Strategies for Transition towards Value-based Life and Profession	**3 Hours**

Theory Hours: 15	**Tutorial HoursHours:**	**Practical**	**Project Hours:**	**Total Hours: 15**

Learning Resources

Textbooks:

Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

References:

Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, Jeevan Vidya:Publishers, 1999.

Online Resources (Weblinks)

https://www.uhv.org.in/uhv-ii

Assessment (Theory course)

Presentation, MCQ, Assignment, Case Study and E Chart.

Course Curated by

Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**
	Sh. Umesh Jadhav, NCCIP (National Co-oridnation Committee)-AICTE	Dr.S.Sivakumar, Associate Professor, SFS Dr.R.Prakasam, Assistant Professor, Department of Physics Mr.J.Sivaguru, Assistant Professor, Department of Mechatronics

Recommended by BoS on	03-05-2025		
Academic Council Approval		**Date**	26-06-2025

24INP201	Innovation Practicum - 3	L	T	P	J	C
		0	0	2	0	1
ES		SDG	4, 9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Develop a deep understanding of the innovation process and apply customer-centric thinking to innovation
2	Evaluate the feasibility and viability of innovation ideas.
3	Optimise innovation projects for efficiency and effectiveness and communicate the ideas effectively.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Analyse the various stages of innovation and their interdependencies	An
CO2	Create innovative solutions that address specific customer needs	C
CO3	Evaluate the potential impact and risks of different innovation concepts and present them clearly and persuasively.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	2	2	2	2									
2			3	2			2		2					
3									2	3				

Course Content

Idea Worth Prototyping Discuss potential risks and challenges associated with innovative ideas - Learn to refine and validate the initial concept - Develop a plan outlining key milestones and timelines for advancing from idea to prototype.	**3 Hours**
Framing the Challenge Define the specific problem or opportunity that the innovation aims to address, understand customer needs and preferences - Identify the gaps in the market and potential obstacles to adoption, assess the potential market size, competition, and feasibility.	**6 Hours**
Crafting High-Value Solutions Generate Minimum Usable Prototype (MUP) concepts that address the identified challenge that provide high value, evaluate the potential of each solution concept based on criteria like feasibility, viability, and desirability.	**6 Hours**

Optimization and Planning Create Bill of Quantities (BOQ) and Bill of Materials (BOM) to estimate costs and resources - Develop a comprehensive innovation proposal outlining the innovation concept, goals, and benefits - Implement Lean principles to improve efficiency and reduce waste in the innovation process - Reflect on the activities to identify areas for improvement and learning.	**7 Hours**
Project Presentation Develop and deliver a compelling presentation of your minimum usable prototype (MUP) and innovation solution to effectively communicate its value and impact to a broader audience - Create a visually engaging presentation that clearly outlines the problem, the proposed solution, and the value of your minimum usable prototype - Utilise tools such as slides, infographics, and videos to enhance the visual appeal - Craft a compelling story around your innovation - Highlight the journey from problem identification to solution development, emphasising key insights and milestones.	**8 Hours**

Theory Hours: 0	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours 30

Learning Resources

References:

1. Everything you need about value proposition: https://blog.forgeforward.in/everything-you-need-to-know-about-value-proposition-7247493c9 40c
2. Test your Value Proposition: http://businessmodelalchemist.com/2012/09/test-your-value-proposition-supercharge-lean-s tartup-and-custdev-principles.html
3. Valuation Risk versus Validation Risk in Product Innovations: https://blog.forgeforward.in/valuation-risk-versus-validation-risk-in-product-innovations-49f25 3ca8624
4. User Guide for Product Innovation Rubric: https://blog.forgeforward.in/user-guide-for-product-innovation-rubric-857181b253dd
5. Innovation Risk Diagnostic — Product Innovation Rubric: https://blog.forgeforward.in/product-innovation-rubric-adf5ebdfd356
6. Evaluating Product Innovations — proof, potential, & progress:https://blog.forgeforward.in/evaluating-product-innovations-e8178e58b86e

Online Resourse (Weblinks)

5. https://formlabs.com/blog/ultimate-guide-to-prototyping-tools-for-hardware-and-product-desi gn/
6. https://docs.kicad-pcb.org/
7. https://www.tinkercad.com/learn/circuits
8. https://docs.github.com/en/free-pro- team@latest/actions/guides

Assessment (Practical course)

Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Dr. Mahesh Veezhinathan Director - Director Forge. Academy	-	Dr. Samuel Ratna Kumar P S Assistant Professor – III Department Mechanical Engineering

Recommended by BoS on	07/05/2025		
Academic Council Approval	No: 28	**Date**	26/06/2025

24CEJ205	Internship - I	L	T	P	J	C
		0	0	0	0	1
PRJ		SDG	9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Provide exposure to real-world civil engineering practices, site operations, and industry standards
2	Enable students to apply theoretical knowledge to practical engineering problems
3	Develop technical, analytical, and problem-solving skills in construction and project environments
4	Enhance professional competencies including teamwork, communication, and ethical responsibility

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Understand industry practices, safety regulations, and project workflows	U
CO 2	Apply civil engineering concepts in real-time construction and field activities	Ap
CO 3	Analyze engineering problems related to construction, materials, and execution	An
CO 4	Evaluate project quality, safety, and sustainability	E
CO 5	Demonstrate teamwork, communication, and ethical professional conduct	Ap
CO 6	Create technical reports and present internship outcomes effectively	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	2	2	1	-	-	2	2	3	1	-	2	3	3
2	3	3	2	2	3	2	1	2	2	-	2	2	2
3	3	3	2	3	2	2	1	1	2	-	2	3	3
4	2	3	3	2	2	3	3	2	2	1	2	2	2
5	1	2	1	-	1	2	3	3	3	2	2	2	2
6	1	2	1	1	2	1	1	2	3	2	3	2	2

Assessment (Theory course)
Presentation and Internship Report

Course Curated by			
Expert from Industry	**Expert from Higher Education Institution**		**Internal Expert**
Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24MAT231	PARTIAL DIFFERENTIAL EQUATIONS AND TRANSFORMS TECHNIQUES (Common to AE, AU, CE, ME, MR)	L	T	P	J	C
		3	1	0	0	4
BS		SDG	7,9			

Pre-requisite courses	-	Data Book / Codes / Standards (If any)	-

Course Objectives:	The purpose of taking this course is to:
1	**apply analytical methods** to solve selected PDEs, including suitable method of characteristics.
2	**construct Fourier series expansions** for functions defined on a finite interval.
3	develop the ability to **formulate and solve** the one-dimensional wave equation and steady-state heat equation using **analytical methods**.
4	introduce students to the **mathematical formulation** of the steady-state two-dimensional heat conduction equation in Cartesian coordinates.
5	enable students to **compute Fourier transforms** of standard functions and understand their properties.
6	apply the Z-transform technique to **solve linear difference equations** with constant coefficients.

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO1	solve certain types of partial differential equations.	Ap
CO2	determine the Fourier Series and half range Fourier Series of a function.	Ap
CO3	solve one dimensional wave equation, one dimensional heat equation in steady state using Fourier series.	Ap
CO4	apply Fourier series to solve the steady state two-dimensional heat equation in cartesian coordinates.	Ap
CO5	identify Fourier transform, Fourier sine and cosine transform of certain functions and use Parseval's identity to evaluate integrals.	Ap
CO6	evaluate Z – transform of sequences and inverse Z – transform of functions and solve difference equations.	Ap

	Program Outcomes (PO)(Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	2												
2	3	2												
3	3	2												
4	3	1		2										
5	3	1		2										
6	3	1		2										

Course Content

PARTIAL DIFFERENTIAL EQUATIONS Solution of PDE by direct integration - solution of standard types of first order partial differential equations (excluding reducible to standard types) - Lagrange's linear equation – Linear homogeneous partial differential equations of second order with constant coefficients.	**9 + 3 Hours**
FOURIER SERIES Dirichlet's conditions – Fourier series – Odd and Even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic Analysis.	**9 + 3 Hours**
BOUNDARY VALUE PROBLEMS – ONE DIMENSIONAL EQUATIONS Classification of second order quasi linear partial differential equations – Solution of one-dimensional wave equation – Solution of one-dimensional heat equation (excluding insulated ends) – (Cartesian coordinates only).	**5 + 2 Hours**
BOUNDARY VALUE PROBLEMS – TWO DIMENSIONAL EQUATIONS Steady state solution of two-dimensional heat equation in infinite plate (Insulated edges excluded) – (Cartesian coordinates only)	**4 + 1 Hours**
FOURIER TRANSFORM Statement of Fourier integral theorem – Infinite Fourier transforms – Sine and Cosine Transforms – Properties (Proofs excluded)– Transforms of simple functions – Convolution theorem – Parseval's identity.	**9 + 3 Hours**
Z –TRANSFORM Z-transform - Properties (Proofs excluded) – Convolution theorem- Inverse Z – transform (by using partial fractions, residues and convolution theorem) – Solution of difference equations using Z - transform.	**9 + 3 Hours**

Theory Hours: 45	**Tutorial Hours: 15**	**Practical Hours:**	**Project Hours:**	**Total Hours: 60**

Learning Resources

Textbooks

1. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, edition 2016.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 45th Edition, 2024.

Reference books/ Web Links

1. Kandasamy P., Thilagavathy K. and Gunavathy K., "Engineering Mathematics Volume III", S. Chand & Company ltd., New Delhi, 2020 Revised 10th edition.
2. Ian Sneddon., "Elements of partial differential equations", McGraw – Hill, New Delhi, 2022.
3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 2018.

Online Resources

1. Partial differential equations – https://www.classcentral.com/course/swayam-partial-differential-equations-17721
2. Fourier series – https://www.classcentral.com/subject/fourier-series
3. Fourier Transform - https://www.classcentral.com/subject/fourier-transform
4.

sessment

rmative	mmative
signments-Open Book Test/Quiz/Case Study Analysis/Group Presentation/Poster Preparation/Mathematical Models, etc.,	CQ, CAT- I, CAT – II and End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	Expert(s) from Higher Education Institutions	Internal Expert(s)
1. Mr. Ramesh V.S., STEPS Knowledge Services Private Limited, Coimbatore.	1. Dr. M. Sivakumar Assistant Professor Sr. Grade Vellore Institute of Technology, Vellore 2. Dr. Ramesh Babu Assistant Professor (SG) Amrita University Coimbatore, Tamil Nadu.	1. Ms. S. Sivasakthi 2. Dr. S. Meenapriyadarshini 3. Ms. A. Shanmughavadivu

Recommended by BoS on	25.4.2025		
Academic Council Approval		**Date**	

24CET201 PC	Fluid Mechanics and Applied Hydraulics	L	T	P	J	C
		3	0	0	0	3
		SDG	7,9,11			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Introduce the fundamental properties of fluids and the principles of fluid statics, kinematics and dynamics, enabling them to analyze and solve practical engineering problems.
2	Equip students with the skills to solve practical problems related to pipe flow systems
3	Provide an in-depth understanding of open channel flow and uniform and non-uniform flow behavior.
4	Study the selection, design, and performance analysis of turbines and pumps used in water and energy systems.
5	Develop students' ability to apply dimensional analysis for scaling fluid systems and to use CFD tools for simulating and analyzing fluid flow behavior

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Understand and apply the fundamental properties of fluids and fluid statics and kinematics to solve real-world engineering problems.	U
CO 2	Analyze and interpret fluid flow behavior using principles of fluid dynamics, including the continuity equation and Bernoulli's theorem and solve practical pipe flow problems	AN
CO 3	Understand the principles of open channel flow and analyze the characteristics of uniform and non-uniform flow behavior	U
CO 4	Analyze the performance characteristics of hydraulic machines	AN
CO 5	Apply dimensional analysis and use CFD tools for simulating and analyzing flow in civil engineering applications.	AP

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative teamwork	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2
1	3	2	1	1	2	2	1	2		1	2	3	2
2	3	3	2	2	3	2	1	3		1	2	2	3
3	3	3	2	3	2	3	2	1		2	3	3	2
4	3	3	3	2	3	2	1	2		3	2	3	3
5	3	2	3	3	3	3	2	2		2	3	3	3

Course Content	
FLUID STATICS	**9 Hours**

• Basic concept of Fluid and its properties – density, specific weight, viscosity, surface tension, capillarity, compressibility • Pressure measurement – manometers, pressure transducers	
FLUID DYNAMICS AND PIPE FLOW • Flow visualization – streamlines, path lines; continuity equation and classification of Flow • Euler's and Bernoulli's equations and applications (Venturi meter and Orifice meter) • Major (Darcy-Weisbach) and minor losses, empirical relations • Pipes in Series and Parallel	**9 Hours**
FUNDAMENTALS OF OPEN CHANNEL FLOW • Open channel flow and Classification of flow • Chezy's and Manning's equations – Most Economical Rectangular, Trapezoidal and circular Channels • Specific Energy – Critical Depth, Critical velocity, Alternate depths, Specific Energy Curve, and normal depth • Gradually varied flow and classification of water surface profiles. • Rapidly Varied flow – Hydraulic Jump– types, energy loss, applications in spillways.	**9 Hours**
HYDRAULIC MACHINES • Turbines - Types and Working Principle. • Computation of work done and determination of efficiency. • Centrifugal pump – working principle, types and performance curves • Reciprocating pump – working principle, types and performance curves	**9 Hours**
INTRODUCTION TO CFD • Introduction to CFD (Computational Fluid Dynamics): Concepts, boundary conditions, post-processing and applications in Civil Engineering: • Advanced simulation of cavitation, flow separation, and turbulence using ANSYS Fluent, Open FOAM	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources

Textbooks:

1. Bansal, R.K., "Fluid Mechanics and Hydraulic Machines", 5th edition, Laxmi Publications Pvt. Ltd, New Delhi, 2010.
2. Subramanya, K, Flow in Open Channels, McGraw Hill, 2017.
3. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics Including Hydraulics Machines", Standard Book House, New Delhi, 2019.
4. Cimbala, J. M. and Y. A. Cengel, Essentials of Fluid Mechanics, McGraw-Hill, New York, 2006.

References:

1. Jain A. K. "Fluid Mechanics", Khanna Publishers, 2010
2. Y. A. Cengel, J. M. Cimbala,"Fluid Mechanics, Fundamentals and Applications," 2nd Ed., McGraw-Hill, 2009.
3. Kundu, Pijush K., and Ira M. Cohen. Fluid Mechanics. 6th ed. Academic Press, 2015.
4. "Computational Methods for Fluid Dynamics," J. H. Ferziger, M. Peric, 3rd edition, Springer, 2002
5. Ven Te Chow, Open Channel Hydraulics, McGraw Hill, 2009.
6. L.W. Mays, Water Resources Engineering, Wiley, 2020
7. Jagadish Lal, Hydraulic Machines, Metropolitan Book Co., 2022.

Online Resources:

1. https://archive.nptel.ac.in/courses/105/103/105103095/
2. https://archive.nptel.ac.in/courses/105/101/105101082/
3. http://ocw.mit.edu/courses/2-25-advanced-fluid-mechanics-fall-2013/pages/fluid-statics/
4. http://www.digimat.in/nptel/courses/video/105103096/L01.html
5. http://www.digimat.in/nptel/courses/video/112103249/L36.html
6. https://ocw.mit.edu/ans7870/2/2.25/assignments/sec5/5-27/index.html

Assessment (Theory course)

SAI & SAII, Open Book Test, Learning Tasks (Concept Maps, Diagnostic Questions), (ESE).

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
Ms. Lakshmi R, Engineer – I, Technip FMC, Hyderabad	Dr. Krishnan K, Assistant Professor, Amrita Vishwa Vidyapeetham, Coimbatore	1. Ms.S.Rajalakshmi 2. Mr.KRP.Satheesh Kumar 3. Ms. Chitra 4. Dr. Prasanna Venkatesh R KCT	
Recommended by BoS on	05.05.2025		
Academic Council Approval	No:28	**Date**	26.06.2025

24CEI202	SOLID MECHANICS	L	T	P	J	C
		2	1	2	0	4
PC		SDG	9,11			

Pre-requisite courses	Engineering Mechanics	Code book	-

Course Objectives:

The purpose of taking this course is to:

1	Provide a comprehensive understanding of the stress-strain behavior of materials under various loading conditions.
2	Equip students with analytical skills required to construct and interpret shear force and bending moment diagrams for statically determinate beams.
3	Develop the ability to apply flexural and shear stress theories to real-world problems by determining stress distributions in beam cross-sections and calculating beam deflections.
4	Introduce various analytical methods for truss analysis.
5	Enable students to analyze torsional behavior of structural elements, including solid and hollow shafts.
6	Provide hands-on experience with standard laboratory testing and virtual simulations.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyze and evaluate axial stress-strain behavior in materials under various loading conditions, including thermal and impact loads	AN
CO 2	Construct shear force and bending moment diagrams for statically determinate beams and interpret the internal force distribution.	AN
CO 3	Apply flexural and shear stress theories to determine the stress distribution in beam cross-sections and compute beam deflections using analytical methods.	AN
CO 4	Analyze plane and space trusses using the method of joints, method of sections, and the tension coefficient method for both theoretical and practical applications.	AP
CO 5	Evaluate torsional behavior of solid and hollow shafts, assess combined loading conditions, and analyze the mechanical response of closed and open-coiled helical springs.	AN
CO 6	Perform material and structural tests using standard laboratory equipment and virtual simulations to interpret results and validate theoretical analysis.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative work	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2
1	3	3	3	3	3	2	1	2		1	3	3	3
2	3	3	3	3	3	2	1	2		2	3	3	2
3	3	3	3	3	3	2	1	1		1	3	3	3
4	3	3	3	2	3	2	1	2		2	3	3	2
5	3	3	3	3	3	3	1	2		2	3	3	2
6	3	3	3	3	3	3	1	2		3	3	3	3

Course Content

SIMPLE STRESSES AND STRAIN: **09 Hours**

Fundamentals of Stress and Strain- Stress-Strain relationships- Hooke's Law and

Elastic Constants - Strain Energy- Factor of Safety -Thermal stress analysis-Analysis of composite bars- 2D stress system- Mohr's Circle **Practical Component:** • Tension Test on Mild Steel Specimen/Cast iron specimens • Compression Test on Concrete / Wood / Cast Iron Specimen • Study of Mohr's Circle using strain rosette (Virtual Study)	**03 Hours**
SHEAR AND BENDING IN BEAMS Introduction to beam mechanics- Sign conventions and interpretation- Analysis of statically determinate beams - Construction of shear force and bending moment diagrams (SFD & BMD) for different loading conditions. **Practical Component:** • Indentation hardness test on metals	**09 Hours** **03 Hours**
FLEXURAL, SHEAR STRESSES AND DEFLECTION IN BEAMS Theory of simple bending- Stress Analysis in Beams- Shear and Bending Stress distribution at a cross section with different loading conditions- Deflection of determinate beams - Double integration method-Macaulay's methods- Area moment method- Conjugate beam method for the computations of slopes and deflections. **Practical Component:** • Bending Test on Simply Supported Beam/Cantilever Beam • Bending Stresses (Virtual Study)	**09 Hours** **03 Hours**
PLANE AND SPACE TRUSSES Fundamentals of Trusses- Analysis of Plane Trusses- Method of joints – Method of sections; Space truss – Tension Co-efficient Method **Practical Component:** • Model Making: Plane Truss (Pin jointed simply supported/Cantilever Truss)	**09 Hours** **03 Hours**
SHAFTS AND SPRINGS Elastic theory of torsion – Torsion in solid and hollow shafts- Combined loading on shafts- Strain energy in torsion- Modulus of rupture in torsion- Power transmission in shafts- Closed and open coiled helical springs **Practical Component:** • Torsion test on round mild steel/cast-iron rods • Tests on Helical Springs	**09 Hours** **03 Hours**

Theory Hours: 45	**Tutorial Hours: 0**	**Practical Hours: 15**	**Project Hours: 0**	**Total Hours: 60**

Learning Resources

Textbooks:

1. Popov, E.P., Engineering Mechanics of Solids, Prentice-Hall of India, New Delhi, 2009.
2. Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, Mechanics of Materials, Laxmi Publications (P) Ltd., New Delhi, 2017.
3. Bansal, R.K., Strength of Materials, 6th Edition, Laxmi Publications (P) Ltd., New Delhi, 2018.
4. Timoshenko, S., Gere, J.M., Mechanics of Materials, A&C Black, 2nd Edition, 2013.
5. Rajput, R.K., Strength of Materials: Mechanics of Solids, 4th Edition, S. Chand & Company Ltd., New Delhi, 2015.

Reference Books:

1. Ramamrutham, S., Narayan, R., Strength of Materials, Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2017.
2. Rattan, S.S., Strength of Materials, 3rd Edition, McGraw Hill Education (India) Pvt. Ltd., New Delhi, 2022.
3. Beer, F.P., Johnston, E.R., DeWolf, J.T., Mazurek, D.F., Mechanics of Materials, 8th Edition, McGraw Hill Education, New York, 2018.
4. Gere, J.M., Goodno, B.J., Mechanics of Materials, 8th Edition, Cengage Learning, Boston, 2012.
5. Shames, I.H., Pitarresi, J.M., Introduction to Solid Mechanics, 3rd Edition, Prentice Hall, New Jersey, 2000.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc23_me40/preview (Mechanics of Solids by Prof. C.S.

Shankar Ram, IIT Madras)
2. https://archive.nptel.ac.in/courses/112/105/112105234/ (Mechanics of Materials by Prof. S. K. Bhattacharyya, IIT Kharagpur)
3. https://ocw.mit.edu/courses/1-050-solid-mechanics-fall-2004/ (Solid Mechanics by Prof. Louis Bucciarelli, MIT Open Courseware)
4. https://www.youtube.com/playlist?list=PLrjkTql3jnm8ZtMKXZmAJxYzGZLEb4ESZ (Strength of Materials – Neso Academy YouTube Playlist)
5. https://www.youtube.com/playlist?list=PL3D11462114B62A4E (Mechanics of Materials by MIT – YouTube MIT OCW Lectures)
6. https://www.coursera.org/learn/mechanics-1 (Mechanics of Deformable Structures – École Polytechnique on Coursera)
7. https://www.edx.org/course/mechanics-of-materials-i-fundamentals-of-stress-strain-and-axial-loading (Mechanics of Materials I – Georgia Tech on edX)
8. .https://web.mit.edu/course/3/3.11/www/modules/mom.pdf (Mechanics of Materials – Free IT Textbook PDF by David Roylance)
9. https://www.khanacademy.org/science/physics/forces-newtons-laws (Basic Mechanics – Khan Academy Physics Section)
10. https://www.coursera.org/learn/solid-mechanics (Fundamentals of Solid Mechanics – Delft University of Technology on Coursera)

Assessment (Embedded course)
SA I, SA II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE), Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Mr. Kannan Sagadevan Manager Structural Engineer SOBHA GLAZING AND METAL WORKS PRIVATE LIMITED Bengaluru, Karnataka, India	Dr. D. Rajkumar Assistant Professor Civil Engineering Thiagarajar College Of Engineering Madurai, Tamilnadu, India		Mr.A.Vishnu Assistant Professor-II Civil Engineering Kumaraguru College of Technology Coimbatore, Tamilnadu, India
Recommended by BoS on	05/05/2025		
Academic Council Approval	No.28	**Date**	26/06/2025

24CEI203	Surveying	L	T	P	J	C
		3	0	2	0	4
PC		SDG	4,9,11,17			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Acquire fundamental knowledge of traditional and modern surveying techniques.
2	Develop technical skills for field data collection, analysis, and interpretation.
3	Implement surveying methods using advanced instruments like Total Station, GPS, and Drones.
4	Integrate photogrammetry, remote sensing, and GIS in surveying practices.
5	Build competency for handling real-time engineering survey projects for infrastructure development.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Understand the principles, measurements, and instruments of basic surveying.	U
CO 2	Perform levelling, traversing, and curve setting for site planning and execution.	AP
CO 3	Analyze surveying data and conduct hydrographic surveys using modern techniques.	AN
CO 4	Apply advanced field survey systems such as EDM, Total Station, and drones for precision surveying.	AP
CO 5	Integrate GPS, Photogrammetry, and Remote Sensing data for geospatial applications.	AP
CO 6	Execute engineering survey projects with best practices for sustainable and smart infrastructure.	AP

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative Team work	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2
1	3	2	1	1	1	1	1	1	1	1	2	3	2
2	3	3	3	2	3	1	1	2	1	1	2	3	2
3	3	3	3	3	2	1	1	2	1	1	2	3	2
4	3	2	2	3	3	1	1	2	1	2	2	3	2
5	3	2	2	2	3	1	1	2	1	2	2	3	3
6	3	2	3	3	3	2	2	2	2	3	2	3	3

Course Content	
FUNDAMENTALS OF SURVEYING • Principles of Surveying – Linear measurements – Ranging and Chaining – Error corrections – Chain and Compass Surveying. • Levelling: Fly levelling, Check levelling – Contours – Area and Volume Calculations. **Practical Component:**	**9 Hours**

• Setting out foundation by chaining and ranging. • Levelling to determine reduced levels.	**6 Hours**
THEODOLITE AND TACHEOMETRY SURVEYING • Theodolite Surveying: Measurement of angles (horizontal and vertical), Traversing. • Tacheometry: Stadia method, Tangential method – Height and Distance measurement. • Control Surveys and Triangulation. **Practical Component:** • Measurement of horizontal angles using repetition and reiteration. • Determination of gradient using tacheometric surveying.	**9 Hours** **6 Hours**
CURVES AND HYDROGRAPHIC SURVEYING • Simple curves, Compound curves, Reverse curves, Transition and Vertical curves – Setting out methods. • Hydrographic Surveying: Tides – Mean Sea Level – Sounding methods – Three-point problem. **Practical Component:** • Setting out of simple curve (right or left handed). • Conducting hydrographic survey simulation exercises.	**9 Hours** **6 Hours**
MODERN FIELD SURVEY SYSTEMS • Principles of Electronic Distance Measurement (EDM). • Total Station: Components, Accessories, Field procedures, Error corrections, Care and Maintenance. • Introduction to Drone Surveying: Types of drones, Applications in Surveying. **Practical Component:** • Area determination using Total Station. • Height and distance measurement using Single plane and Double plane methods.	**9 Hours** **6 Hours**
GPS, PHOTOGRAMMETRY AND GIS APPLICATIONS • GPS Surveying: Segments, Satellite Configuration, Signal structure, Orbit determination. • Types of GPS Receivers: Handheld and Geodetic. • Introduction to Photogrammetry and Remote Sensing. • Introduction to GIS Applications in Surveying. **Practical Component:** • Marking column points using Total Station and GPS. • Geospatial data collection using basic mobile GIS applications.	**9 Hours** **6 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**30**	**Project Hours:**	**0**	**Total Hours:**	**75**

Learning Resources

Textbooks:

1. Punmia, B.C., Jain, A.K., Jain, A.K., Surveying Vol I and II, Laxmi Publications, New Delhi (2016).
2. Duggal, S.K., Surveying Vol I and II, McGraw Hill Education, New Delhi (2013).

References:

1. Basak, N.N., Surveying and Levelling, Tata McGraw-Hill Education (2014).
2. Madhu, N., Sathish Kumar, R., Satheesh Gopi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India (2017).
3. Arora, Manoj K., Badjatia, Geomatics Engineering, Nem Chand & Bros (2011).
4. Reddy, Anji M., Remote Sensing and Geographical Information Systems, B.S. Publications (2012).

Online Resources (Weblinks)

1. https://www.udemy.com/course/surveying/
2. https://www.teacheron.com/online-surveying-tutors
3. https://archive.nptel.ac.in/courses/105/104/105104101/

Assessment (Embedded course)

SA I and SA II, Open Book Test, Learning Tasks (Concept Maps, Diagnostic Questions), End Semester Examination (ESE), Lab Workbook, Experimental Cycle tests, viva-voce.

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution		Internal Expert(s)
Mr. V. Saravanan, Assistant Director, PA to Collector, District Survey Office, Coimbatore.	Dr Srinivasa Raju Kolanuvada, Professor, Department of Civil Engineering, Anna University (CEG), Chennai.		Mr. J. Viswanath Ms. S. Anita Mr. A. Aswin Bharath KCT
Recommended by BoS on	05/05/2025		
Academic Council Approval	No:28	**Date**	26/06/2025

24CEP204 ES	BUILDING INFORMATION MODELING LAB	L	T	P	J	C
		0	0	4	0	2
		SDG	4,9 ,11,17			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Impart foundational knowledge of 2D drafting principles and conventions used in civil engineering drawings.
2	Develop hands-on skills in creating accurate 2D plans, sections, and elevations using AutoCAD for different building types.
3	Introducing students to Building Information Modelling (BIM) concepts and their applications in architectural, structural, and MEP modelling.
4	Enable students to create, edit, and manage 3D parametric models using BIM software like Revit, focusing on real-world construction scenarios.
5	Build competency in generating presentation-ready outputs, including detailed drawings, 3D views, and walkthroughs from BIM models for design communication.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply AutoCAD tools to create 2D architectural and civil engineering drawings for various building types.	AP
CO 2	Develop parametric 3D BIM models including architectural, structural, and MEP elements using Revit.	AP
CO 3	Create annotated documentation, sheets, and visualization outputs from BIM models for project communication.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative Team work	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2
1	3	2	3	1	3	1	1	2	2	2	2	3	2
2	3	2	3	1	3	1	1	2	2	2	2	3	3
3	2	1	3	1	3	2	1	3	3	3	2	3	2

Course Content	
2D MODELLING **Practical Component:** • Introduction to CAD: Interface, Layers, Units, Drafting Settings, and Tools • 2D Plan, Section, and Elevation of a Simple Residential Building • Creation of standard blocks: Doors, Windows, Staircases, Furniture Layouts • 2D Working Drawings for an Office Building: Floor plan with furniture and HVAC layout • 2D Drafting of a Commercial Building (e.g., shopping complex) with multiple rooms and service zones • Layout Preparation and Plotting: Creating drawing sheets with title blocks,	**30 Hours**

dimensions, hatching, legends	
3D BIM Modelling **Practical Component:** 1. Introduction to BIM, Revit Interface, Levels, Grids, and Project Setup 2. Basic 3D Modelling: Walls, Doors, Windows for a Residential House 3. Modelling of Floors, Roofs, and Staircases (parametric control) 4. Curtain Walls, Wall Openings, Railings, and Architectural Detailing 5. 3D Modelling of an Office Building: Multi-story design with lobby and workspaces 6. Family Creation: Custom doors, windows, furniture, equipment 7. Structural Elements: Beams, Columns, Slabs, Footings (in model form only) 8. MEP Elements: Plumbing layout, basic ducting and lighting for commercial spaces 9. Annotations, Callouts, Legends, and View Templates 10. Complete 3D BIM model of a Commercial Building, including rendering and sheet creation	**30 Hours**

Theory Hours:	**0**	**Tutorial Hours:**	**0**	**Practical Hours:**	**60**	**Project Hours:**	**0**	**Total Hours:**	60

Learning Resources

Textbooks:

1. Krygiel, Eddy., Mastering Autodesk Revit 2021, Wiley, Indianapolis (2021).
2. Omura, George., AutoCAD 2021 for Beginners, BPB Publications, New Delhi (2021).

References:

1. Eastman, Chuck., BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers, Wiley, New Jersey (2018).
2. Smith, Dana K., "BIM in Civil Engineering Practice," BIM Handbook, Wiley, New Jersey (2018): pp. 245–267.
3. Kymmell, Willem., "Building Information Modeling: Planning and Managing Construction Projects with 4D CAD and Simulations," SDC Publications, Kansas City, MO, USA. (2016). DOI: 10.1002/9781119287537
4. Hergunsel, Mehmet F., "Benefits of Building Information Modeling for Construction Managers," Technical Report No. CM-2011-103, Worcester Polytechnic Institute, Worcester, MA, USA. (2011).
5. Azhar, Salman., "Building Information Modeling (BIM): Trends, Benefits, Risks, and Challenges," Architectural Engineering and Design Management, Vol. 6 No. 3 (2011): pp. 240–252, DOI: 10.3763/aedm.2010.0117, Link
6. Arayici, Yusuf., "Towards Implementation of BIM in the UK Construction Industry," Proceedings of CIB W78 Conference, Paper #37: pp. 51–62, Sophia Antipolis, France, October 26–29, 2009., DOI: 10.1109/ICCRE.2009.37,

Online Resources (Weblinks)

1. https://nptel.ac.in/courses/106105171
2. https://swayam.gov.in/nd1_noc19_cs42/preview
3. https://www.coursera.org/learn/fundamentals-of-bim
4. https://www.linkedin.com/learning/learning-autodesk-revit
5. https://www.udemy.com/course/mastering-building-information-modeling-bim-in-revit

Assessment (Practical course)

Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr. P. Ravikumar MD, Infinity PMC solutions Pvt Ltd	Dr. Jyoti Singh at RICS School of Built Environment, Amity University	1. Dr.P.A.Prabakaran 2. Mr. A. Aswin Barath 3. Ms.U.Sindhu Vaardini KCT
Recommended by BoS on	05.05.2025	

Academic Council Approval	No.28	**Date**	26.06.2025

SEMESTER IV

24HSP006	Mastering Group Discussion and Presentation Skills	L	T	P	J	C
		0	0	2	0	1
Practical		SDG	4&8			

Pre-requisite courses	-	Data Book / Codes / Standards (If any)	-

Course Objectives:	The purpose of taking this course is to:
1	To equip learners with techniques for organizing and presenting ideas effectively, ensuring logical flow and engaging delivery through appropriate visual and verbal strategies.
2	To enhance students' ability to evaluate diverse viewpoints and articulate reasoned arguments, fostering meaningful participation in collaborative discussions.
3	To strengthen students' ability to adapt their speaking style and content to different audiences and contexts, utilizing digital tools for enhanced presentation effectiveness.

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Create and deliver structured presentations with a clear introduction, body, and conclusion, utilizing effective visual tools and appropriate pacing to enhance clarity and impact.	C
CO 2	Analyse issues from multiple perspectives, articulate ideas effectively within group discussions	An
CO 3	Deliver confident presentations and speeches in professional and social settings, leveraging digital tools and technologies to enhance quality and effectiveness.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1		2			1	2		3	3		3			
2		2			1	2		3	3		3			
3		2			1	2		3	3		3			

Course Content	
MODULE 1 **Introduction to Group** Discussions - Key skills for effective participation - Phases in a GD - Conversational Phrases in GD. **Group Dynamics** - Understanding group roles and dynamics - Conflict resolution and management in groups - Techniques for fostering collaboration. **Presentations** - Introduction to Visual Aids and Technology in Presentations.	**6 Hours**

Delivery Techniques - Voice modulation and speech clarity - Body language and gestures – audience analysis. **Handling Q&A Sessions** - Preparing for audience questions - Techniques for handling difficult questions - Mock Presentation with Q&A sessions.	
MODULE 2 **Factual Group Discussions**: Focus on sharing and verifying accurate information on a given topic. Participants base their contributions on verifiable data and concrete evidence. **Opinion-based / Argumentative Group Discussion**: Encourages participants to express and defend their point of view on a topic. Evaluate different perspectives and build critical thinking skills.	**6 Hours**
MODULE 3 **Case Study Group Discussion**: Involves analyzing the complexities, identifying key issues, and developing insights or solutions based on the group's collective knowledge. **Abstract Discussion**: Deals with intangible concepts, ideas, or themes without concrete reference points. Encourages creative thinking and theoretical exploration.	**6 Hours**
MODULE 4 **Impromptu Presentations**: Participants speak on a given topic with little to no preparation. Helps develop quick thinking and effective communication skills. **Informative Presentation**: Aims to educate the audience on a specific topic by providing clear, factual information. The focus is on clarity, accuracy, and comprehensiveness. **Demonstrative Presentation**: Interactive sessions where participants engage in hands-on activities to learn practical skills. Often includes exercises, demonstrations, and collaborative tasks.	**6 Hours**
MODULE 5 **Training and Technical Presentation**: Designed to teach specific technical skills or procedures. Includes detailed instructions, demonstrations, and may involve technical jargon. **Academic Presentation**: Involves presenting research findings or theoretical concepts in an academic setting. Emphasizes clarity, evidence-based arguments, and adherence to scholarly standards. **Pitch Presentation:** A concise, persuasive presentation aimed at securing support, investment, or approval. Focuses on the value proposition, potential benefits, and unique selling points. **Persuasive Presentation**: Seeks to convince the audience to adopt a particular viewpoint or take a specific action. Utilizes logical arguments, emotional appeals, and credible evidence. **Multimedia Presentations**: Uses visual and auditory media to convey information and present arguments. Enhances engagement and aids in illustrating complex concepts.	**6 Hours**

Theory Hours:	-	Tutorial Hours:	-	Practical Hours:	2	Project Hours:	-	Total Hours:	30

Learning Resources*

Reference books/ Web Links

1. Powell, M. (2010). Dynamic presentations student's book with audio CDs (2). Cambridge University Press.
2. Reynolds, G. (2011). Presentation Zen: Simple ideas on presentation design and delivery. New Riders.
3. Galanes, G. J., Adams, K., & Brilhart, J. K. (2020). Effective group discussion: Theory and practice (15th ed.). McGraw-Hill Education.
4. Adams, K., & Galanes, G. (2018). Communicating in groups: Applications and skills, a practical guide (18th ed.). McGraw-Hill Education.
5. Ivy, D. K., & Backlund, P. (2018). Speak with confidence: A practical guide. Pearson.
6. Reynolds, G. (2019). Presentation Zen: Simple ideas on presentation design and delivery. New Riders.

Online Resources

1. https://www.coursera.org/learn/verbal-communications-and-presentation-skills
2. https://www.coursera.org/learn/present-with-purpose
3. https://www.coursera.org/learn/teamwork-skills-effective-communication

Assessment	
Formative	Summative
-----	1. Participation in group discussions (40%) 2. Individual presentations (40%) 3. Quizzes and written assignments (20%)

Course Curated By

Expert(s) from Industry	Expert(s) from Higher Education Institutions	Internal Expert(s)
Mr. Bhuvana Sundar Soorappaiah Program Manager Bosch, Coimbatore	Dr Kishore Selva Babu Head and Associate Professor Department of English and Cultural Studies Christ University Bangalore-560029	Dr. J Srikala- AP III Dr. C Tissaa Tony - AP III Dr. S G Mohanraj – AP III Dr. S Sreejan – AP III Dr. R Hema – AP II Dr. A S Mythili - AP II

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	BOS **25.04.2025**

24MAI241	APPLIED NUMERICAL METHODS AND PROBABILITY FOR ENGINEERS (Common to AE, AU, CE, ME, MC)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	8, 9			

Pre-requisite courses	Partial differential equations	Data Book / Codes books (If any)	Normal table

Course Objectives:

The purpose of taking this course is to:

1	to solve algebraic and transcendental equations where analytical solutions are impractical or impossible.
2	**develop the ability to solve engineering problems** and other real-world applications using interpolation and integration methods for both data analysis and numerical solutions.
3	**critically analyse the performance** of different numerical methods in terms of accuracy, stability, and computational efficiency for solving PDEs in practical engineering applications.
4	**apply probability theory to model and solve real-world problems** involving uncertainty, risk analysis, and decision-making in engineering, business, and science.
5	**to study and apply standard probability distributions**, with emphasis on the Poisson and Normal distributions, including their properties, applications, and parameter interpretation.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	develop algorithmic and computational skills to implement these numerical techniques using programming or mathematical tools.	Ap
CO 2	analyse and compare the **accuracy and efficiency** of various interpolation and integration techniques in solving real-world numerical problems.	An
CO 3	implement numerical schemes and compute approximate solutions for both heat and wave equations using finite difference methods.	Ap
CO 4	implement and simulate the solution of 2D Laplace and Poisson equations using numerical algorithms on rectangular domains.	Ap
CO 5	analyse and model real-world problems involving uncertainty using fundamental probability concepts.	An
CO 6	interpret and use distribution-related concepts in statistical modelling and data analysis.	An

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2										1			
2	2										1			
3	2										2			
4	3	2									2			
5	3	2			2						2			
6	3	2			2						2			

Course Content

NUMERICAL SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS Linear interpolation method-Newton's method –Solution of linear system in engineering field by Gaussian elimination, Gauss Jordan method - Iterative method: Gauss Seidel method – Inverse of a matrix by Gauss Jordan method. **Practical Component** • Gauss Elimination & Inverse by Gauss Jordan method • Newton Raphson method.	**9 Hours** **6 Hours**
INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION Newton's forward, backward and divided difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal and Simpson's rules(single integration) **Practical Component** • Newtons divided difference interpolation • Numerical integration by Simpsons rule	**9 Hours** **6 Hours**
SOLUTION OF BOUNDARY VALUE PROBLEMS Solution of one dimensional heat equation using Bender Schmidt difference scheme –Solution of one dimensional wave equation by explicit scheme. Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain. **Practical Component** • Solution of one dimensional heat equation using Bender Schmidt method Solution of one dimensional wave equation by explicit scheme	**9 Hours** **6 Hours**
PROBABILITY THEORY Axioms of probability - Conditional probability – Total probability – Bayes' theorem • Introduction to R Programming • **Probability and Bayes' Theorem in R programming**,	**9 Hours** **6 Hours**
RANDOM VARIABLES Random variable – Distribution function – properties – Probability mass function-Probability density function –Poisson and Normal distributions – Properties. **Practical Component** • . Application of Poisson distribution • Application of normal distribution	**9 Hours** **6 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 75

Learning Resources

Textbooks

1. Steven C. Chapra and Raymond P. Canale., Numerical Methods for Engineers with Programming and Software Applications., McGraw-Hill, 7th Edition (2021).
2. Johnson R.A., Miller I and Freund J., Miller and Freund's Probability and Statistics for Engineers., PearsonEducation, Asia 8th Edition (2015).

Reference books

1. Numerical Methods for Scientific and Engineering Computation by M.K. Jain, S.R.K.Iyengar and R.K. Jain, New Age International Publishers 2019.
2. Gupta S.C and Kapoor V.K, "Fundamentals of Mathematical Statistics", 11th extensively revised edition, Sultan Chand & Sons, 2020.
3. Conte S.D and Carl de Boor., Elementary Numerical Analysis - An Algorithmic Approach., McGraw-Hill (2018)
4. John H. Mathews and Kurtis D. Fink., Numerical Methods using MATLAB, Prentice Hall of India,4th Edition (2021).

Online Resources (Web Links)

1. https://nptel.ac.in/courses/111106101 2. https//nptel.ac.in/courses/111105041

Assessment	
Formative	Summative
Assignments-Open Book Test/Quiz/Case Study Analysis/Group Presentation/Poster Preparation/Mathematical Models, etc.,	CQ, CAT- I, CAT – II and End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
1. Dr. R VASU Business Excellence and Management Systems Consultant Specialisation in Process Excellence, Six Sigma Quality, Health Safety & Environment Systems Vice President (Retired) Brakes India.	Dr. M. Sivakumar Assistant Professor Sr. Grade Vellore Institute of Technology, Vellore Dr. Ramesh Babu Assistant Professor (SG) Amrita University Coimbatore, Tamil Nadu.		Dr. S. Meena Priyadarshini
Recommended by BoS on	25.4.2025		
Academic Council Approval		**Date**	

24INM202	ENVIRONMENTAL SCIENCE AND SUSTAINABILITY (Common to All Branches)	L	T	P	J	C
		1	0	2	0	2
HS		SDG	6, 13, 15			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	To introduce the importance, types, and conservation strategies of natural resources, with a focus on sustainable practices in water and food management.
2	To understand the structure and function of ecosystems and biodiversity, and explore the need for conservation through the study of hotspots and global environmental concerns.
3	To examine the causes and effects of environmental degradation, including pollution and waste management, and to promote mitigation strategies for sustainable development.
4	To provide knowledge of the legal and institutional frameworks for environmental protection in India and globally, including critical environmental acts and enforcement challenges.
5	To explore conventional and alternative energy resources, and to assess methods for energy conservation and carbon footprint reduction through audits and sustainability measures.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Apply the concept of natural resource conservation to demonstrate sustainable practices	Ap
CO2	Analyse the structure, function, and adaptive capacity of ecosystems to categorize threats and conservation strategies for biodiversity.	An
CO3	Analyse various forms of environmental degradation and propose management and preventive solutions.	An
CO4	Apply national environmental laws and frameworks in the personal and professional contexts	Ap
CO5	Design strategies using renewable energy principles to develop sustainable energy utilization plans through audits and footprint analysis to transfer a healthy environment for future generations.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2	–	–	–	–	2	3	–	1	–	–	2	–	–
2	2	2	–	–	–	2	3	1	–	–	–	2	2	–
3	2	3	–	2	–	3	3	1	–	–	–	2	3	–

4	–	2	–	–	–	3	3	3	1	2	2	–	2	–
5	2	2	3	2	2	3	3	–	1	2	2	2	2	3

Course Content	
NATURAL RESOURCES **Introduction to Natural resources :** Types, significance, and conservation strategies **Water resources:** Utilization, management practices, and conservation strategies - rainwater harvesting methods.– Water distribution system audit **Food resources:** Challenges of food security in India - impact of modern agriculture, and environmental concerns related to fertilizers and pesticides. **Practical Component:** • Parameter Testing : Water / Effluent / Soil/Fertiliser • Simulation Experiments • Online Course	**3 Hours** **10 Hours**
ECOSYSTEM AND BIODIVERSITY **Ecosystem:** Structure and function of an ecosystem- ecosystem resilience and adaptive capacity **Biodiversity:** Values of biodiversity - Hot Spot of biodiversity (in the Himalayas, the Western Ghats, the Indo-Burma region, and the Gulf of Mannar) - Threats to biodiversity. **Conservation Strategies:** Emerging Issues in Biodiversity Conservation - Citizen science - In-situ and Ex-situ conservation of biodiversity. **Practical Component:** • Documentation of biodiversity in the campus	**3 Hours** **Hours**
ENVIRONMENTAL DEGRADATION AND MANAGEMENT **Pollution**: Causes, effects and control measures of Air pollution, Water pollution - Role of an individual in prevention of pollution **Waste management**: Circular Economy vs. Linear Economy - Disposal of solid wastes - Treatment of Liquid wastes **Disaster Management**: Mitigation strategies and Readiness **Practical Component:** • Waste Management and Resource recovery in Campus • Documentation of Environmental Data Resources and Monitoring Tools.	**3 Hours** **6 Hours**
LEGAL FRAMEWORK FOR ENVIRONMENTAL PROTECTION IN INDIA **Global and National Initiatives**: United Nations Sustainable Development Goals - Coastal Regulation Zone - Environmental impact assessment **Environmental Legislation in India**: Key Legal and Regulatory Terminology in India – Valuation of Ecosystem Services and integration of Acts in the workplace - Plastic Waste Management Rules - E-Waste Management Rules - Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act **Implementation Challenges**: Issues involved in enforcement of environmental legislation **Practical Component:** • Online Course	**3 Hours** **2 Hours**

ENERGY MANAGEMENT **Energy Resources:** Energy Demand and Urban energy Challenges - Necessity of alternate energy methods - Renewable and Non- renewable energy resources - Carbon footprint and carbon credit – Sustainable energy utilization – Case study **Energy Audits** – Purpose, methodology, and common instruments used **Practical Component**: • Documentation of Energy usage through Carbon footprint calculation - Personal as well as Institutional	**3 Hours** **6 Hours**

Theory Hours: 15	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 45

Learning Resources

References:

1. Bharucha, E. (2021). Textbook of environmental studies for undergraduate courses (3rd ed.). Orient BlackSwan / Universities Press - Hyderabad, India.
2. Miller, G. T., & Spoolman, S. E. (2014). Environmental science (14th ed.). Cengage India
3. Anubha Kaushik & C.P. Kaushik (2024). Perspectives in Environmental Studies (8th ed.). New Age International Publishers, New Delhi.
4. Masters, G. M., & Ela, W. P. (2013). Introduction to environmental engineering and science (3rd ed.). Pearson Education, New Delhi.
5. Leelakrishnan, P. (2018). Environmental law in India (3rd ed.). LexisNexis Butterworths, New Delhi.
6. Botkin, D. B., & Keller, E. A. (2014). Environmental science: Earth as a living planet (9th ed.). Wiley, Hoboken, NJ.
7. Armstrong, J. (2023). The future of energy: The 2023 guide to the energy transition. Independently published.
8. Easton, T. (Ed.). (2017). Taking sides: Clashing views on environmental issues (17th ed.). McGraw-Hill Education, New York, NY.
9. Ishwaran, N. (2022). Ecosystem services and economic valuation. New Delhi: TERI Press.

Online Resources (Weblinks)

https://www.youtube.com/watch?v=j4Z6WmTnhRQ How to Conduct a Water Audit in Institutions

- https://www.youtube.com/watch?v=_OKYio2Yk9U India's Food Security Challenge
- https://www.youtube.com/watch?v=IjNT9Z2OLf4 India's Biodiversity Hotspots
- https://www.youtube.com/watch?v=_c_sJIEJY4M What is Citizen Science?
- https://www.youtube.com/watch?v=1HZR3GyzFZc What is a Circular Economy
- https://www.youtube.com/watch?v=6_tLYyR_3Vo Environmental Law and Acts in India
- https://www.youtube.com/watch?v=kGcrYkHwE80 Introduction to SDGs
- https://www.youtube.com/watch?v=V__eNSHdChA Conducting an Energy Audit
- https://www.youtube.com/watch?v=dUqTt5Qrxn8 - What is Your Carbon Footprint?

Assessment (Embedded course)

CAT, Activity and Learning Task(s), MCQ, End Semester Examination (ESE)
Lab Workbook, Report Submission

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Dr. Muthuraja Perumal General Manager - Research & Development Rohith Industries, APIIC Industrial Park, Andhra Pradesh	Dr. Mathivanan Packiarajan University of Michigan Ann Arbor, MI USA Dr. Venkatakrishnan Professor, School of Chemical Sciences Indian Institute of Technology (Mandi) Himachal Pradesh India		Faculty Of Chemistry Department of Chemistry
Recommended by BoS on			
Academic Council Approval	No.	**Date**	

24INM102	Indian Knowledge Systems in Science and Engineering (CommontoAll branches)	L	T	P	J	C
		1	0	0	0	1
HS		SDG	5,16			

Pre-requisite courses	_	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Explore the Role of Traditional Knowledge in Basic Scientific Concepts
2	Know the science behind the establishment of traditional architecture
3	Revive ancient Indian aerospace, metallurgy and navigation technologies
4	Revitalize ancient textile traditions through sustainable practices, promoting eco- friendly materials
5	Explore and integrate ancient Indian medical systems like Ayurveda, Siddha & Rasa Shastra

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	understanding Indigenous Knowledge Systems (IKS) in Science and Technology	U
CO 2	apply Traditional Design Principles in Civil Engineering	Ap
CO 3	explore of Ancient Aerospace Technologies for Aeronautical Engineering	E
CO 4	know the sustainable traditional textile practices for ecofriendly atmosphere	R
CO 5	gain knowledge of Ancient Medical Practices for Biotechnologists	U

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative Team work	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2	2	2	2	1	2	3	1	2	1	3			
2	2	2	2	2	1	2	2	1	2	1	3			
3	2	2	2	2	1	2	2	1	2	1	3			
4	2	2	2	2	1	2	2	1	2	1	3			
5	2	2	2	2	1	2	2	1	2	1	3			

Course Content

IKS in Basic Sciences Study of ancient Indian concepts such as atomism (paramāṇu)- the five elements (Panchabhūta)- Exploration of alchemical practices, metallurgy-development of zero, decimal systems, algebra, and trigonometry - works by scholars such as Brahmagupta and Aryabhata- detailing planetary motions and timekeeping systems.	**3 hours**
IKS in Civil Engineering Evolution from rock-cut caves to grand temples like Madurai Meenakshi and Brihadeeswarar.- Vastu Shastra- The Concept of "Mandala- Courtyard Design- Sacred Geometry- Panchabhuta- Chhatri- dome-shaped canopy- Prana Vayu- Shilpa Shastra- Sthapatya Veda- Kaalchakra- Brahmasthan.	**3 hours**

IKS in Mechanical Engineering Exploration of ancient metallurgical techniques-including ore extraction-alloying, furnace design-Vimana (Flying Machines) - Shakti (Energy Source) -Aerospace materials- Vimana Shapes -Ancient Navigation- Vedic Astronomy- Flight Principles in Nature- Matrika Systems- Indian shipbuilding techniques and navigation methods.	**3 hours**
IKS in Textile technology Introduction to Ancient Indian Textiles- Cultural and Historical Context -Traditional Dyeing Techniques-Weaving Techniques and Patterns-Khadi- -Natural Fibers and Materials-Cotton,Silk,Wool and Jute-Sustainable Practices and Eco-Friendly Technologies-Organic Cotton Farming-Recycling and Repurposing.	**3 hours**
IKS in medicine Ayurveda- Siddha Medicine- Rasa Shastra- Herbal Medicine- Nadi Pariksha- Chikitsa- Yoga and Pranayama- Surgical Techniques -Charaka Samhita - Sushruta Samhita— Panchagavya usage-Medicinal Plants and Herbal Remedies-Agricultural Practices and Crop Diversity-Sacred and Ritual Plants.	**3 hours**

Theory Hours: 15	**Tutorial Hours: 0**	**Practical Hours: 0**	**Project Hours: 0**	**Total Hours: 15**

Learning Resources

Textbooks:

1. Indian Knowledge Systems: A Sustainable Approach: The Science of Self-Healing" by Vasant Lad, Excel India Publisher, 2024.
2. Indigenous Knowledge Systems: Towards a Holistic Inclusive Conservation, Satarupa Dutta Majumder, Manohar Publishers & Distributors, 2019.

References:

1. Indian Knowledge System: Integrating Heritage with Engineering, Gagan Bansal, Deep Science Publishing, 2025

Online Resources (Weblinks)

www.deepscienceresearch.com/dsr/catalog/book/70

Assessment (Theory course)

Presentation, MCQ, Assignment, Case Study and E Chart.

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
	Dr K Sangeetha, Professor and Head-Textile Department, IKS-Nodal officer, Bharathiar University,Coimbatore-46.	Dr.R.Prakasam, AssistantProfessor, Department of Physics. Capt-A.R.Arul, Assistant Professor, Department of Physics
Recommended by BoS on	25-04-2025	
Academic Council Approval		**Date** 26-06-2025

24CEP206	FLUID MECHANICS LAB	L	T	P	J	C
		0	0	2	0	1
Professional Core		SDG	6,7,9,11			

Pre-requisite courses	24CET201	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	To experimentally verify the fundamental principles of fluid mechanics.
2	To familiarize students with various flow measurement devices and techniques.
3	To analyze the performance characteristics of hydraulic machines such as pumps and turbines.
4	To enable basic exposure to flow simulation tools used in engineering practice.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply fundamental principles to analyze fluid flow systems	Ap
CO 2	Calibrate and use various flow measurement devices.	Ap
CO 3	Evaluate the performance of different types of pumps and turbines	An

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	3	1	3	1	1	2	2	2	2	3	2
2	3	2	3	1	3	1	1	2	2	2	2	3	3
3	2	1	3	1	3	2	1	3	3	3	2	3	2

Course Content	
Practical Component: **Flow Measurement** • Determine the coefficient of discharge and compare theoretical vs actual flow using a venturimeter. • Determine the coefficient of discharge and compare theoretical vs actual	**30 Hours**

flow using a Orificemeter. • Determination of velocity using Pitot Tube. • Measure flow rate over v-notch and determine its coefficient of discharge **Losses in Pipes** • Measure the frictional losses in pipes and determine the Darcy-Weisbach friction factor. • Evaluate head losses and loss coefficients in various pipe components **Laminar and Turbulent Flow** • Determine Reynolds number and Visualize the flow behaviour. **Hydraulic Machines** • Analyze the performance characteristics of a Pelton wheel turbine. • Study the performance characteristics of reaction turbine (Kaplan or Francis). • Determine the efficiency and plot the characteristic curves of centrifugal pump. • Determine the efficiency and plot the characteristic curves of reciprocating pump. **Computational Fluid Dynamics** • CFD simulation of laminar pipe flow using OpenFOAM or ANSYS Fluent.	

Theory Hours:	**0**	**Tutorial Hours:**	**0**	**Practical Hours:**	**30**	**Project Hours:**	**0**	**Total Hours:**	**30**

Learning Resources

Textbooks:

1. Modi, P.N., and Seth, S.M., Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 2017.
2. Fox, R.W., McDonald, A.T., and Pritchard, P.J., Introduction to Fluid Mechanics, Wiley, 2020.

References:

1. White, F.M., Fluid Mechanics, McGraw-Hill Education, 2015.
2. Hydraulic Laboratory Manual, Centre for Water Resources, Anna University, 2015.
3. Anil W. Date, "Introduction to Computational Fluid Dynamics", Cambridge University Press

Online Educational Resources:

1. https://fmc-nitk.vlabs.ac.in/List%20of%20experiments.html
2. https://doc.cfd.direct/openfoam/user-guide/
3. https://elearn.nptel.ac.in/shop/masterclasss-workshops/masterclass-series-closed/introduction-to-cfd-using-openfoam/

Assessment (Practical course)

Lab Workbook, Experimental Cycle tests, viva-voce, etc…

*** Course Curated by**

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Er.M.H.Salman Farish, Assistant Engineer Chennai Metropolitan Water Supply & Sewerage Board, Chennai	**Danish D R** Senior Project Scientist Global Water and Climate Adaptation Centre Aachen - Bangkok - Chennai -	1. Ms.S.Rajalakshmi / 2. Mr.KRP.Satheesh Kumar AP/Civil KCT

	Dresden (ABCD Centre) Department of Ocean Engineering Indian Institute of Technology Madras, Chennai- 600 036		
Recommended by BoS on	05/12/2025		
Academic Council Approval	No.	**Date**	14/11/2025

24CEI207	Remote Sensing and Geographic Information Systems	L	T	P	J	C
		2	0	2	0	3
PC		SDG	9,11			

Pre-requisite courses	24CEI203	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the fundamental principles of remote sensing and the electromagnetic spectrum as it relates to Earth observation.
2	Familiarize with various satellite platforms, sensors, and image acquisition techniques used in environmental and civil engineering studies.
3	Develop skills in interpreting and analyzing satellite imagery using visual and digital image processing methods.
4	Gain proficiency in using GIS software to manage, analyze, and visualize spatial and attribute data
5	Apply knowledge of remote sensing and GIS to real-world civil engineering problems such as land use planning, infrastructure development, and environmental monitoring

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Understand and explain the fundamental principles of remote sensing, including electromagnetic spectrum interactions and the characteristics of various natural surfaces.	U
CO 2	Classify and analyze the types of sensors and satellite platforms and evaluate their suitability for specific Earth observation applications.	An
CO 3	Apply digital image processing techniques for image enhancement, classification, and interpretation using both supervised and unsupervised methods.	Ap
CO 4	Demonstrate the ability to use Geographic Information Systems (GIS) software tools to digitize, manage, and analyze spatial and non-spatial data.	Ap
CO 5	Perform integrated data analysis using GIS models, apply raster and vector data processing, and use GIS for solving civil engineering problems.	C
CO 6	Apply practical skills in map digitization, database integration, spatial data visualization, and layout preparation using industry-standard GIS and remote sensing software.	E

Co	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)
	1	2	3	4	5	6	7	8	9	10	11	

	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	2	1	1	1	1	1	1	1	1	2	3	2	1
2	3	3	3	2	3	1	1	2	2	1	2	3	2	1
3	3	3	3	3	2	1	1	2	2	1	2	3	2	1
4	3	2	2	3	3	1	1	2	2	2	2	3	2	1
5	3	2	2	2	3	1	1	2	2	2	2	3	3	1
6	3	2	2	2	3	1	1	2	2	1	2	3	3	1

Course Content	
MODULE 1: INTRODUCTION TO REMOTE SENSING Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions important to remote sensing – Wave theory, Particle theory, Stefan- Boltzmann and Wein's Displacement Law – Atmospheric scattering, absorption – Atmospheric windows.Spectral signature concepts –typical spectral reflective characteristics of water, vegetation and soil **Practical Component:** Projection, Re-projection and Coordinate Transformation of Maps.	**9 Hours** **3 Hours**
MODULE 2: PLATFORMS AND SENSORS Types of platforms – orbit types, Sun- synchronous and Geosynchronous Passive and Active sensors – resolution concept. Pay load description of important Earth Resources and Meteorological satellites – Airborne and space borne TIR and microwave sensors. **Practical Component:** Data Input – Onscreen Digitisation – Creation of Point, Line and Polygon layers. Linking External Database and Tabular Data Analysis using SQL commands	**9 Hours** **3 Hours**
MODULE 3: IMAGE INTERPRETATION AND ANALYSIS Types of Data Products – types of image interpretation- basic elements of image interpretation- visual interpretation keys. Digital image processing – Pre-processing – image enhancement techniques – multispectral image classification – supervised and unsupervised. **Practical Component:** • Attribute data input and Measurement of Distance, Area • Supervised and Unsupervised Image Classification	**9 Hours** **3 Hours**
MODULE 4: GEOGRAPHIC INFORMATION SYSTEM Introduction – Maps- Definitions – Map projections – types of map projections – map analysis GIS definition – basic components of GIS – standard GIS software.Data type – Spatial and non-spatial (attribute) data – measurement scales- Data base Management Systems (DBMS).	**9 Hours** **3 Hours**

Practical Component: • Generating Graphs, Charts and Diagrams from Tabular data	
MODULE 5: DATA ANALYSIS Data type – Spatial and non-spatial (attribute) data – measurement scales- Data base Management Systems (DBMS). Application of GIS in highway- alignment studies, Environmental and water resources – land Information system. **Practical Component:** • Data Conversion – Vector to Raster and Raster to Vector. • Map Joining, Edge Matching and Layout Design.	**9 Hours** **3 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**15**	**Project Hours:**	**0**	**Total Hours:**	**60**

Learning Resources

Textbooks:

1. Thomas. M.Lillesand and Ralph. W. Kiefer, "Remote Sensing and Image Interpretation", John Wiley and Sons, 7th Edition 2015.).
2. Basudeb Bhatta "Remote sensing and GIS" Oxford Publication, 2nd Edition 2011.

References:

3. Ian Heywood "An Introduction to GIS", Pearson Education, Asia, 4th Edition 2012
4. Lo.C.P and A.K.W.Yeung, "Concepts and Techniques of Geographic Information Systems", Prentice Hall of India Pvt. Ltd., New Delhi, 2nd Edition 2010
5. Burrough P.A. and Rachel A. McDonell, "Principles of Geographical Information Systems", Oxford Publication, 3rd Edition 2016.

Online Educational Resources:

4. https://elearn.nptel.ac.in/shop/nptel/remote-sensing-and-gis/?v=c86ee0d9d7ed
5. https://www.coursera.org/courses?query=remote%20sensing
6. https://www.udemy.com/course/google-earth-engine-gis-remote-sensing/?couponCode=ST8MT220425G3

Assessment (Embedded course)

CAT, Open Book Test, Learning Tasks (Concept Maps, Diagnostic Questions), End Semester Examination (ESE). Lab Workbook, Experimental Cycle tests, viva-voce.

Course Curated by

Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**
Mr. **Saravanan Karuppasamy** Application Engineer at Autonomy & Positioning Division (Part Of Hexagon), Karnataka.	Dr. T Reshma Assistant Professor Department of Civil Engineering National Institute of Technology, Andhra Pradesh Tadepalligudam	1. Mr. S.Nishant /Civil 2. Mr.J.Viswanath

Recommended by BoS on	05.12.2025		
Academic Council Approval		**Date**	

24CET208	Strength of Materials	L	T	P	J	C
		3	0	0	0	3
PC		SDG		04, 09 & 12		

Pre-requisite courses	24CEI202	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Acquire knowledge of the fundamental concepts of stress, strain, deformation, and stability of materials.
2	Develop skills in analyzing various loading conditions on structural elements.
3	Enhance competency in solving engineering problems related to material behavior under different forces.
4	Foster understanding of the theoretical and practical aspects of indeterminate structures and energy principles.
5	Prepare students for real-world applications, aligning with industrial trends and sustainable development practices.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Explain the concepts of stress, strain, and energy principles.	U
CO 2	Apply principles of static equilibrium and energy methods to analyze indeterminate beams.	Ap
CO 3	Analyze the state of stress and strain in two-dimensional elements using mathematical models.	An
CO 4	Evaluate the critical loads for columns under various end conditions.	E
CO 5	Design structural elements considering advanced bending theories and sustainability aspects.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Tool Engineering Usage	The Engineer and The World	Ethics	Individual and Collaborative work Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	CO1	3	3	2	1	2	1	1	1	1	2	1	3	2
2	CO2	3	3	3	2	2	2	1	2	1	1	2	3	2
3	CO3	3	3	3	3	3	2	1	2	1	2	1	3	3
4	CO4	3	3	2	2	2	2	1	2	1	1	2	3	3
5	CO5	3	3	3	3	3	2	3	2	2	3	2	3	3

Course Content

ENERGY PRINCIPLES Concepts of strain energy, resilience, and work-energy principles - Applications of Castigliano's theorem and Maxwell's reciprocal theorem - Energy methods for deformation analysis.	**09 Hours**

INDETERMINATE BEAMS Analysis of propped cantilever, fixed beam - Clapeyron's theorem of three moments for continuous beams.	**09 Hours**
GENERALIZED STATE OF STRESS AND STRAIN States of stress and strain – Differential equations of equilibrium of stress and strain - principal stresses and principal planes (3D) – Theories of elastic failure	**09 Hours**
COLUMNS Euler's theory of buckling - Members with eccentric loading - Rankine Gordon formula for eccentrically loaded columns - Practical design considerations for columns with different end conditions.	**09 Hours**
ADVANCED TOPICS IN BENDING OF BEAMS Non-linear bending behaviour and shear stresses in beams - Unsymmetrical bending and curved beams - Winkler Bach formula - Application of bending theories to engineering design - shear flow - shear centre - channel section - stress concentration	**09 Hours**

Theory Hours:45	**Tutorial Hours: 15**	**Practical Hours: 0**	**Project Hours: 0**	**Total Hours:60**

Learning Resources

Textbooks:

1. Gere, J.M., Mechanics of Materials, Cengage Learning, Stamford (2020).
2. Beer, F.P., Johnston, E.R., Mechanics of Materials, McGraw Hill, New York (2019).
3. R.K. Rajput, Strength of Materials (Mechanics of Solids), S. Chand Publishing, 2022.

References:

1. Timoshenko, S.P., Goodier, J.N., Theory of Elasticity, McGraw Hill, New York (2021).
2. Boresi, A.P., Schmidt, R.J., Advanced Mechanics of Materials, Wiley, Hoboken (2019).

Online Educational Resources:

1. https://nptel.ac.in/courses/112103108
2. https://ocw.mit.edu/courses/mechanical-engineering/
3. https://www.khanacademy.org/
4. https://www.civilengineeringacademy.com
5. https://www.youtube.com/LearnEngineering
6. https://nptel.ac.in/courses/112107147
7. https://www.coursera.org/
8. https://swayam.gov.in/
9. https://www.engineeringtoolbox.com/column-buckling
10. https://www.edx.org/
11. https://ocw.tudelft.nl
12. https://civilengineeringhub.com

Assessment (Theory course)

CAT, Activity and Learning Task(s)*, Mini project, MCQ, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**
Mr. Kannan Sagadevan Manager Structural Engineer Sobha Glazing and Metal Works Private Limited Bengaluru, Karnataka, India	**Dr. D. Rajkumar** Assistant Professor Civil Engineering Thiagarajar College Of Engineering Madurai, Tamilnadu, India	**G. Karthikeyan** Assistant Professor-II Civil Engineering Kumaraguru College of Technology Coimbatore, Tamilnadu, India

Recommended by BoS on	05.12.2025		
Academic Council Approval		**Date**	

24CEI209	Highway Engineering	L	T	P	J	C
		3	0	2	0	4
PC		SDG 9				

Pre-requisite courses	-	Code book	IRC 37, IRC 58

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the principles of highway classification, alignment, and geometric design to establish the foundation for efficient and safe roadway planning.
2	Learn the characteristics of traffic flow, including road user behavior, vehicle interactions, and traffic control measures, to support effective traffic management.
3	Develop proficiency in testing and evaluating highway materials, such as aggregates, bitumen, and soil, to ensure their suitability for different pavement designs.
4	Gain practical experience in pavement construction techniques and maintenance strategies to enhance the durability and performance of road infrastructure.
5	Build the ability to integrate modern technologies, such as Intelligent Transportation Systems (ITS), into transportation planning and operations to address contemporary urban mobility challenges.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Explain the fundamentals of transportation systems, highway planning	U
CO 2	Apply geometric design principles for horizontal and vertical curves	Ap
CO 3	Apply traffic engineering methods for data collection, analysis and level-of-service evaluation.	Ap
CO 4	Analyze pavement materials using standard tests and design of pavements.	An
CO 5	Analyze the pavement construction techniques and maintenance practices to select appropriate methods for road longevity.	An
CO6	Explain the fundamentals of intelligent transportation systems to enhance traffic operations and improve urban mobility.	U

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	3	3	2	3	2	2				2	3	3	

2	3	3	3	3	3	2	2	2			2	3	3	
3	3	3	3	3	3	2	2	3			2	2	3	
4	3	2	3	3	2	2	2	2			2	3	3	
5	3	1	2	2	2	2	2	3	3		2	2	3	
6	3	3	3	3	3	2	3	3	3		2	3	3	

Course Content	
MODULE 1: HIGHWAY ALIGNMENT AND GEOMETRIC DESIGN Introduction - Highway development in India - Classification of roads - Requirements and factors controlling alignment of roads -Modern Techniques-Engineering surveys for highway location - cross sectional elements - Sight distances - Design of horizontal alignment - Design of vertical alignment - worked out problems in geometric design.	**10 Hours**
MODULE 2: TRAFFIC ENGINEERING Introduction - Road user, vehicle and traffic characteristics – traffic studies - Speed, volume, Origin Destination, parking studies, accident study - traffic signs, markings, signal design concepts. **Practical Component:** • Traffic Volume Study • Traffic Speed study	**10 Hours** **2 Hours**
MODULE 3: PAVEMENT OF MATERIALS AND DESIGN Desirable properties and testing of highway materials: aggregates, bitumen and subgrade soil – Bituminous mix design – pavement types and layer composition - Factors influencing the design of pavements - Design of flexible pavement (worked out problems) and rigid pavements- IRC guidelines. **Practical Component:** Highway Materials Testing: • Tests on Aggregate (Impact, Shape, Abrasion, specific gravity, water absorption tests) • Tests on Bitumen (Specific gravity, penetration, ductility, flash and fire point, softening point test, viscosity) • Test on soil (CBR) Design of Bituminous Mixes: • Marshall Stability Test	**10 Hours** **10 Hours**
MODULE 4: PAVEMENT CONSTRUCTION AND MAINTENANCE Construction of flexible pavements, construction of rigid pavements - Pavement Failures - Pavement Maintenance - evaluation methods - overlay. **Practical Component:** Pavement Evaluation Tests: • Benkleman Beam test (Demonstration) • Roughness Test (MERLIN) • Skid Resistance Test	**10 Hours** **3 Hours**
MODULE 5: SUSTAINABLE AND SMART TRANSPORTATION Basics of sustainability - Smart mobility, Introduction to Intelligent Transportation Systems (ITS), Green pavements.	**5 Hours**
Theory Hours: 45 **Tutorial Hours: 0** **Practical Hours: 15** **Project Hours: 0** **Total Hours:** 60	
Learning Resources	
Textbooks:	

1. Khanna, S.K.,Justo, C.E.G., Veeraragavan. A. Highway Engineering, Nemchandand Bros, 2015, Roorkee.
2. Kadiyali, L.R.,andLal, N.B., Principles and Practices of Highway Engineering, Khanna Publishers, 2013.

References:

1. IRC: 37, Guidelines for the Design of Flexible Pavements.
2. IRC: 58, Guidelines for the Design of Rigid Pavements.
3. IRC:15, Standard Specifications and Code of Practice for Construction of Concrete Roads
4. Ministry of Road Transport and Highways Specifications for Roads and Bridges
5. Mashrur A. Chowdhury, and Adel Sadek, Fundamentals of Intelligent Transportation Systems Planning, Artech House, Inc., 2013
6. Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand & Co., New Delhi, 2017.

Online Educational Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ce94/preview (Geometric Design of Highways By Prof. Rajat Rastogi IIT Roorkee)
2. https://archive.nptel.ac.in/courses/105/105/105105107/ (Transportation Engineering and Road development Process by IIT Kharagpur)
3. https://www.coursera.org/specializations/infrastructure-for-transportation-systems (L&T Edutech)
4. Mastering bitumen for better roads and innovative applications | Coursera

Assessment (Embedded course)

CAT 1, CAT 2, Activity and Learning Task(s), MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr. K. Sankar, Highway Design Engineer, AS Systems Chennai	Dr. Arjun Siva, Assistant Professor Amritha University	Mrs. Anita . S AP/ CE KCT

Recommended by BoS on	05.12.2025		
Academic Council Approval	No.	**Date**	

SEMESTER V

24HSP007	Building Professional Readiness	L	T	P	J	C
		0	0	2	0	1
Practical		SDG	4&8			

Pre-requisite courses	-	Data Book / Codes / Standards (If any)	-

Course Objectives**:	The purpose of taking this course is to:
1	To familiarize students with various interview formats and equip them with essential techniques for effectively handling personal, behavioural, stress, and panel interviews.
2	To develop self-awareness and career readiness by guiding students in analysing job roles, articulating career goals, and confidently presenting their skills and experiences.
3	To enhance students' adaptability in diverse career pathways by exploring alternative job opportunities, entrepreneurial ventures, and global career options beyond traditional engineering roles.

Course Outcomes***:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Effectively navigate various interview formats by applying appropriate techniques for personal, behavioural, stress, and panel interviews, demonstrating confidence and professionalism in different interview scenarios.	Ap
CO 2	Exhibit career readiness and self-awareness by analysing job roles, articulating career aspirations, and presenting skills and experiences in alignment with employer expectations.	An
CO 3	Evaluate and explore diverse career pathways beyond traditional engineering roles, demonstrating adaptability in pursuing opportunities in entrepreneurship, global careers, public sector roles, and other emerging industries.	E

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1						2	2	3	3		3			
2						2	2	3	3		3			
3						2	2	3	3		3			

Course Content

Career Awareness and Goal Setting	6 Hours
• Exploring Varied Career Options Beyond Engineering • Industry Roles	

• Startups and Entrepreneurial Ventures • Research Opportunities and Higher Education • Public Sector and Non-Profit Careers • Self-Assessment and Personal Reflection • Identifying Strengths, Weaknesses, Skills, and Career Aspirations • Setting Short-Term and Long-Term Career Goals	
Fundamentals of Interview Preparation • Analysing Company Background and Understanding Job Roles • Aligning Career Goals with Job Opportunities • Professional Etiquette and Appearance • Interview Dress Code, Grooming, and First Impression • Resume and Digital Profile Readiness • Types of interviews: personal, behavioural, stress, virtual, and panel	**6 Hours**
Behavioural Interviews – Responding with Purpose • Introduction to behavioural interviews: What and Why? • Common behavioural interview questions • The STAR technique (Situation – Task – Action – Result) • Identifying and reflecting on past experiences • Mapping soft skills to behavioural questions • Practicing concise storytelling • Active listening and adapting responses	**6 Hours**
Stress Interviews – Performing Under Challenging Situations • Understanding stress interviews: Purpose and setting • Types of stress tactics (rapid-fire questions, silence, disagreement, interruptions) • Strategies to stay composed and confident • Emotional regulation and response control • Maintaining clarity, tone, and respect under pressure • Practicing assertive and professional body language • Turning pressure moments into strengths	**6 Hours**
Panel Interviews • What is a panel interview? Structure and expectations • Understanding panel roles (HR, technical, managerial) • Techniques for engaging with a diverse panel • Managing eye contact, addressing questions, and body posture • Preparing multi-perspective answers • Handling follow-up or cross-questions • Strategies for closing the interview with impact	**6 Hours**

Theory Hours:	**-**	**Tutorial Hours:**	**-**	**Practical Hours:**	**2**	**Project Hours:**	**-**	**Total Hours:**	**30**

Learning Resources*

Reference books/ Web Links

1. Amos, J. (2004). Handling Tough Job Interviews: Be Prepared, Perform Well, Get the Job. United Kingdom: How To Books.
2. Clark, A. (2019). Cracking the Behavioral Interview Code!!! How to Answer Behavioral Interview Questions and Answer with a Preparation Guide + 20 Most Popular Behavioral Interview Questions and Answers.. (n.p.): Amazon Digital Services LLC - KDP Print US.
3. Collins, A. (2015). HR Interview Secrets: How to Ace Your Next Human Resources Interview, Dazzle Your Interviewers and LAND the JOB YOU WANT!. United States: Success in HR Publishing.
4. Downes, C. (2008). Cambridge English for Job-hunting Student's Book with Audio CDs (2). Germany: Cambridge University Press.
5. Hatcher, S. (2015). Group Interview Preparation: Learn How to Use Group Discussion to Your Advantage and Be Comfortable, Confident, and Likeable While Standing Out in a Group

Interview. (n.p.): CreateSpace Independent Publishing Platform.
6. McKay, D. R. (2013). The Everything Job Interview Question Book: The Best Answers to the Toughest Interview Questions. United States: Adams Media.
7. Ryan, R. (2016). 60 Seconds and You're Hired!: Revised Edition. United States: Penguin Publishing Group.
8. Winter, S. (2020). Job Interview Preparation and Conversation Skills 2-in-1 Book: Learn How to Crush Your Next Job Interview and Develop A Magnetic Charisma to Enhance Your Communication Skills. United States: Native Publish

Online Resources

1. https://www.coursera.org/projects/preparation-for-job-interviews
2. https://www.coursera.org/projects/accomplishment-star-techniques-for-job-interviews
3. https://www.coursera.org/specializations/english-interview-resume

Assessment	
Formative	Summative
-----	1. Participation in Mock interviews (80%) 2. Career Readiness Portfolio Submission (20%)

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
Mr. Bhuvana Sundar Soorappaiah Program Manager Bosch, Coimbatore	Dr Kishore Selva Babu Head and Associate Professor Department of English and Cultural Studies Christ University Bangalore-560029	Dr. J Srikala- AP III Dr. C Tissaa Tony - AP III Dr. S G Mohanraj – AP III Dr. S Sreejan – AP III Dr. R Hema – AP II Dr. A S Mythili - AP II
Approved by: BoS Chairman		With Signature and date
BoS Approval date:		BOMS **25.04.2025**

24CEI301	ENVIRONMENTAL ENGINEERING	L	T	P	J	C
		3	0	2	0	4
PC		SDG				

Pre-requisite courses	-	Data Book / Codes / Standards (If any)	-

Course Objectives

The purpose of taking this course is to

1	Analyze water quality parameters and evaluate water demand for planning sustainable public water supply systems.
2	Analyze the performance of unit operations and processes to determine suitable treatment options for water and wastewater.
3	Analyze and develop water distribution networks including IS 10500-based design problems for reliable supply.
4	Analyse wastewater generation patterns and design hydraulically efficient sewer systems per CPHEEO manual.
5	Analyse sewage treatment methods, sludge management practices, and resource recovery approaches based on circular economy concepts.
6	Apply GRIHA/LEED green building awareness and open-source modelling tools (EPANET) to sustainable water systems.

Course Outcomes

After successful completion of this course, the students shall be able to		**Revised Bloom's Taxonomy Levels (RBT)**
CO 1	Analyze the characteristics of water sources and evaluate water demand using IS 10500 design criteria to plan sustainable public water supply systems.	**An**
CO 2	Analyze the performance and applicability of unit operations and evaluate sustainable water management practices using GRIHA/LEED green building concepts and relevant water quality standards.	**An**
CO 3	Analyze and develop water distribution networks and building plumbing systems using EPANET awareness to ensure reliable and sustainable supply.	**An**
CO 4	Analyse wastewater generation patterns and design hydraulically efficient sewer systems per CPHEEO Manual provisions.	**An**
CO 5	Analyze sewage treatment, sludge management, and resource recovery practices using circular economy principles for sustainable wastewater management.	**An**

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											**Program Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	3	2	1	-	2	-	-	-	-	1	3	2	-
2	3	3	2	2	1	2	2	-	-	-	1	3	2	-
3	3	3	3	1	2	2	-	-	-	1	1	3	3	-
4	3	3	3	1	1	2	2	-	-	1	1	3	3	-
5	3	3	2	2	1	3	2	-	1	1	2	3	3	-

Course Content

PLANNING FOR WATER SUPPLY SYSTEM Public water supply system – Planning - Objectives – Estimation of population forecasting (Based on recent census data) and water demand – Sources of water, Climate resilience for water supply, drought-proofing strategies, water budgeting, and groundwater recharge structures for sustainable water resource management - physical, chemical and biological characteristics of water – IS 10500:2012 water quality standards — permissible and desirable limits for drinking water -Water supply intake structures – types of pumps and its location- pipes and conduits for water. Pipe materials – transmission main lines – laying, jointing and testing of pipes- design problems on pipe sizing and distribution using IS standards. **Practical Component:** • Introduction to standards, collection, preservation of samples and sampling techniques – A study. • Determination of pH, Electrical Conductivity. • Determination of Turbidity. • Determination of fluoride. • Determination of acidity and alkalinity. • Determination of MPN (Most Probable Number).	**10 Hours** **10 Hours**
WATER TREATMENT Objectives of unit operations and processes – Principles, functions and design of plain sedimentation tanks, coagulation tanks and sand filters – disinfection – Operation and maintenance of water treatment plants. Aeration – Iron and manganese removal, Defluoridation (Nalgonda Technique) and Demineralization – Water softening - Advanced treatment: desalination – Reverse Osmosis. Sustainable Urban Water Management Practices: GRIHA/LEED green building water criteria and rainwater harvesting integration, - CPCB effluent discharge standards for surface water bodies and comparison with potable water quality standards (IS 10500). **Practical Component** • Determination of Optimum Coagulant Dosage. • Determination of Hardness. • Determination of Chlorides • Determination of Sulphates • Determination of Iron. • Determination of Dissolved Oxygen.	**9 Hours** **10 Hours**
WATER DISTRIBUTION AND SUPPLY TO BUILDINGS Service reservoirs –Network design – Analysis of distribution networks- Overview of EPANET for basic water distribution network modelling– node pressures, pipe flows and velocity check. Operation and maintenance – leak detection, method. Smart water metering and IoT-based leak detection: NRW (Non-Revenue Water) management strategies in urban water supply systems (CMWSSB and BWSSB context). Principles of water supply in buildings – House service connection– Pipe appurtenances - Systems and types of plumbing **Practical Component** • Determination of residual and available chlorine for water sample • Determination of Solids in water/wastewater sample.	**8 Hours** **4 Hours**
SEWER DESIGN Sources of wastewater generation – Estimation of DWF & WWF –Hydraulics of flow in sewers – Design of sanitary and storm sewers – Sewer appurtenances – Sewage plumbing system for buildings - Effluent standards - Reclamation and reuse of sewage Effluent reuse standards and CPCB guidelines for treated sewage for irrigation and industrial reuse. **Practical Component**	**8 Hours** **4 Hours**

• Determination of BOD for wastewater sample. • Determination of COD for wastewater sample.	
TREATMENT OF SEWAGE Objectives of sewage treatment and layout - Design of Screens, Grit chambers - Types of secondary Treatment - Design of Activated sludge process and Trickling filter, – Design of Septic tank -Basic concepts on Advanced sewage treatment methods, Sequencing Batch reactor – Sludge management- Anaerobic digestion, UASB, Biogas recovery, composting- Circular economy concepts **Practical Component** • Determination of Oil and Grease for wastewater sample.	**10 Hours** **2 Hours**

Theory Hours:45	**Tutorial Hours:0**	**Practical Hours: 30**	**Project Hours:0**	**Total Hours:75**

Beyond the syllabus:

Environmental engineers are directly responsible for public health. Falsifying water quality results, under-designing treatment plants, or bypassing EIA can cause disease outbreaks. IS 10500 compliance is legally required under Prevention of Water Pollution Act 1974 and Environment Protection Act 1986 — violations are criminal offences.

Case Study: Eloor Industrial Area Water Contamination (Kerala): untreated effluent from chemical industries contaminating the Periyar river — multiple IS 10500 and CPCB violations. Students: what treatment systems were absent? Who failed in regulatory duty? What EIA process should have caught this? What is an engineer's whistle-blower obligation?

Learning Resources*

Textbooks

1. Garg, S.K., "Water supply Engineering", Khanna Publishers, 31st Edition, 2017
2. Garg, S.K., "Sewage Disposal and Air Pollution (Environmental Engineering II)", Khanna Publishers, 38th Edition, 2017

Reference books/ Web Links

1. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. "Environmental Engineering", Mc-Graw - Hill Indian Editions, New York 1st Edition2013. 13. "Manual on Water Supply and Treatment". Ministry of Urban Development, New Delhi,3rd Edition, 2013.
2. "Manual on Sewerage and Sewage Treatment Systems, Part A, B and C". Central Public Health and Environmental Engineering Organization, Ministry of Urban Development, 3rd Edition, 2013.
3. "APHA, AWWA Standard methods for the Examination of Water and Wastewater", American Public Health Association, Washington, D.C, 22nd Edition, 2012.

Online Resources

1. https://onlinecourses.nptel.ac.in/noc21_ar13/preview
2. https://www.coursera.org/learn/sanitation
3. https://onlinecourses.nptel.ac.in/noc20_ce23/preview

Assessment

SAI & SA I & SA II (ESE).

Course Curated By

Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
Er. E. Thinakaran, Project Director, P & C Adyar Water Projects (P) Ltd, Chennai, Tamil Nadu -600 037	Dr. R. Saraswathi, Professor, Department of Civil Engineering, Coimbatore Institute of Technology, Coimbatore – 641 014.	Dr. B. Nithyalakshmi Dr. A. Geethakarthi Department of Civil Engineering
Recommended by BoS on		

Academic Council Approval	No:	Date	

24CEI302	SOIL MECHANICS	L	T	P	J	C
		3	0	2	0	4
PC		SDG	9, 11, 13, 15			

Pre-requisite courses	-	Data Book / Codes / Standards (If any)	IS 2720, IS 1498, IS 1892, Plaxis software Manual

Course Objectives	
The purpose of taking this course is to	
1	Understand soil formation, index properties, and apply the IS 1498 soil classification system.
2	Compute total and effective stress; determine stress distribution using Boussinesq/Westergaard.
3	Analyse soil permeability and seepage characteristics; interpret flow-net diagrams.
4	Evaluate soil compaction parameters and select field compaction equipment.
5	Determine soil consolidation parameters and shear strength using multiple test methods.

Course Outcomes		
After successful completion of this course, the students shall be able to		**Revised Bloom's Taxonomy Levels (RBT)**
CO 1	Classify soils per IS 1498 (ISSCS) based on index properties and grain size analysis.	Ap
CO 2	Compute total/effective stress; determine vertical stress distribution from Boussinesq/Westergaard.	Ap
CO 3	Analyse permeability and seepage; interpret flow-nets; identify quicksand condition.	An
CO 4	Analyse compaction characteristics; select suitable field compaction methods and equipment.	An
CO 5	Estimate total and time-dependent settlement using Terzaghi's consolidation theory.	An
CO 6	Determine shear strength parameters using direct shear, triaxial, UCC, and vane shear tests.	An

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3

1	3	2	1	1	1	1	1	1	1	1	2	3	2	-
2	3	3	2	2	2	1	1	1	1	1	2	3	2	-
3	3	3	2	3	2	1	1	1	1	1	2	3	3	-
4	3	3	3	2	2	2	1	1	1	1	2	3	3	-
5	3	3	2	3	2	1	1	1	1	1	2	3	3	-
6	3	3	3	2	2	1	1	1	1	1	2	3	2	-

Course Content

MODULE 1: ORIGIN AND CLASSIFICATION OF SOILS Historical development of soil engineering - Soil formation: weathering; soil structure; clay minerals (kaolinite, illite, montmorillonite) - Three-phase system: mass-volume relationships; index properties - Identification and classification of soils: IS 1498 (Indian Standard Soil Classification system (ISSCS); plasticity chart (A-line).	**10 Hours**
Practical Component Determination of index properties: Specific gravity of soil solids (IS 2720 Part 3), Grain size distribution – Sieve analysis and Hydrometer analysis (IS 2720 Part 4), Atterberg's Limit (Liquid limit, Plastic limit, Shrinkage limit - IS 2720 Part 5, 6, 7) and Differential free swell tests (IS 2720 Part 40). Determination of in-situ density: Sand replacement method, Core cutter method (IS 2720 Part 28, 29).	**12 Hours**
MODULE 2: EFFECTIVE STRESS AND VERTICAL STRESS DISTRIBUTION Soil water: capillarity, capillary pressure; effective and neutral stress - Vertical stress distribution in soil: Boussinesq equation; Westergaard's equation; Newmark's influence chart; Equivalent point load; Other approximate methods; Pressure bulb.	**8 Hours**
Practical Component xis Demo: model soil layer under footing; compute and compare vertical stress with conventional calculation	**2 Hours**
ODULE 3: PERMEABILITY AND SEEPAGE rmeability, Darcy's law, coefficient of permeability test in the laboratory (constant head and falling head permeability tests) – Factors affecting permeability; Effect of seepage on effective stress; Quicksand condition - Seepage flow, Seepage head, Seepage gradient, and Seepage pressure; Steady State Seepage; One-dimensional and two-dimensional seepage; Flow Net - Properties, construction, and determination of seepage discharge, head loss, uplift pressure, seepage pressure, exit gradient, FOS against piping.	**8 Hours**
actical Component termination of Permeability of soil: Constant head and falling head methods (IS 2720 Part 17)	**4 Hours**
ODULE 4: SOIL COMPACTION AND CONSOLIDATION mpaction mechanism; moisture-density relationship; Compaction curves (Optimum Moisture Content and Maximum Dry Density); Factors affecting compaction; Laboratory compaction tests (Standard and Modified Proctor) – Field compaction methods; Types of rollers and their suitability; Field control of compaction - Consolidation; Terzaghi's one-dimensional consolidation theory; pressure-void ratio relationship; pre-consolidation pressure; compression index,	**11 Hours**

recompression index, coefficient of compressibility, coefficient of volume compressibility, secondary compression index; component of settlement; calculations on total settlement and time rate of settlement; coefficient of consolidation; curve fitting methods. **actical Component** ndard and Modified Proctor tests (IS 2720 Part 7,8) mo on One-dimensional consolidation test (Determination of coefficient of consolidation only) (IS 2720 Part 15)	**6 Hours**
ODULE 5: SHEAR STRENGTH hr's circle; principal stresses - Shear strength; Mohr-Coulomb failure criterion; shear strength tests in the Laboratory (Direct shear test, Vane shear test, Unconfined compression test), Triaxial test with different drainage conditions - shear strength parameters of cohesive and cohesionless soil - Skempton's pore water pressure parameters. **actical Component** ear strength determination: Direct shear test in cohesionless soil (IS 2720 Part 13), ear strength determination: Unconfined compression test in cohesive soil (IS 2720 Part 10) ear strength determination: Laboratory Vane Shear Test in cohesive soil (IS 2720 Part 30) ear strength determination: Tri-axial compression test (Demonstration) (IS 2720 Part 11)	**8 Hours** **6 Hours**

Theory Hours:45	Tutorial Hours:0	Practical Hours: 30	Project Hours:0	Total Hours:75

Learning Resources*

Textbooks

3. Arora, K. R., Soil Mechanics and Foundation Engineering, Standard Publishers Distributors, New Delhi (2014).
4. Punmia, B. C., Jain, A. K., Jain, A. K., Soil Mechanics and Foundations, Laxmi Publications, New Delhi (2017).
5. Ranjan, G., Rao, A. S. R., Basic and Applied Soil Mechanics, New Age International Publishers, New Delhi (2014).

Reference books/ Web Links

4. Murthy, V. N. S., Soil Mechanics and Foundation Engineering, CBS Publishers & Distributors Pvt. Ltd., New Delhi (2011).
5. Das, B. M., Principles of Geotechnical Engineering (7th ed.), Cengage Learning, Stamford, CT (2010).
6. McCarthy, D. F., Essentials of Soil Mechanics and Foundations, Prentice-Hall, New Delhi (2006).
7. Coduto, D. P., Geotechnical Engineering – Principles and Practices, Prentice Hall of India Pvt. Ltd., New Delhi (2010).
8. Das, B.M., 'Principles of Geotechnical Engineering', 7th ed., Cengage, 2010.
9. IS 1498 – Soil classification and identification for general engineering purposes.
10. IS 2720 (Part 3) – Specific gravity of soil solids.
11. IS 2720 (Part 4) – Sieve analysis and hydrometer analysis.
12. IS 2720 (Part 5) – Liquid limit and plastic limit.
13. IS 2720 (Part 6) – Shrinkage limit and shrinkage factors.
14. IS 2720 (Part 40) – Differential free swell test.
15. IS 2720 (Part 28) – Sand replacement method.
16. IS 2720 (Part 29) – Core cutter method.
17. IS 2720 (Part 17) – Constant head and falling head permeability tests.
18. IS 2720 (Part 7) – Standard Proctor compaction test.
19. IS 2720 (Part 8) – Modified Proctor compaction test.
20. IS 2720 (Part 15) – One-dimensional consolidation test.
21. IS 2720 (Part 13) – Direct shear test in cohesionless soil.

22. IS 2720 (Part 10) – Unconfined compression test in cohesive soil.
23. IS 2720 (Part 30) – Laboratory vane shear test in cohesive soil.
24. IS 2720 (Part 11) – Triaxial compression test.

Online Resources

4. https://nptel.ac.in/courses/105101084
5. https://nptel.ac.in/courses/105103097
6. https://nptel.ac.in/courses/105104147
7. https://nptel.ac.in/courses/105105168
8. Plaxis: https://www.bentley.com/software/plaxis/

Assessment

SAI & Theory: SA I, SA II, MCQ, ESE, Assignments, Lab test report submission

Course Curated By

Expert(s) from Industry	Expert(s) from Higher Education Institutions		Internal Expert(s)
Er Karthick Kumar Viswanadhan, Asst Engineering Manager (Civil), L & T Construction, Heavy Civil Infrastructure, Chennai, Tamil Nadu -600 089	Mr A. Ramachandran, Assistant Professor, Department of Civil Engineering, University College of Engineering BIT Campus, Anna University, Tiruchirappalli-620024.		Dr Prasanna Venkatesh R Dr Gayathri V Mr Sathiyanathan K Department of Civil Engineering
Recommended by BoS on			
Academic Council Approval	No:	**Date**	

24CET303	STRUCTURAL ANALYSIS	L	T	P	J	C
		3	1	0	0	4
PC		SDG	4,9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	To understand the concept of indeterminacy
2	To analyse continuous beams and frames using moment distribution method
3	To analyse continuous beams and frames using matrix methods
4	To learn the concepts of moving loads and its effects on structures
5	To analyse the behaviour of parabolic arches and suspension cables

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply concepts of static and kinematic indeterminacy to distinguish between determinate and indeterminate structures and analyze their equilibrium conditions.	Ap
CO 2	Analyze continuous beams considering with and without sinking of supports and single storey portal frames considering with and without sway using moment distribution method.	An
CO 3	Analyze indeterminate pin-jointed and rigid-jointed plane frames, continuous beams by applying matrix flexibility and stiffness method.	An
CO 4	Apply the concept of influence lines to analyze determinate and indeterminate beams under moving loads and determine critical load positions for maximum bending moment and shear force.	An
CO 5	Analyze arches under different loading conditions, considering factors like settlement and temperature effects and cables with stiffening girders.	An

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative Team work	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	3	2	1	2	2		1			2	3	2	
2	3	3	2	1	2	2		1			2	3	2	
3	3	3	2	1	2	2		1			2	3	2	
4	3	3	2	1	2	2		1			2	3	2	
5	3	3	2	1	2	2		1			2	3	2	

Course Content	
BASIC CONCEPTS Introduction –Static Indeterminacy and Kinematic Indeterminacy – Determinate vs	**4 Hours**

Indeterminate Structures - Equilibrium and Compatibility conditions - Force and Displacement methods of analysis.	
MOMENT DISTRIBUTION METHOD Stiffness and Carry-Over Factors – Distribution and Carryover of Moments - Analysis of Continuous Beams- Plane Rigid Frames with and without Sway – Support Settlement.	**9 Hours**
MATRIX METHODS OF STRUCTURAL ANALYSIS **Flexibility Matrix** - Primary Structures - Compatibility Conditions – Formation of Flexibility - Analysis of Continuous Beams, Rigid Jointed Plane Frames and Indeterminate Pin-Jointed Plane Frames by Matrix Flexibility Approach. (Up to Three Degree of Redundancy). **Stiffness Matrix -** Restrained Structure – Formation of Stiffness - Equilibrium Conditions - Analysis of Continuous Beams, Pin-Jointed Plane Frames and Rigid Frames by Matrix Stiffness Method. (Up to Three Degree of Redundancy). Validation of the structural analysis of selected structural elements such as beams, trusses, and frames using software.	**14 Hours**
MOVING LOADS AND INFLUENCE LINES ON BEAMS **Determinate Beams:** Introduction to moving loads, Concept of Influence Lines, Influence Lines for Reactions in Statically Determinate Beams – Influence Lines for Shear Force and Bending Moment – Calculation of Critical Stress Resultants due to Concentrated and Distributed Moving Loads - Absolute Maximum Bending Moment - Influence Lines for Member Forces in Pin-Jointed Frames. **Indeterminate Beams:** Muller Breslau's principle - Influence line for support reactions, shearing force and bending moments for continuous beams	**9 Hours**
ARCHES, CABLES AND SUSPENSION BRIDGES **Arches** - Types of Arches – Analysis of Three-Hinged, Two-Hinged Arches - Parabolic and Circular Arches - Settlement and temperature effects. **Cables and Suspension Bridges** - Suspension bridges - Components and their Functions - Analysis of cable - Three hinged and Two hinged stiffening girders	**9 Hours**

Theory Hours: 45	**Tutorial Hours: 15**	**Practical Hours: 0**	**Project Hours: 0**	**Total Hours: 60**

Learning Resources

Textbooks:

1. Punmia B.C, Ashok Kumar Jain and Arun Kumar Jain, "Theory of structures", Laxmi Publications Pvt. Ltd., New Delhi, 13th Edition 2017.
2. Reddy.C.S., "Basic Structural Analysis", Tata McGraw Hill Education Pvt.Ltd., New Delhi, 3rd Edition 2017.
3. Vaidyanadhan R and Perumal, P, "Comprehensive Structural Analysis-Vol.1 &Vol.2", Laxmi Publications Pvt.Ltd, New Delhi,4th Edition 2019.

References:

1. Bhavikatti,S.S, Structural Analysis,Vol.1 & 2, Vikas Publishing House Pvt. Ltd., NewDelhi-4, 2014.
2. Negi.L.S and Jangid R.S ., Structural Analysis , Tata McGraw-Hill Publishers, 2004.
3. Vazrani.V.N And Ratwani,M.M, Analysis of Structures, Vol.II, Khanna Publishers,2015.

Online Educational Resources:

1. https://nptel.ac.in/courses/105105166
2. https://theconstructor.org/structural-engg/analysis/moment-distribution-method-analysis/1444/#goog_rewarded
3. https://www.udemy.com/course/structural-analysis/?couponCode=PMNVD2025

sessment

rmative	mmative
signments / Mini	I, SA II and End Semester Examination (ESE)

project), Quiz	

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
			Dr.R.Manju Civil Engineering
Recommended by BoS on			
Academic Council Approval		**Date**	

24CEP304	Survey Camp	L	T	P	J	C
		0	0	0	2	1
		SDG	7,11			

Pre-requisite courses	Surveying	Data Book / Codes / Standards (If any)	-

Course Objectives:	The purpose of taking this course is to:
1	Apply knowledge, techniques, skills, and modern tools in surveying practices.
2	Translate theoretical surveying concepts into real-time civil engineering field applications.
3	Develop competency in field data collection, recording, and processing.
4	Enable execution of surveying works for infrastructure development.

Course Outcomes	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Perform surveying operations as per field conditions	K 2
CO 2	Conduct longitudinal and cross-section surveys using advanced instruments	K 4
CO 3	Prepare contour maps for given terrain	K 3
CO 4	Perform topographical and building layout surveys	K 6

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	2	1	-	2	-	-	-	-	-	2	2	-	-
2	3	3	2	1	3	-	-	-	-	-	2	3	-	-
3	3	2	2	2	2	-	-	-	-	-	2	3	2	-
4	3	2	3	1	2	-	-	-	1	1	2	3	2	-

Course Content

SURVEY CAMP FIELD WORK	**30 Hours**
Practical (Field Work – One Week Camp): • Large area survey for measurement and mapping • Angular and linear measurements using conventional instruments • Traversing and levelling operations **Core Survey Activities:** a) **Topographical Survey** • Collection of field data • Plotting natural and man-made features b) **Contour Surveying** • Contour interval selection • Preparation of contour maps c) **L.S / C.S for Road Works** • Longitudinal section • Cross-sectional profiling • Road alignment survey d) **Building Survey (Column Marking)** • Setting out building layout • Foundation and column positioning e) **Total Station Surveying** • Boundary survey • Data collection and coordinate plotting	

Theory Hours:0	**Tutorial Hours:0**	**Practical Hours:0**	**Project Hours:90**	**Total Hours:90**

Learning Resources*
Textbooks
5. Bansal, R.K., *Surveying*, Laxmi Publications, New Delhi (2018). 6. Duggal, S.K., *Surveying (Vol. 1 & 2)*, Tata McGraw Hill, New Delhi (2017).
Reference books/ Web Links
1. Kanetkar, T.P., and Kulkarni, S.V., *Surveying and Levelling*, Pune Vidyarthi Griha Prakashan (2015). 2. Wolf, P.R., and Ghilani, C.D., *Elementary Surveying: An Introduction to Geomatics*, Pearson (2018). 3. IS Codes related to surveying practices 4. Anderson, J.M., and Mikhail, E.M., *Surveying: Theory and Practice*, McGraw Hill (2012).
Online Resources

Assessment	
Formative	Summative
Assignments / Mini project), Quiz, Lab	Review - End Semester Examination (ESE)

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
[Name, Organization]	[Name, Institution]	**Mr.A.Aswin Bharath** **Assistant Professor/CE**

		Kumaraguru College of Technology, Coimbatore

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEI305	CONCRETE TECHNOLOGY	L	T	P	J	C
		3	0	2	0	4
PC		SDG		9 ,11,12,13		

Pre-requisite courses	24CYI102–Material Chemistry, 24CEI101 Building Materials;	Data Book / Code book (If any)	IS 10262, IS 456, IS 383, IS 516

Course Objectives:	
The purpose of taking this course is to:	
CO 1	Evaluate properties of concrete ingredients and their influence on workability and strength
CO 2	Design concrete mixes using IS 10262:2019 for ordinary and special concretes
CO 3	Evaluate SCC, UHPC, FRC, and Geopolymer Concrete for sustainability and performance
CO 4	Apply non-destructive testing (NDT): Rebound Hammer, UPV, carbonation depth
CO 5	Compute Embodied Carbon of a concrete mix and propose low-carbon alternatives

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Evaluate concrete ingredient properties and their effect on workability, strength, and durability	Ap
CO2	Design concrete mixes using IS 10262:2019; execute trial mixes and evaluate results	An
CO3	Apply admixtures and SCMs to modify concrete properties; compute embodied carbon savings	Ap
CO4	Evaluate SCC, UHPC, FRC, geopolymer concrete for performance and sustainability.	An
CO5	Apply NDT methods (rebound hammer, UPV, carbonation) for in-service condition assessment.	Ap
CO6	Apply the knowledge of cement and aggregates to evaluate their suitability for different concrete applications.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	2	1	1	2	1	1	1	1	1	1	3	2	-
2	3	3	2	2	2	1	1	1	1	1	1	3	3	-
3	3	2	3	2	2	1	1	2	1	2	1	3	2	-
4	3	3	2	3	2	1	1	2	2	2	1	3	3	-
5	3	2	2	2	3	2	2	2	2	2	2	3	3	-

Course Content

CONCRETE INGREDIENTS AND ADMIXTURES IN CONCRETE — **9 Hours**

Cement: types, hydration, heat of hydration; Bogue compounds; IS 269/IS455 - Water-Cement Ratio (Abrams' Law); Aggregates: IS 383:2016; Aggregate types and properties - Tests: Sieve Analysis, Impact, Crushing, Abrasion- Flakiness/Elongation Index; Bulking of sand; Max Aggregate Size Effects- Workability: Slump, Compaction factor, Vee-bee time - Admixtures: plasticizers (SP), retarders, accelerators, air-

entraining agents — mechanisms. Mineral admixtures: fly ash, silica fume, GGBS - sustainability metrics, CO_2 reduction table- Embodied carbon of concrete. **Practical Component:** • Sieve analysis of fine and coarse aggregates — IS 383:2016 grading zone classification • Impact test, crushing value test, abrasion test on coarse aggregate — IS 2386 reference	**6 Hours**
CONCRETE MIX DESIGN nciples of Mix Proportioning - Properties of concrete related to Mix Design - Physical properties of materials required for Mix Design - Design Mix and Nominal Mix - BIS Method of Mix Design - Mix Design Examples. IS 10262:2019 for SCM-blended mixes: fly ash and GGBS replacement; water demand correction factors **actical Component:** • Design M25 mix per IS 10262:2019; cast and test 7-day and 28-day cube strength (IS 516) • Compare M30 OPC mix vs M30 with 30% fly ash: cost/m^3 and CO_2/m^3 calculation • Effect of superplasticizer on concrete workability — dosage optimization using Marsh cone or mini-slump	**9 Hours** **6 Hours**
ECIAL CONCRETES Light-weight, Heavy-Weight, High-Density Concrete: Applications and Properties- Ready-Mix Concrete. Self-Compacting Concrete (SCC)- Fiber-Reinforced Concrete (FRC): Shotcrete - High Performance Concrete – 3D concrete printing- Pervious concrete- Ferrocement- Bacterial Concrete **Practical Component:** SCC demonstration: Slump Flow, J-ring, L-box, V-funnel provided SCC mix	**9 Hours** **6 Hours**
CONCRETE DURABILITY AND NDT Durability: permeability, water absorption, sorptivity; IS 456 exposure category requirements. Alkali-Silica Reaction (ASR); sulfate attack; chloride attack — IS 456 protective measures. Concrete protection: coatings, sealers, cathodic protection for marine/industrial environments. NDT: Rebound Hammer IS 13311; UPV IS 13311, Carbonation depth test procedure **Practical Component:** • Durability tests • NDT lab: Rebound Hammer on 28-day cubes; UPV measurement; correlate with cube strength	**9 Hours** **6 Hours**
GEOPOLYMER AND SUSTAINABLE CONCRETE Polymer concrete -Geopolymer concrete: fly ash/GGBS + alkaline activator - Recycled Aggregate Concrete (RAC): IS 383:2016 limits; Concrete circular economy: C&D waste recycling per C&D Waste Management Rules 2016- Sustainable concrete scorecard: embodied carbon, water demand, recycled content, durability — LCA **Practical Component:** • Geopolymer mortar trial: fly ash + $NaOH/Na_2SiO_3$; compare 7-day and 28-day strength with OPC • Casting and testing of FRC (steel fibre, 1% by volume) and SCC (V-funnel, J-ring, slump flow)	**9 Hours** **6 Hours**
Beyond the Syllabus: **Sustainability Component:** The course promotes sustainable concrete practices through SCMs, SCC, UHPC, FRC, Geopolymer Concrete, and NDT techniques to reduce embodied carbon, optimize material usage, and enhance durability. Students will assess embodied carbon for concrete mixes as part of sustainable design practice.	

Aligned SDGs: SDG 9, SDG 11, SDG 12, SDG 13. **Professional Ethics Component - Case Study: Bengaluru Flyover Partial Collapse (2017)** – Analysis of poor concrete compressive strength, violations of IS 456:2000 cube testing procedures, stakeholder responsibility, and the role of NDT techniques in quality assessment and failure prevention.	

Theory Hours:	**45**	**Tutorial Hours:**		**Practical Hours:**	**30**	**Project Hours:**		**Total Hours:**	**75**

Learning Resources
Textbooks:
1. Shetty, M.S., Concrete Technology, S. Chand & Company, New Delhi (2019). 2. Neville, A.M., Properties of Concrete, Pearson Education, Delhi (2012).
References:
1. Mehta, P.K., Monteiro, P.J.M., Concrete: Microstructure, Properties and Materials, McGraw Hill Education, New York (2014). 2. IS Codes: IS 10262, IS 456, IS 383, IS 516 (BIS Publications).
Online Educational Resources:
1. https://nptel.ac.in/courses/105/102/105102012/ 2. https://swayam.gov.in/nd1_noc20_ce31/preview

Assessment (Theory)
SAI, II, Activity and Learning Task(s)· Mini project, MCQ, End Semester Examination (ESE)

sessment (Embedded course)
I, II , Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE) ɒ Workbook, Experimental Cycle tests, viva-voce, etc…

Assessment (Practical course)
ɒ Workbook, Experimental Cycle tests, viva-voce, etc…

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Er.A.P.Murugan Technical Head Ultra Tech Cements	Dr.M.P.Muthuraj Professor/Civil Coimbatore Institute of Technology Coimbatore		Dr.A.Vennila Assistant Professor -II Kumaraguru College of Technology Coimbatore
Recommended by BoS on	-		
Academic Council Approval	No.	**Date**	

SEMESTER VI

24CEI307	DESIGN OF MASONRY AND REINFORCED CONCRETE ELEMENTS	L	T	P	J	C
		3	0	2	0	4
PC		SDG	9, 11			

Pre-requisite courses	-	Data Book / Codes / Standards (If any)	IS:456, SP 16, IS: 1905

Course Objectives:	
The purpose of taking this course is to:	
1	To design masonry elements as per IS codes
2	To familiarize with the design of structural elements using limit state of design concept using IS codes.
3	To design various types of foundations.

Course Outcomes:		Bloom's Taxonomy Level (BTL)
After successful completion of this course, the students shall be able to		
CO 1	Apply principles of masonry wall classification and lateral support to analyze their stability and design of axially and eccentrically loaded brick walls.	Ap
CO 2	Design singly and doubly reinforced rectangular and flanged beams, one-way and two-way slabs for various loading and boundary conditions and design of staircases.	E
CO 3	Analyze the behaviour of RC members in bond and anchorage and design RC members for combined bending, shear, and torsion.	An
CO 4	Design short rectangular and circular columns, slender compression members for axial, uniaxial, and biaxial bending	E
CO 5	Design various types of footings for axial and eccentric loading.	E
CO 6	Demonstrate proficiency in using design software for analyzing and designing RC elements, framed multi-storied buildings and steel trusses.	E

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	3	3	3	2	1	1	1	1	1	1	3	2
2	3	3	3	3	2	1	1	1	1	1	1	3	2
3	3	3	3	3	2	1	1	1	1	1	1	3	2
4	3	3	3	3	2	1	1	1	1	1	1	3	2
5	3	3	3	3	3	1	1	1	1	1	1	3	2
6	3	3	3	3	2	1	1	1	1	1	1	3	2

Course Content	
MASONRY: Introduction, Classification of walls, Lateral supports and stability, effective height of wall and columns, effective length of walls, design loads, load dispersion, permissible stresses, design o axially and eccentrically loaded brick walls. **Practical Component: Nil**	**8 Hours** **-**
METHODS OF DESIGN OF CONCRETE STRUCTURES: Methods of design - advantages of Limit State Method over other methods- Design codes and specification. **Practical Component: Nil**	**4 Hours** _
DESIGN FOR FLEXURE: Analysis and design of singly and doubly reinforced rectangular and flanged beams- Analysis and design of one way, two way and continuous slabs subjected to uniformly distributed load for various boundary conditions - Design of staircase. **Practical Component:** 1. Introduction to software design. 2. Analysis and Design of Simply supported beams. 3. Analysis for RC elements like RC slabs for various supporting conditions.	**9 Hours** **12 Hours**
DESIGN FOR BOND, ANCHORAGE, SHEAR & TORSION: Behaviour of RC members in bond and Anchorage- Design requirements as per IS code- Behaviour of RC beams in shear and torsion- Design of RC members for combined bending, shear and torsion. **Practical Component:** 1. Analysis and Design of Fixed beams and Continuous beams. 2. Analysis and Design of trusses.	**9 Hours** **9 Hours**
DESIGN OF COLUMNS: Types of columns- Braced and unbraced columns – Design of short Rectangular and circular columns for axial, uniaxial and biaxial bending – Design of slender compression members Theory only). **Practical Component:** 1. Analysis for RC elements like RC columns for various supporting conditions.	**9 Hours** **6 Hours**
DESIGN OF FOOTING: Design of wall footing – Design of axially and eccentrically loaded rectangular isolated footing–Design of combined footing- rectangular. **Practical Component:** 1. Analysis and Design of RCC framed multi-storied building.	**6 Hours** **3 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 75

Learning Resources

Textbooks

1. Gambhir.M.L., Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private limited, New Delhi, 4th Reprint 2011.
2. Varghese, P.., "Limit state Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2nd Edition 2013.
3. Subramanian, N. Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 1st Edition 2013.
4. Punmia, B.C., Ashok Kumar jain, Arun Kumar jain, "Limit state Design of Reinforced concrete, Laxmi Publications Pvt. Ltd., New Delhi, 1st Edition 2007.
5. Sinha, S.N., " Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition 2004.
6. I.C.Syal and A.K.Goel, "Reinforced Concrete Structures", S.Chand and Company Ltd, New Delhi, 4th Edition 2007.
7. Pillai & Menon ."Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., New Delhi 2014.

Reference books/ Web Links

8. C.Syal and A.K.Goel, "Reinforced Concrete Structures", S.Chand and Company Ltd, New Delhi, 4th Edition 2007.
9. Pillai & Menon ."Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., New Delhi 2014.

Online Resources

3. https://onlinecourses.nptel.ac.in/noc19_ce21/preview
4. https://l1nq.com/B4dds

Assessment	
Formative	Summative
Assignments / Mini project), Quiz, Lab	CAT- I, CAT – II and End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	Expert(s) from Higher Education Institutions	Internal Expert(s)
[Name, Organization]	[Name, Institution]	Dr.K.Ramadevi Civil Engineering

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

Course Code	FOUNDATION ENGINEERING	L	T	P	J	C
		3	0	0	0	3
PC		SDG	9 & 11			

Pre-requisite courses	Soil Mechanics	Data Book / Codes / Standards	IS 6403-1981

Course Objectives:	The purpose of taking this course is to:
1	Suggest and design a suitable foundation for a structure depending on the type of soil.
2	Understand and analyze different types of earth pressure and perform stability checks for retaining wall.
3	Understand basic slope stability concepts for foundation design.

Course Outcomes	After successful completion of this course, the students shall be able to:	Bloom's Taxonomy Level (BTL)
CO 1	Apply soil exploration methods (auguring, boring, rotary drilling, geophysical methods) for site investigation.	Ap
CO 2	Analyze bearing capacity using Terzaghi and BIS methods and estimate the settlement of shallow foundations	An
CO 3	Analyze the suitability of different shallow foundations by evaluating the relationship between site-specific soil parameters and codal provisions.	An
CO 4	Analyze load capacity/settlement of single pile and pile groups using static/dynamic methods.	An
CO 5	Estimate different types of earth pressure and check the stability of retaining walls and evaluate the effectiveness of geosynthetic reinforcement in mitigating failure modes.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	3	2	3	2	2	2	2	2	2	2	3	2
2	3	3	3	3	2	2	2	2	2	2	2	3	2
3	2	2	3	2	2	2	2	2	2	2	2	3	2
4	2	2	3	2	3	2	2	2	2	2	2	3	2
5	2	2	2	3	2	2	2	2	2	2	2	2	2

Course Content

SITE INVESTIGATION AND FOUNDATION SELECTION	7 Hours
ɔpe/objectives – Exploration methods: auguring, boring (wash/rotary drilling), geophysical (seismic refraction, electrical resistivity) – Borehole depth/spacing – Sampling (representative/undisturbed,	

samplers) – Bore log reports – Foundation selection as per soil condition	
BEARING CAPACITY AND SETTLEMENT Foundation location/depth – Codal provisions – Bearing capacity for homogeneous deposits by Terzaghi & BIS methods – Factors affecting bearing capacity – In-situ tests (plate load, SPT, SCPT) – Allowable bearing pressure – Seismic considerations – Settlement- types – settlement on granular and clay soil.	**10 Hours**
SHALLOW FOUNDATIONS Types of footings – Contact pressure distribution, isolated footing – combined footings – proportioning – Mat foundation – Types and applications- Floating foundation – Codal provision (No structural design).	**8 Hours**
PILE FOUNDATIONS Pile types and functions– Selection factors – Single pile capacity for granular & cohesive soil: static & dynamic formulas, in-situ tests – Negative skin friction/uplift – Group capacity by Feld, Converse-Labarre, block failure methods – Group efficiency concepts – Pile group settlement –Pile Load test – Under-reamed piles.	**10 Hours**
RETAINING WALLS and SLOPE STABILITY Plastic equilibrium – Active & passive states by Rankine for cohesionless and cohesive soils – Critical failure plane – Earth pressure (simple walls, line loads) – Cullman's graphical method – Stability analysis of retaining wall– Introduction to slope stability: infinite & finite slopes, causes of failure, basic remediation concepts – Applications of Geosynthetics.	**10 Hours**

Theory Hours: 45	**Tutorial Hours: 0**	**Practical Hours: 0**	**Project Hours: 0**	**Total Hours: 45**

Learning Resources
Textbooks
7. Arora K.R., Soil Mechanics and Foundation Engineering, Standard Publishers, 7th Edition, 2014 8. Punmia B.C., Jain A.K., Jain A.K., Soil Mechanics and Foundations, Laxmi Publications, 17th Edition, 2017
Reference books/ Web Links
9. Ranjan G., Rao A.S.R., Basic and Applied Soil Mechanics, Wiley Eastern Ltd., 2nd Edition, 2014 10. Murthy V.N.S., Soil Mechanics and Foundation Engineering, CBS Publishers, 5th Edition, 2011 11. Das B.M., Principles of Foundation Engineering (SI Units), Cengage Learning 12. IS 1904:2016 – Code of Practice for Foundation Design 13. IS 456:2000 – Plain and Reinforced Concrete
Online Resources
14. NPTEL Course: "Foundation Engineering" by IIT Kharagpur (nptel.ac.in) 15. L&T EduTech: "Principles of Foundation Engineering" (lntedutech.com)

Assessment	
Formative	Summative
ssignments / Mini project & Quiz.	SA-I, SA-II and End Semester Examination (ESE)

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**

Approved by: BoS Chairman	With Signature and

	date
BoS Approval date:	

24CET308	DESIGN OF STEEL STRUCTURES	L	T	P	J	C
		3	0	0	0	3
Professional Core		SDG	SDG9, SDG12.			

Pre-requisite courses	24CEI202- Solid Mechanics	Data Book / Codes / Standards (If any)	IS 800-2007 SP6

Course Objectives:	The purpose of taking this course is to:
1	Impart knowledge to the students on the design concepts of steel structures
2	To develop knowledge on design of welded and bolted joints for steel structures
3	To develop competency and design skills of various steel structural elements like compression members, tension members, flexural members and truss members.

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Design the bolted and welded joints for steel structures	Understand
CO 2	Design steel tension members using steel sections	Apply
CO 3	Design steel compression members like simple columns, built up columns angle struts and column bases.	Analysis
CO 4	Design flexural members like beams and plate girders	Evaluate
CO 5	Design the roof truss and purlins	Evaluate

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2	2	3	2						2		2	2	3
2	2	2	3	2						2		2	2	3
3	2	2	3	2						2		2	2	3
4	2	2	3	2						2		2	2	3
5	2	2	3	2						2		2	2	3

Course Content

Module 1 DESIGN METHODS AND CONNECTIONS FOR STEEL MEMBERS **Introduction-** properties of Indian standard rolled steel sections, limit state method of	**12 Hours**

design-general IS code requirements. **Bolted Connections**- Types – Design of bolted joints using IS 800-2007 code book. **Welded connections-** Types of welded joints, design of welded joint in direct compression, tension-moment in the plane of weld- moment perpendicular to the plane of weld.	
Module 2 **DESIGN OF STEEL TENSION MEMBERS** Behaviour and mode of failure in tension members- design of tension members with steel plates- single and double angle sections.	**6 Hours**
Module 3 **DESIGN OF STEEL COMPRESSION MEMBERS** Type of column sections- design of compression member with simple rolled steel sections- built-up sections- laced and battened columns, design of column slab base and gusseted base .	**9 Hours**
MODULE 4 **DESIGN OF STEEL FLEXURE MEMBERS** Design of simple and compound beams- laterally restrained – laterally unrestrained beams-built up beams, design of plate girders.	**9 Hours**
MODULE 5 **DESIGN OF TRUSSES** Types of trusses – design loads for trusses-dead load, live load and wind load. Design of truss members – purlins.	**9 Hours**

Theory Hours: 45	Tutorial Hours:0	Practical Hours:0	Project Hours:0	Total Hours:45

Learning Resources*

Textbooks

1. Subramanian N(2008), "Design of steel structures", Oxford University Press, USA (2008)
2. Duggal S.K, " Limit State design of steel structures McGraw Hill Co., New Delhi 2014

Reference books/ Web Links

10. Gambhir M L , Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt Ltd, 2013
11. Bhavikatti S S, Design of Steel Structures, IK International Publishing House New Delhi (2017)
12. Jack C McCormac and Stephen F Csemak, Structural Steel Design, Pearson Education Limited, 2013.
13. Jayagopal L.S, Tensing D, Design of Steel Structures, Vikas Publishing House (2015)

Online Resources

1. https://nptel.ac.in/courses/105105162

Assessment	
Formative	Summative
Assignments, Quiz.	CAT- I, CAT – II and End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	Expert(s) from Higher Education Institutions	Internal Expert(s)

		Dr. J. PREMALATHA/ KCT

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEI309	CONSTRUCTION PROJECT MANAGEMENT	L	T	P	J	C
		3	0	2	0	4
PC		SDG	3,5,8			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	To understand the fundamental principles of construction project management, including project life cycle, scope, cost estimation, and budgeting.
2	To develop skills in project planning, scheduling, and resource optimization using techniques such as Bar Charts, CPM/PERT, and time-cost analysis.
3	To gain knowledge in quality control, safety management, and the application of project management software (Primavera) for effective project execution and monitoring.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Apply the principles of project management to explain the life cycle of construction projects	Ap
CO2	Analyze project planning techniques to construct bar charts and CPM/PERT networks for scheduling	An
CO3	Evaluate resource allocation methods to determine optimized schedules under constrains	An
CO4	Analyze the relationship between time, cost, and project activities to propose optimal crashing strategies	An
CO5	Recommend quality and safety control measures by interpreting statistical methods for construction projects	Ap
CO6	Demonstrate the use of Primavera software to create, update, and analyze project schedules effectively	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative teamwork	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2
1	3	2	1			1				2	1	2	1
2	3	3	2	2	2					2	1	3	2
3	2	3	3	2	2					3	1	3	2
4	2	3	3	2	1					3	1	3	2
5	2	2	2	3	2	2	3	2		2	1	2	2

Course Content	
INTRODUCTION AND SCOPE OF PROJECT MANAGEMENT Context of construction management - characteristics of the construction industry - domestic and global construction market - Definition of a project - Nature of	**9 Hours**

construction projects, project life-cycle - Principles of project management, project management functions- project scope management -Elements of cost estimation - Estimating methods -Project budgeting, bidding.	
PROJECT PLANNING AND SCHEDULING **Bar** chart planning – CPM Network construction: Activities and events, logic and interdependence in network, time computations, critical period and path, floats – PERT Network : time estimates, Beta distribution, expected time, standard deviation, probability of achieving desired time targets for projects-introduction to project management softwares	**9 Hours**
RESOURCEALLOCATION Resource aggregation diagrams as per early start and late start - smoothing by activity start time manipulation - Levelling of resources according to constraints - priorities of activities - sort rules – Minimum project duration subject to resource constrain	**9 Hours**
TIME COST OPTIMISATION Direct and Indirect costs and their relation to time – Activity crashing – Normal and Crash duration and corresponding cost of activities – Cost slope – Crashing of network to optimize cost and duration of a project – Operations Research Technique to optimize assignment of tasks to groups of workmen, transport of materials quarries to sites..	**9 Hours**
QUALITY CONTROL AND SAFETY DURING CONSTRUCTION Quality and safety Concerns in Construction-Organizing for Quality and Safety-Work and Material Specifications-Total Quality Control-Quality control by statistical methods -Statistical Quality control with Sampling by Attributes-Statistical Quality control by Sampling and Variables-Safety.	**9 Hours**
Practicals: Primavera P6 Professional - Navigation in PPM module – EPS & OBS – Calendar usage in projects – Project creation – WBS – Creation of activities in projects – Sequencing – Scheduling – Assigning resource units and costs – Codes – Baseline – Progress update – Earned value management – Reports	**30 Hours**

Theory Hours: 45	**Tutorial Hours: 0**	**Practical Hours: 30**	**Project Hours: 0**	**Total Hours: 75**

Learning Resources

Textbooks:

1. Punmia B C and Khandelwal K K, “Project Planning and Control with PERT and CPM”, Laxmi Publications, 2016.
2. Dr.S.Seetharaman, “Construction Engineering and Management”, Umesh Publications, 2015.

References

1. Chitkara, K.K. “Construction Project Management Planning, Scheduling and Control”, Tata McGraw-Hill Publishing Co., New Delhi, 2014.
2. Srinath L S, “PERT/CPM Principles and Applications”, Affiliated East West Press (P) ltd, 2002.
3. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners, Engineers, Architects and Builders”, Prentice Hall, Pitsburgh, 2000.

Online Resources:

1. https://nptel.ac.in/courses/105106149/
2. https://nptel.ac.in/courses/105103093/
3. https://onlinecourses.nptel.ac.in/noc18_ce15/preview

sessment (Theory course)

I, SAII, Group Presentation, Open Book Test, ,Assignments, End Semester Examination (ESE)			
Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
1. **Mr. Suresh Kumar** Senior Project Manager, L&T Construction 2. **Mr. Amit Sharma** Vice President, Project Management, TATA Projects Ltd.	1. **Dr. P.K. Viswanathan** Professor, Department of Civil Engineering, IIT Madras 2. **Dr. M. Arivazhagan** Dean, School of Management Studies, NIT Trichy		1. Mr.A.Aswin Bharath AP/Civil 2. Dr. P.A.Prabakaran AP/Civil 3. Dr.U.Sindhu Vaardini AP/Civil
Recommended by BoS on			
Academic Council Approval	No:	**Date**	

SEMESTER VII

24CET309	CONSTRUCTION FINANCE, ESTIMATION & VALUATION	L	T	P	J	C
		3	0	0	0	3
HS		SDG	8, 9, 11			

Pre-requisite courses	24CEI101 Building Materials and Construction Practices	Data Book / Codes / Standards (If any)	PWD Standard Data Book & Schedule of Rates

Course Objectives:	
The purpose of taking this course is to:	
1	Interpret standard architectural and structural drawings for quantity estimation.
2	Calculate the exact quantities of items for civil engineering structures using standard methods.
3	Evaluate the rates for various construction items based on standard data and prevailing market rates.
4	Understand the procedures for contracting, tendering, and drafting detailed specifications.
5	Build competency in estimating and 5D planning using modern industry software like CostX and Bentley Synchro.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Understand the principles of estimation, specifications, and the standard methods of measurement.	U
CO2	Calculate the exact quantities of materials and work items for residential and commercial buildings.	Ap
CO3	Compute the quantities of earthwork and materials for roads, culverts, and environmental structures.	Ap
CO4	Analyze the rates for specific items of work using standard schedules of rates.	An
CO5	Evaluate the valuation of properties, depreciation, and rent fixation methodologies.	E
CO6	Execute 2D/3D quantity take-offs and 5D cost estimates using CostX and Bentley Synchro.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	2	2	1	-	-	2	1	2	1	2	2	2	1
2	3	3	2	2	2	1	-	1	2	3	2	3	3
3	3	3	2	2	2	1	-	1	2	3	2	3	3

4	3	3	2	2	2	1	1	2	2	3	2	3	3
5	3	2	2	2	-	2	1	3	2	3	2	2	3
6	3	3	3	2	3	2	-	2	2	3	3	3	3

Course Content

FUNDAMENTALS OF ESTIMATION AND SPECIFICATIONS Types of estimates: Approximate and detailed. Methods of estimating: Long wall & short wall, Centre line method. Standard modes of measurement. General and detailed specifications for various civil engineering works.	**9 Hours**
QUANTITY ESTIMATION FOR BUILDINGS Estimation of foundations, masonry, RCC works, flooring, and finishing for load-bearing walls and RCC framed structures. Doors and windows, steel roof trusses.	**9 Hours**
ESTIMATION OF OTHER CIVIL STRUCTURES Estimation of earthwork for roads. Estimation of single span RCC slab culverts and pipe culverts. Estimation of sanitary and water supply installations (Septic tanks, soak pits).	**9 Hours**
RATE ANALYSIS AND CONTRACTS Task work, out-turn of work. Rate analysis for earthwork, concrete, masonry, and plastering using PWD Schedule of Rates. Types of contracts, tendering process, earnest money deposit, security deposit, and arbitration.	**9 Hours**
VALUATION OF PROPERTIES Purpose of valuation. Market value, book value, salvage value, scrap value. Methods of valuation. Depreciation: Straight line, declining balance, sinking fund methods. Fixation of rent.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources*

Textbooks

1. Datta, B.N., Estimating and Costing in Civil Engineering. UBS Publishers' Distributors Pvt. Ltd., New Delhi (2020).
2. Patil, B.S., Civil Engineering Contracts and Estimates. Universities Press, Hyderabad (2015).

Reference books/ Web Links

1. Chakraborti, M., Estimating, Costing, Specification and Valuation in Civil Engineering. Published by Author, Calcutta (2006).
2. RIB Software., CostX User Manual. RIB Software (Current Edition)

Online Resources

1. https://nptel.ac.in/courses/105103093 (Construction Economics & Finance)
2. https://www.bentley.com/software/synchro/ (Bentley Synchro Resources)
3. https://www.rib-software.com/en/costx/ (RIB CostX Resources)

sessment

I & SAII, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE), Lab Workbook, Experimental Cycle tests, Viva-voce.

Course Curated By

Expert(s) from Industry	Expert(s) from Higher Education Institutions		Internal Expert(s)
[Name, Organization]	[Name, Institution]		Mr. Satheesh Kumar KRP, CE Dr. U. Sindhu Vaardini, CE Mr. A. Aswin Bharath, CE
Recommended by BoS on			
Academic Council Approval		**Date**	

24CEJ401	PROJECT PHASE-I	L	T	P	J	C
PW		0	0	0	6	3
		SDG	7,11			

Pre-requisite courses	Design of Reinforced Concrete Structures and Design of Steel structures	Data Book / Codes / Standards (If any)	IS 456 SP6 & IS 875 (part I to part V)

Course Objectives:

The purpose of taking this course is to:

1	To enable students to identify and select a real-time Civil or Interdisciplinary engineering problem by analysing societal and industry needs and assessing feasibility.
2	To facilitate detailed literature exploration using journals, codes, standards, and technical resources to recognize existing solutions and identify research gaps.
3	To guide students in formulating a clear problem statement along with defining the scope, objectives, assumptions, and expected outcomes of the project.
4	To develop student capability in preparing a structured methodology, including preliminary analysis/design planning, data collection strategies, and project scheduling using appropriate tools.
5	To strengthen students' technical communication skills through effective presentation and discussion of project progress in review meetings.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Identify and select a real-time Civil or Interdisciplinary engineering problem based on societal/industry needs and feasibility.	U
CO2	Conduct a comprehensive literature review using journals, codes, and standards to identify research gaps and support problem formulation.	An
CO3	Develop a clear problem statement, define scope, objectives, and assumptions for the chosen project.	Ap
CO4	Prepare a structured methodology, preliminary analysis/design plan, and project schedule using appropriate tools and resources.	C
CO5	Present technical progress and compile the Project Report with professional documentation and communication skills.	E

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	3	2	2	1	2	2	2	2	2	2	3	2	2
2	2	3	2	3	1	2	1	1	1	3	3	3	2	2
3	2	3	2	2	1	2	2	1	2	2	2	3	2	2
4	3	2	3	3	3	1	2	2	2	2	2	3	2	2
5	3	2	2	2	1	2	1	2	2	2	2	3	3	2

Course Content	
This course enables students to identify and select a real-time Civil or Interdisciplinary engineering problem by analysing societal and industry needs and evaluating its feasibility. Students will conduct a comprehensive literature review using journals, codes, standards, and technical resources to identify research gaps and support effective problem formulation. The course further guides learners to develop a clear problem statement, define the project scope, objectives, and necessary assumptions. Emphasis is placed on preparing a structured methodology that includes preliminary analysis or design planning, data collection strategies, and project scheduling using appropriate tools and resources. Students will also gain experience in presenting technical progress and compiling a professional Project Report with effective documentation and communication skills.	**90 Hours**

Theory Hours:0	Tutorial Hours:0	Practical Hours:0	Project Hours:90	Total Hours:90

Learning Resources*

Textbooks

1. Engineering Capstone Design: Project Process and Reviews by R. Pidaparti — A practical workbook guiding students through the entire capstone design process across disciplines.
2. The Engineering Capstone Course by H. F. Hoffman et al. — Covers start-to-finish planning, execution, and documentation of engineering projects.
3. Project Management for Engineering and Construction (3rd Edition) — Provides principles and techniques of project management tailored for engineering & construction-type projects.
4. (4th Edition) by Alan Twort & Gordon Rees — Focuses on site-based management, scheduling, contracts, project controls specifically for civil engineering
5. Practical Concepts for Capstone Design Engineering — A textbook tailored for senior-level civil/construction/environmental engineering capstone work: site selection, investigation, preliminary design, drawing preparation.

Reference books/ Web Links

1. Engineering Capstone Design: Project Process and Reviews (R. Pidaparti) — covers the full design-process, templates and student notes.
2. Civil Engineering Project Management (Alan Twort & Gordon Rees) — practical guide for site-based civil engineering projects, management and contracts.
3. Engineering Capstone Design: Project Planning, Organizing and Executing — structured project planning and execution for engineering capstones.
4. Project Management: Planning and Control – Managing Engineering, Construction and Manufacturing Projects to PMI, APM and BSI Standards (Albert) — detailed reference on project-management standards and tools.
5. Handbook of Construction Project Management (Deepak Bajaj, ed.) — covers modern construction project management from planning through execution with sustainability focus.

Online Resources

1. https://scholar.google.com
2. https://bis.gov.in
3. https://www.youtube.com/c/CivilEngineeringTutorials

Assessment	
Formative	Summative
Assignments / Mini project), Quiz, Lab	eview-1, Review -2 & Review -3 End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	Expert(s) from Higher Education Institutions	Internal Expert(s)
[Name, Organization]	[Name, Intitution]	**Mr.A.Vishnu**

		Assistant Professor/CE Kumaraguru College of Technology, Coimbatore

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

SEMESTER VIII

24CEJ402	Project Phase-II	L	T	P	J	C
		0	0	0	24	12
PW		SDG	7,11			

Pre-requisite courses	Core Civil Engineering courses relevant to the chosen project domain	Data Book / Codes / Standards (If any)	IS 456 SP6 & IS 875 (part I to part V) IS10262

Course Objectives:	
The purpose of taking this course is to:	
CO 1	Conduct a comprehensive literature review of state-of-the-art developments in Civil Engineering to identify research gaps.
CO 2	Identify and analyse real-world Civil Engineering problems considering societal and industry needs.
CO 3	Design components and conduct experimental investigations on building materials in accordance with relevant BIS standards.
CO 4	Apply advanced software tools and modern engineering techniques for modelling, analysis, and project implementation.
CO 5	Prepare a comprehensive project report in the prescribed professional format adhering to standard guidelines.

Course Outcome:		
After successful completion of this course, the students shall be able to		**Revised Bloom's Taxonomy Level (RBT)**
CO 1	Conduct a comprehensive literature review of state-of-the-art developments in Civil Engineering to identify research gaps. (K4)	An
CO 2	Identify and analyse real-world Civil Engineering problems considering societal and industry needs. (K4)	An
CO 3	Design components and conduct experimental investigations on building materials in accordance with relevant BIS standards. (K5)	E
CO 4	Apply advanced software tools and modern engineering techniques for modelling, analysis, and project implementation. (K6)	C
CO 5	Prepare a comprehensive project report in the prescribed professional format adhering to standard guidelines. (K5)	E

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
3	3	2	2	1	2	2	2	2	2	2	2	2	2	2

2	2	3	2	3	1	2	1	1	1	3	3	3	3	3
3	3	2	3	3	3	1	2	2	1	2	2	3	2	2
4	3	2	3	3	3	1	2	2	2	2	2	3	2	2
5	3	2	2	2	2	1	2	1	2	2	2	3	3	2

Course Content	
This course focuses on the implementation and completion of the project initiated in Phase I. Students will work in groups to solve a real-world Civil or interdisciplinary engineering problem approved by the Project Review Committee. The course involves detailed design, experimental investigation, material testing as per BIS standards, and application of advanced software tools for analysis and validation. Students are expected to demonstrate engineering judgement, problem-solving ability, and practical skills during execution. Continuous evaluation is carried out through periodic reviews. The course also emphasizes preparation of a comprehensive project report in the prescribed format and effective presentation of the project outcomes.	**360 Hours**

Theory Hours:0	**Tutorial Hours:0**	**Practical Hours:0**	**Project Hours:360**	**Total Hours:360**

Learning Resources

Textbooks

1. Engineering Capstone Design: Project Process and Reviews by R. Pidaparti — A practical workbook guiding students through the entire capstone design process across disciplines.
2. The Engineering Capstone Course by H. F. Hoffman et al. — Covers start-to-finish planning, execution, and documentation of engineering projects.
3. Project Management for Engineering and Construction (3rd Edition) — Provides principles and techniques of project management tailored for engineering & construction-type projects.
4. (4th Edition) by Alan Twort & Gordon Rees — Focuses on site-based management, scheduling, contracts, project controls specifically for civil engineering
5. Practical Concepts for Capstone Design Engineering — A textbook tailored for senior-level civil/construction/environmental engineering capstone work: site selection, investigation, preliminary design, drawing preparation.

Reference books/ Web Links

1. Engineering Capstone Design: Project Process and Reviews (R. Pidaparti) — covers the full design-process, templates and student notes.
2. Civil Engineering Project Management (Alan Twort & Gordon Rees) — practical guide for site-based civil engineering projects, management and contracts.
3. Engineering Capstone Design: Project Planning, Organizing and Executing — structured project planning and execution for engineering capstones.
4. Project Management: Planning and Control – Managing Engineering, Construction and Manufacturing Projects to PMI, APM and BSI Standards (Albert) — detailed reference on project-management standards and tools.
5. Handbook of Construction Project Management (Deepak Bajaj, ed.) — covers modern construction project management from planning through execution with sustainability focus.

Online Resources

1. https://scholar.google.com
2. https://bis.gov.in
3. https://www.youtube.com/c/CivilEngineeringTutorials

sessment

Formative	Summative
Assignments / Mini project), Quiz, Lab	eview-1, Review -2 & Review -3 End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**

[Name, Organization]	[Name, Institution]	MS. Chitra S Assistant Professor/CE Kumaraguru College of Technology, Coimbatore

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

PROFESSIONAL ELECTIVES

24CEE001	AUGMENTED & VIRTUAL REALITY IN STRUCTURAL VISUALIZATION	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9			

Pre-requisite courses	Computer Aided Civil Engineering Drawing	Data Book / Codes / Standards (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Understand the fundamentals of Augmented Reality (AR) and Virtual Reality (VR) in civil engineering
2	Apply AR/VR tools for structural visualization and design interpretation
3	Analyze immersive visualization techniques for structural systems
4	Evaluate the effectiveness of AR/VR in construction planning and monitoring
5	Develop conceptual AR/VR-based visualization models for civil engineering applications

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Explain principles of AR and VR technologies in structural visualization	U
CO2	Apply AR/VR tools for modelling and visualization of structures	Ap
CO3	Analyse immersive visualization techniques for structural systems	An
CO4	Evaluate AR/VR applications in construction and infrastructure projects	E
CO5	Design conceptual AR/VR-based structural visualization models	C

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
CO1	3	2	-	-	-	1	1	-	-	-	-	2	1
CO2	3	3	2	-	3	1	2	-	-	-	-	3	2
CO3	3	3	2	2	3	2	2	-	-	-	-	3	2
CO4	2	2	3	2	2	3	3	2	-	-	2	2	3
CO5	3	3	3	2	3	2	2	2	2	2	2	3	3

Course Content

MODULE 1: INTRODUCTION TO AR/VR IN CIVIL ENGINEERING Fundamentals of Augmented Reality (AR) and Virtual Reality (VR) - Differences between AR, VR, and Mixed Reality - Applications in civil and structural engineering - Role in design visualization and communication - Overview of immersive technologies	**9 Hours**
MODULE 2: 3D MODELING AND BIM FOR AR/VR 3D modeling concepts for structures -BIM for structural visualization -Data integration from CAD/BIM to AR/VR platforms -Model optimization for immersive environments	**9 Hours**
MODULE 3: IMMERSIVE VISUALIZATION TECHNIQUES Visualization principles for structural systems -Rendering, lighting, and textures in VR - User interaction and navigation in virtual environments - Structural walkthroughs and simulations	**9 Hours**
MODULE 4: AR/VR IN CONSTRUCTION AND PROJECT MANAGEMENT AR/VR in construction planning and monitoring -Clash detection and error visualization -Safety training using VR -Digital twins and smart infrastructure	**9 Hours**
MODULE 5: CASE STUDY ON AR/VR IN STRUCTURAL VISUALIZATION Case study of AR in structural inspection -Case study of VR in building walkthroughs - Infrastructure visualization (bridges, high-rise buildings) -Integration of BIM with AR/VR platforms -Challenges and future trends	**9 Hours**

Theory Hours:45	**Tutorial Hours:0**	**Practical Hours:0**	**Project Hours:0**	**Total Hours:45**

Learning Resources*	
Textbooks	
1. Sherman, William., Understanding Virtual Reality, Morgan Kaufmann 2. Eastman, Chuck., BIM Handbook, Wiley	
Reference books/ Web Links	
1. Furht, Borko., Handbook of Augmented Reality 2. Whyte, Jennifer., "Virtual Reality in Construction", Journal Papers 3. IEEE / ASCE papers on AR/VR in civil engineering	
Assessment	
Formative	Summative
Assignments, Quiz	SAT- I, SAT – II and End Semester Examination (ESE)

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
Er. A.P.Murugan, Technical Head (South) Ultratech Cements Chennai	Dr.S.Praveen Kumar Associate Professor, PSG College of technology, Coimbatore	Dr.A.Vennila Assistant Professor -II Kumaraguru College of Technology Coimbatore

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEE002	Design of Prestressed Concrete Structures	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9 , 12			

Pre-requisite courses	24CEI-306-Design of Masonry and Reinforced Concrete Elements	Data Book / Codes / Standards (If any)	IS1343 Code

Course Objectives:	The purpose of taking this course is to:
1	understand the behaviour and performance of prestressed concrete structures
2	To understand the performance of composite members.
3	To learn the design of prestressed concrete structures

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Design a prestressed concrete beam accounting for losses	An
CO 2	Design for flexure and shear	Apply
CO 3	Design the anchorage zone for post tensioned members and deflection in beams	Evaluate
CO 4	Design composite members and continuous beams	Evaluate
CO 5	Design water tanks, pipes and poles	Evaluate

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	3									2	2
2	3	2	3									2	2
3	3	2	3									2	2
4	3	2	3									2	2
5	3	2	3									2	2

Course Content

INTRODUCTION — **9 Hours**

Historical developments- Basic principles of prestressing- classification and types- advantages over ordinary reinforced concrete- Materials- High strength concrete and high tensile steel- methods of prestressing- Freyssinet, Magnel, Lee-McCall and

Gifford Udall anchorage systems- Analysis of sections of stresses by stress concept, strength concept and load balancing concept- losses of prestress in post tensioned and pre tensioned members.	
DESIGN FOR FLEXURE AND SHEAR Basic assumptions for calculating flexural stresses- permissible stresses in steel and concrete as per IS 1343 code- Design of Type I and Type II post-tensioned and pre-tensioned beams- check for strength limit based on IS 1343 code.- Layout of cables in post tensioned beams- design for shear as per IS 1343 Code.	**9 Hours**
DEFLECTION AND DESIGN OF ANCHORAGE ZONE Factors influencing deflections- short term deflections of uncracked members- predictions of long term deflections due to creep and shrinkage- check for serviceability limit state of deflection. Determination of anchorage zone stresses in post tensioned beams by Magnel's method, Guyon's method and IS 1343 code- design of anchorage zone reinforcement.	**9 Hours**
COMPOSITE BEAMS AND CONTINUOUS BEAMS Analysis and design of composite beams- Shrinkage strain and its importance- methods of achieving continuity in continuous beams- Analysis of secondary moments- concordant cable and linear transformation- calculation of stresses- principle of design.	**9 Hours**
MISCELANEOUS STRUCTURES Design of tension and compression members- Design of sleepers, pipes and poles- partial prestressing- Definition, methods of achieving partial prestressing and demerits of partial prestressing.	**9 Hours**

Theory Hours:45	Tutorial Hours:0	Practical Hours:0	Project Hours:0	Total Hours:45

Learning Resources*

Textbooks

16. Krishna Raju N., Prestressed Concrete, tata McGraw Hill Company, Fifth Edition 2012.
17. Pandit G.S and Gupta S.P, Prestressed Concrete, CBS Publishers and Distributors Pvt. Ltd, Second Edition, 2014.

Reference books/ Web Links

1. Lin T.Y. and Ned H. Bums, Design of Prestressed Concrete Structures, John Wiley and Sons, Third Edition 1981.
2. Rajagopalan.N, Prestressed Concrete, Narosa Publishing House 2002.
3. Dayaratnam P, Sarah P, Prestressed Concrete Structures, Seventh edition, Oxford and IBH, 2017.
4. Sinha N.C,and Roy s.K, Fundamentals of prestressed concrete, S.Chand and Co.Ltd, 2011.

Online Resources

1. https://nptel.ac.in/courses/105106117

sessment	
Formative	Summative
Assignments , Quiz.	SA- I, SA – II and End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	Expert(s) from Higher Education Institutions	Internal Expert(s)
[Name, Organization]	[Name, Institution]	Dr.J.Premalatha/KCT

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEE003	PRECAST CONSTRUCTION	L	T	P	J	C
		3	0	0	0	3
PE		SDG				

Pre-requisite courses	Design of Reinforced Concrete Elements	Data Book / Codes / Standards (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the importance, principles, systems, materials, production, transport, and erection process used in prefabricated construction.
2	Learn the behavior and types of prefabricated structural components including panels, slabs, beams, columns, and shear walls.
3	Study design philosophy focused on material efficiency, joint flexibility, and joint deformation in precast systems.
4	Understand different types of joints and structural connections and their detailing, dimensions, and sealing requirements.
5	Learn design methods for abnormal loads and the principles to prevent progressive collapse as per code provisions.

Course Outcomes		
After successful completion of this course, the students shall be able to		**Revised Bloom's Taxonomy Levels (RBT)**
CO1	Generalize the need and principles of prefabrication and prepare a proper workflow plan for production, transportation and erection.	An
CO2	Compare different prefabricated structural components and interpret their suitability for civil engineering applications.	An
CO3	Apply material-efficient design philosophy and solve cross-section design problems considering joint deformation and flexibility.	Ap
CO4	Evaluate types of joints and structural connections and justify the choice of detailing, dimensions and sealants for safe performance.	E
CO5	Develop abnormal load design strategies and predict structural behavior to prevent progressive collapse.	C

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											**Program Specific Outcomes (PSO)**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	1	1	1	1	1	1	1	2	3	2
2	3	3	3	2	3	1	1	2	2	1	2	3	2
3	3	3	3	3	2	1	1	2	2	1	2	3	2
4	3	2	2	3	3	1	1	2	2	2	2	3	2
5	3	2	2	2	3	1	1	2	2	2	2	3	3

Course Content

INTRODUCTION Need for prefabrication – Principles of prefabrication – Modular coordination – Standardization – Materials – Systems – Production – Transportation – Erection.	**09 Hours**
PREFABRICATED COMPONENTS Behaviour and types of structural components – Large panel systems – roof and floor slabs – Walls panels - Beams - Columns - Shear walls	**09 Hours**
DESIGN PRINCIPLES Design philosophy- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation - Demountable precast concrete systems.	**09 Hours**
JOINTS AND CONNECTIONS IN STRUCTURAL MEMBERS Types of Joints – based on action of forces - compression joints - shear joints - tension joints - based on function - construction, contraction, expansion. Design of expansion joints - Dimensions and detailing - Types of sealants - Types of structural connections - Beam to Column - Column to Column - Beam to Beam - Column to foundation.	**09 Hours**
DESIGN FOR ABNORMAL LOADS Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.	**09 Hours**

Theory Hours: 45	**Tutorial Hours:**	**Practical Hours:**	**Project Hours:**	**Total Hours:** 45

Learning Resources*

Textbooks

1. Bruggeling A.S. G and Huyghe G.F. "Prefabrication with Concrete", A.A. Balkema Publishers, USA,1991.
2. Lewitt, M. " Precast Concrete- Materials, Manufacture, Properties and Usage", Applied Science Publishers, London And New Jersey, 1982.
3. Bachmann, H. and Steinle, A. "Precast Concrete Structures", Ernst & Sohn, Berlin, 2011.

Reference books/ Web Links

1. Mokk, “Prefabricated Concrete for Industrial and Public Structures”, Publishing House of the Hungarian, Academy of Sciences, Budapest, 2007.
2. Kim S. Elliott, “Precast Concrete Structures”, British Library Cataloguing in publication Data, company, Woburn, 2002
3. Ramadevi K & Anuradha R., “Prefabricated Structures”, VSRD Academic Publishing, Septmember, 2017.
4. Ramachandra Murthy S., “Design and Construction of Precast Concrete Structures”, SKU DCPCS Category Book Publications, Chennai, 2017.
5. IS 15916:2010 – Building design and erection using prefabricated concrete – Code of practice.
6. "Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.
7. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.

Online Resources

1. http://www.iitk.ac.in/nicee/wcee/article/11_16.PDF
2. https://precast.org/education/classes/

Assessment	
Formative	Summative
Assignments / Mini project), Quiz, Lab	SA- I, SA – II and End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	Expert(s) from Higher Education Institutions	Internal Expert(s)
[Name, Organization]	[Name, Institution]	Dr. K. Ramadevi /Prof/ Civil Mr. Nandhakumar P /AP II/ Civil

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEE004	SUSTAINABLE CONSTRUCTION PRACTICES AND METHODS	L	T	P	J	C
		3	0	0	0	3
PE		SDG	7, 9, 11, 12, 13			

Pre-requisite courses	Course code and name	Data Book / Codes / Standards (If any)	

Course Objectives**:	The purpose of taking this course is to:
1	Understand the principles of sustainability and green construction practices.
2	Learn sustainable construction techniques, materials and technologies.
3	Understand green building concepts, rating systems and energy efficient design.
4	Apply BIM, lean concepts and modern tools for sustainable infrastructure development.
5	Develop competency in sustainable planning, construction and resource optimization.

Course Outcomes	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Explain sustainability concepts and life cycle assessment in construction.	U
CO 2	Illustrate sustainable construction techniques and modern materials.	U
CO 3	Analyze green building concepts and rating systems.	An
CO 4	Apply energy efficient methods in building design.	Ap
CO 5	Utilize BIM and lean tools for sustainable construction management.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	1	1	-	2	1	-	1	-	2	3	2	-
CO2	3	2	2	1	1	2	1	1	1	-	2	3	2	1
CO3	2	3	3	2	1	3	2	1	1	1	2	2	3	1
CO4	2	2	3	2	2	3	1	1	1	2	2	2	3	2
CO5	2	2	2	2	3	2	1	2	2	2	3	2	2	3

Course Content

Fundamentals of Sustainability and Green Construction Introduction to Sustainability, Three Dimensions of Sustainability, Building Life Cycle, Resource Use in Built Environment, Life Cycle Assessment (LCA), Carbon Footprint, Principles of Green Engineering, Sustainable Building Materials, Environmental Impact of Materials, Green Construction Materials.	**09 Hours**
Sustainable Construction Techniques and Modern Materials Formwork Techniques, Advanced Formwork Systems, Prefabrication, Construction Waste Management, Environmentally Friendly Insulation Materials, Biodegradable Materials,	**09 Hours**

Rammed Earth Construction, Passive Solar Design, Smart Glass and IoT Integrated Automated Building Systems.	
Green Buildings and Rating Systems Green Building Concepts and Benefits, Sustainable Features in Green Buildings, IGBC, LEED India Rating System, GRIHA, BREEAM, Green Globes, CASBEE, HVAC Systems for Green Buildings, Net Zero Energy Buildings	**09 Hours**
Energy Efficiency and Sustainable Building Design Energy and Environment, Energy Efficiency and Conservation, Life Cycle Energy Use in Buildings, Embodied Energy, Operational Energy, Energy Modeling, Energy Audit, Passive Heating and Cooling, Thermal Design, Natural Ventilation.	**09 Hours**
Modern Tools and Sustainable Infrastructure Development Introduction to BIM, BIM Software Tools, BIM in Design and Maintenance, Lean Construction Concepts, Sustainable Civil Infrastructure Development, Occupational Health and Safety, Clean Energy Technologies, Operational Research Applications in Construction Management.	**09 Hours**

Theory Hours:	**45 hrs**	**Tutorial Hours:**	**Practical Hours:**	**Project Hours:**	**Total Hours: 45 Hrs**

Learning Resources*

Textbooks

14. Kibert, Charles J., Sustainable Construction: Green Building Design and Delivery, Wiley Publications.
15. Varghese, P.C., Building Materials, PHI Learning

Reference books/ Web Links

1. Sustainable Construction: Green Building Design and Delivery – Charles J. Kibert, Sustainable Construction: Green Building Design and Delivery, Wiley Publications.
2. Building Materials – P. C. Varghese, Building Materials, PHI Learning Pvt. Ltd.
3. Green Building Handbook – Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison, Green Building Handbook, Routledge Publications.
4. Integrated Design in Contemporary Architecture – Bharat Dave, Integrated Design in Contemporary Architecture, J. Ross Publishing.
5. Building Information Modeling – Chuck Eastman et al., BIM Handbook: A Guide to Building Information Modeling, Wiley Publications.
6. Lean Construction – Lincoln H. Forbes and Syed M. Ahmed, Modern Construction: Lean Project Delivery and Integrated Practices, CRC Press.

Online Resources

1. Indian Green Building Council (IGBC)
2. U.S. Green Building Council (USGBC) – LEED Resources
3. GRIHA – Green Rating for Integrated Habitat Assessment
4. Bureau of Energy Efficiency (BEE), India
5. National Programme on Technology Enhanced Learning (NPTEL)
6. SWAYAM Online Courses
7. Autodesk BIM Resources
8. World Green Building Council

sessment	
rmative	mmative
signments / Mini project), Quiz, Lab	T- I, CAT – II and End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	Expert(s) from Higher Education Institutions	Internal Expert(s)
[Name, Organization]	[Name, Institution]	Dr. K. Ramadevi, Prof/Civil

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEE005	ADVANCED DESIGN OF REINFORCED CONCRETE STRUCTURES	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9			

Pre-requisite courses	Design of Masonry and Reinforced Concrete Elements	Data Book / Code book (If any)	IS 456, SP-16

Course Objectives:

The purpose of taking this course is to:

1	Develop advanced knowledge in reinforced concrete behaviour and design principles.
2	Analyse complex RC structural components under different loading conditions.
3	Design advanced RC elements such as deep beams, flat slabs, and shear walls
4	Apply codal provisions (IS codes) in real-world structural design scenarios.
5	Enhance competency in safe, sustainable, and economical structural design.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Interpret advanced RC behavior and codal provisions	U
CO 2	Analyse complex RC elements such as deep beams and flat slabs	An
CO 3	Design advanced structural components like shear walls and water tanks	Ap
CO 4	Evaluate structural safety, serviceability, and durability	E
CO 5	Develop design solutions for complex RC structural systems	C

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	-	-	-	-	-	-	-	2	2	-
2	3	3	2	2	1	-	-	-	-	-	2	3	-
3	3	3	3	2	2	-	-	-	-	-	2	3	2
4	3	3	2	2	1	1	1	-	-	-	3	2	2
5	3	3	3	2	2	1	1	1	1	1	3	3	3

Course Content

ADVANCED DESIGN PHILOSOPHY — **9 hours**

Limit state design review- stress-strain characteristics- ductility concepts, redistribution of moments- durability and sustainability in RC design. Performance-based design concepts, comparison with international codes (ACI, Eurocode).

DESIGN OF DEEP BEAMS AND CORBELS Behavior of deep beams, strut-and-tie models, design of corbels, shear transfer mechanisms, anchorage design. Advanced STM applications and numerical modeling techniques.	**9 Hours**
DESIGN OF FLAT SLABS Direct design method, equivalent frame method, punching shear, reinforcement detailing, drop panels and column heads.	**9 Hours**
DESIGN OF SHEAR WALLS Types of shear walls, design under lateral loads, ductile detailing, coupling beams, seismic considerations (IS 13920). Performance of shear walls under earthquake loading.	**9 Hours**
DESIGN OF WATER TANKS Design principles of liquid retaining structures, rectangular and circular tanks, crack control, IS 3370 provisions. Advanced tank configurations and sustainability considerations.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources
Textbooks:
1. Pillai, S.U., and Menon, D., Reinforced Concrete Design, Tata McGraw Hill, New Delhi (2017). 2. Bansal, R.K., Reinforced Concrete Design, Laxmi Publications (2018). 3. Park, R., and Paulay, T., Reinforced Concrete Structures, Wiley (1992)
References:
1. IS 456: 2000 – Plain and Reinforced Concrete Code 2. IS 3370 – Liquid Retaining Structures 3. IS 13920 – Ductile Detailing Code

Assessment (Theory course)
SA-I, SA-II, Activity and Learning Task(s)*, Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
		Dr.V.Selvan Civil Engineering	
Recommended by BoS on			
Academic Council Approval		**Date**	

24CEE006	EARTHQUAKE ENGINEERING	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9			

Pre-requisite courses	Nil	Data Book / Code book (If any)	IS 4326, IS 1893, IS 13920, IS 13827 & IS 13828

Course Objectives:	
The purpose of taking this course is to:	
1	Gain knowledge about the types of vibration and damping
2	Understand dynamic response of SDOF and MDOF systems
3	Study active and passive vibration control devices
4	Design and introduce ductility into RC structural elements as per code provisions

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the basics of engineering seismology and theory of vibration for earthquake analysis	U
CO 2	Analyze the response of single degree of freedom (SDOF) systems to various types of excitation.	An
CO 3	Analyze the behavior of multiple degree of freedom (MDOF) systems using normal modes of vibration	An
CO 4	Analyze the code provisions for seismic design of structural elements as per relevant IS codes and apply principals of active and passive control devices for mitigating earthquake effects.	An
CO 5	Apply IS code provisions and Design structural elements like RC beams, columns and shear walls	E

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	1	1										
2	3	2	1		2							2	1
3	3	2	1		2							2	1
4	3	3	2	1	2	1	3	1	2		1	3	2
5	2	3	3	1	2	2	3	1	2		1	3	2

Course Content

INTRODUCTION: Engineering Seismology, Theory of vibration, Importance of Vibration Analysis Indian Seismicity, Earthquake history.	**6 Hours**
SINGLE DEGREE OF FREEDOM (SDOF) SYSTEMS: Degrees of freedom – SDOF idealisation - Free vibration of SDOF system – Forced vibration - Response to harmonic excitation, Impulse and response to unit impulse, Duhamel integral.	**9 Hours** _
MULTIPLE DEGREE OF FREEDOM (MDOF) SYSTEMS: Two degree of freedom system – Normal modes of vibration, Natural frequencies and Mode shapes, Introduction to MDOF system, Decoupling of equations of motion – Concept of mode superposition.	**9 Hours**
BIS SPECIFICATIONS AND SPECIAL TOPICS: Code Provisions of Design of Buildings as per IS1893 and IS4326, Ductile Detailing of Structuresas per IS13920, Behaviour and Design of Masonry Structures as Per IS 13827 and IS13828. Activeand passive control devices, Soil liquefaction	**9 Hours**
DESIGN OF STRUCTURAL ELEMENTS: Design of RC beams, columns and shear walls as per IS code provisions.	**12 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources
Textbooks:
1. Pankaj Agarwal and Manish Shrikhande, Earthquake Resistant Design of Structures, Prentice Hall of India, New Delhi, 2016. 2. Duggal S.K., Earthquake Resistant Design of Structures, Prentice Hall of India, New Delhi, 2013.
References:
1. Damodarasamy and Kavitha, Basics of Dynamics and Aseismic Design, PHI Learning PvtLtd., 2009. 2. Neville, A.M, Properties of Concrete, Pitman Publishing Limited, London, 1995. 3. Paz Mario., Structural Dynamics – Theory and Computation, CBS Publication., 5th edition, 2018. 4. A.K. Chopra, Dynamics of Structures – Theory and Applications of Earthquake Engineering, Pearson Education., 2020.
Online Educational Resources:
1. https://www.nicee.org/EQTips.php 2. https://archive.nptel.ac.in/courses/105/101/105101004/

Assessment (Theory course)
SA-I, SA-II, Activity and Learning Task(s)*, Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
			Dr.K.Ramadevi Civil Engineering
Recommended by BoS on			
Academic Council Approval		**Date**	

24CEE007	SMART INTERIORS AND AUTOMATION	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9 ,11&7			

Pre-requisite courses	Building Materials and Construction Basic Electrical Engineering (Fundamentals)	Data Book / Codes / Standards (If any)	NBC 2016

Course Objectives:	
The purpose of taking this course is to:	
1	Understand principles of smart interiors and intelligent building systems
2	Apply interior design and automation software tools in civil engineering contexts
3	Analyse IoT-based systems for building automation and energy efficiency
4	Evaluate sustainable smart interior solutions for modern infrastructure
5	Develop competency in designing smart interior layouts using BIM and simulation tools

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Explain concepts of smart interiors and building automation systems	U
CO 2	Apply interior design and IoT tools for smart building layouts	AP
CO 3	Analyse smart lighting, HVAC, and energy systems using software tools	An
CO 4	Evaluate sustainable and automated interior solutions	E
CO 5	Design smart interior layouts integrating civil and automation systems	C

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
CO1	3	2	-	-	-	1	2	-	-	-	-	2	1
CO2	3	3	2	-	3	1	2	-	-	-	-	3	2
CO3	3	3	2	2	3	2	3	-	-	-	-	3	2
CO4	2	2	3	2	2	3	3	2	-	-	2	2	3
CO5	3	3	3	2	3	2	3	2	2	2	2	3	3

Course Content

MODULE 1: INTRODUCTION TO SMART INTERIORS Evolution of interior design in civil engineering - Smart interiors and intelligent buildings - Smart homes vs conventional buildings - Role of civil engineers in smart infrastructure -Integration of architecture, interiors, and automation	**9 Hours**
MODULE 2: IoT AND SENSOR SYSTEMS IN BUILDINGS Fundamentals of IoT in buildings -Types of sensors: motion, light, temperature, humidity - Communication protocols (Wi-Fi, Zigbee, Bluetooth) -Smart device integration in buildings - Data acquisition and monitoring	**9 Hours**
MODULE 3: SMART LIGHTING AND ENERGY MANAGEMENT Smart lighting systems and control -Daylighting techniques - Energy-efficient interior design - Smart metering and monitoring - green building concepts	**9 Hours**
MODULE 4: HVAC AND INDOOR ENVIRONMENT AUTOMATION Smart HVAC systems - Thermal comfort and indoor air quality -Automated climate control - Integration with building systems - Sustainable indoor environmental design	**9 Hours**
MODULE 5: CASE STUDY ON SMART INTERIORS AND AUTOMATION Software Integration: Autodesk Revit -SketchUp- Case study of smart residential building - commercial smart buildings Integration of lighting, HVAC, IoT, and security systems -Building Management Systems (BMS) - Challenges and future trends	**9 Hours**

Theory Hours: 45	**Tutorial Hours:0**	**Practical Hours:0**	**Project Hours:0**	**Total Hours:** 45

Learning Resources*	
Textbooks	
1. Sinopoli, Jim., Smart Building Systems, Elsevier, 2010 2. Wang, Shengwei., Intelligent Buildings and Building Automation, Routledge, 2009	
Reference books/ Web Links	
1. Clements-Croome, Derek., Intelligent Buildings, ICE Publishing, 2013 2. Kolokotsa, Dimitra., "Smart Buildings and Energy Efficiency", Journal of Energy Systems 3. IEEE Papers on IoT-enabled smart infrastructure	
Assessment	
Formative	Summative
Assignments, Quiz	SA- I, SA- II and End Semester Examination (ESE)

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
Er.Kumaravel.S Founder Aram Architecture, Interior Design Studio, Coimbatore	Dr.M.P.Muthuraj HOD Coimbatore Institute of Technology Coimbatore Internal Expert(s)	Dr.A.Vennila Assistant Professor -II Kumaraguru College of Technology Coimbatore

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEE008	MAINTENANCE AND REHABILITATION OF STRUCTURES	L	T	P	J	C
PE		SDG	9, 11, 12			

Pre-requisite courses	Course code and name	Data Book / Codes / Standards (If any)	IS 456, IS 15988, IRC SP 40

Course Objectives**:	The purpose of taking this course is to:
1	Understand the concepts of maintenance, repair and rehabilitation of structures.
2	Analyze the causes of deterioration and durability issues in concrete structures.
3	Gain knowledge on repair materials and modern rehabilitation techniques.
4	Develop competency in retrofitting, strengthening and demolition practices.
5	Apply suitable maintenance and rehabilitation strategies for damaged structures.

Course Outcomes	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO1	Explain the principles of maintenance, inspection, structural health monitoring and condition assessment of structures.	U
CO2	Analyze durability and serviceability problems in concrete structures under various environmental and loading conditions.	An
CO3	Select advanced repair materials and modern rehabilitation techniques for damaged structures.	Ap
CO4	Apply suitable retrofitting, strengthening and seismic rehabilitation methods for structural systems.	Ap
CO5	Evaluate sustainable demolition, recycling and smart rehabilitation practices for existing structures.	E

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	1	2	2	2	1	-	-	1	1	3	2	1
CO2	3	3	2	2	2	2	1	-	-	1	1	3	2	1
CO3	3	2	3	2	3	2	1	-	-	1	1	3	3	2
CO4	3	3	3	2	3	2	1	-	1	1	1	3	3	2
CO5	2	2	2	1	2	3	3	1	1	1	2	2	2	2

Course Content

MODULE 1 – MAINTENANCE AND REPAIR STRATEGIES	09 Hours
Maintenance, repair and rehabilitation – facets and importance of maintenance – preventive and predictive maintenance – structural health monitoring (SHM) concepts – digital inspection techniques using drones and sensors – non-destructive testing methods – assessment procedures for damaged structures – causes of deterioration – condition rating systems – life cycle assessment of structures.	

MODULE 2 – SERVICEABILITY AND DURABILITY OF CONCRETE Quality assurance in concrete construction – concrete properties: strength, permeability, thermal properties and cracking – durability under aggressive environmental exposure – chloride and sulphate attack – carbonation and corrosion mechanisms – effects of climate change on structural durability – self-healing concrete concepts – performance-based durability design – design and construction errors – service life prediction techniques.	**09 Hours**
MODULE 3 – MATERIALS AND TECHNIQUES FOR REPAIR Special concretes and mortars – polymer concrete – geopolymer concrete – ultra-high-performance concrete (UHPC) – fibre reinforced concrete – ferrocement – self-compacting concrete for repair – nano-materials in concrete repair – corrosion resistant coatings – cathodic protection – epoxy injection – grouting methods – shotcrete and robotic shotcreting – FRP wrapping systems – 3D printing applications in repair and rehabilitation.	**09 Hours**
MODULE 4 – REPAIRS, REHABILITATION AND RETROFITTING OF STRUCTURES Repairs for low member strength, cracking and deflection – retrofitting techniques for RCC and steel structures – seismic rehabilitation and base isolation systems – jacketing methods – FRP strengthening – rehabilitation of bridges and industrial structures – fire damage assessment and repair – marine structure rehabilitation – BIM applications in rehabilitation projects – estimation and project management of rehabilitation works.	**09 Hours**
MODULE 5 – DEMOLITION AND DISMANTLING TECHNIQUES Engineered demolition techniques – controlled blasting methods – robotic demolition – dismantling and deconstruction techniques – safety measures during demolition – reuse and recycling of construction materials – sustainable rehabilitation practices – circular economy concepts in construction – smart materials for adaptive structures – case studies on advanced rehabilitation and demolition projects.	**09 Hours**

Theory Hours:	**45 hrs**	**Tutorial Hours:**	**Practical Hours:**	**Project Hours:**	**Total Hours: 45 hrs**

Learning Resources*

Textbooks

18. Shetty, M.S., Concrete Technology, S. Chand & Company Ltd., New Delhi (2019).
19. Varghese, P.C., Maintenance Repair and Rehabilitation & Minor Works of Buildings, PHI Learning Pvt. Ltd., New Delhi (2014).

Reference books/ Web Links

16. Denison Campbell, Allen and Harold Roper, *Concrete Structures – Materials, Maintenance and Repair*, Longman Scientific and Technical, UK (1991).
17. Raikar, R.N., *Learning from Failures – Deficiencies in Design, Construction and Service*, R&D Centre (SDCPL), Mumbai (2005).
18. IS 15988:2013, *Seismic Evaluation and Strengthening of Existing Reinforced Concrete Buildings – Guidelines*, BIS, New Delhi.
19. IS 456:2000, *Plain and Reinforced Concrete – Code of Practice*, BIS, New Delhi.
20. https://nptel.ac.in
21. https://swayam.gov.in

Online Resources

1. NPTEL – Repair and Rehabilitation of Structures
2. SWAYAM Courses – Civil Engineering

3. Indian Concrete Institute (ICI)
4. American Concrete Institute (ACI)
5. International Federation for Structural Concrete (fib)
6. Bureau of Indian Standards (BIS)
7. Federal Highway Administration – Bridge Preservation Resources
8. The Constructor – Repair and Rehabilitation of Structures Articles
9. Institution of Civil Engineers (ICE) Knowledge Hub
10. ASCE Library – Structural Engineering Resources

sessment	
rmative	mmative
signments / Mini project), Quiz, Lab	T- I, CAT – II and End Semester Examination (ESE)

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
[Name, Organization]	[Name, Institution]	[Name, Department]

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEE013	ENVIRONMENTAL IMPACT ASSESSMENT AND LIFE CYCLE ANALYSIS	L	T	P	J	C
		3	0	0	0	3
PE		SDG	13,15,17			

Pre-requisite courses	NIL	Data Book / Code book (If any)	

Course Objectives:	
The purpose of taking this course is to:	
1	To provide a basic understanding of the EIA process as its uses in research, planning, project or program evaluation, monitoring, and regulatory enforcement
2	To introduce legal, economic, social, administrative and technical process of preparing and/or evaluating environmental impact documents
3	To use the EIA tool for arriving practical situations in project planning and implementation and decision making

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the concepts of Environmental Impact Assessment (EIA) process flow to create a clear process diagram for Civil Engineering projects.	Ap
CO 2	Analyze various methods of EIA to assess their impact on the environment, including air, water, soil, and biological aspects.	An
CO 3	Evaluate the socio-economic impacts of Civil Engineering projects by conducting a thorough Socio-Economic Impact Assessment (SIA)	E
CO 4	Create a comprehensive EIA for Civil Engineering projects, incorporating screening, scoping, analysis, and mitigation measures.	C
CO 5	Apply Life Cycle Assessment (LCA) as a decision-making tool in evaluating the sustainability and environmental impact of engineering projects.	Ap

ourse Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3			3	3		3	2			3	3	2
2	3			3	3		3	2			3	3	2
3	3			3	3		3	2			3	3	2
4	3			3	3		3	2			3	3	2
5	3			3	3		3	2			3	3	2

Course Content	
INTRODUCTION AND HISTORICAL DEVELOPMENT OF	**9 Hours**

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) EIA in Project Cycle. Legal and Regulatory aspects in India. – Types and limitations of EIA – Cross sectoral issues and terms of reference in EIA – Public Participation in EIA. EIA process- screening – scoping - setting – analysis – mitigation	
COMPONENTS AND METHODS FOR EIA EIA Matrices – Networks – Checklists – Connections and combinations of processes - Cost benefit analysis – Analysis of alternatives – Software packages for EIA – Expert systems in EIA. Prediction tools for EIA – Mathematical modeling for impact prediction – Assessment of impacts – air – water – soil – noise – biological — Cumulative Impact Assessment	**9 Hours**
SOCIO-ECONOMIC IMPACT ASSESSMENT Definition of social impact assessment-Social impact assessment planning process-measurement for SIA variables-Relationship between social impacts and change in community and institutional arrangements. Individual and family level impacts. Selecting, testing and understanding significant social impacts. Mitigation and enhancement in social assessment	**9 Hours**
ENVIRONMENTAL MANAGEMENT PLAN AND SECTORAL EIA Environmental Management Plan - preparation, implementation and review – Mitigation and Rehabilitation Plans – Policy and guidelines for planning and monitoring programmes – Post project audit – Ethical and Quality aspects of Environmental Impact Assessment. EIA case studies related to the following sectors - Infrastructure –construction and housing Mining – Industrial - Thermal Power - River valley and Hydroelectric – coastal projects-Nuclear Power.	**9Hours**
INTRODUCTION AND APPLICATION OF LCA Introduction and history of LCA terminology, Goal & scope definition Economic input-output (EIO) LCA Attributional versus consequential LCA. Future developments in LCA, Life cycle impact assessment (LCIA) Characterization factors, LCA-Case studies	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources

Textbooks:

1. Environmental Impact Assessment: Theory and Practice – Anji Reddy Mareddy (2017), Butterworth-Heinemann.
2. Environmental Impact Assessment – R. R. Barthwal (2nd Edition, 2012), New Age International.

References:

1. Environmental Impact Assessment: A Guide to Best Professional Practices – Charles H. Eccleston (2011), CRC Press.
2. Life Cycle Assessment: Theory and Practice – Michael Z. Hauschild, Ralph K. Rosenbaum, Stig Irving Olsen (2018), Springer.
3. Environmental Impact Assessment – Lawrence W. Canter (1996), McGraw-Hill.

Online Resources:

1. International Institute for Sustainable Development – EIA Online Learning Platform (www.iisd.org/learning/eia)
2. Ministry of Environment, Forest and Climate Change – EIA Manuals (http://www.MoEF.nic.in/division/EIA-Manual)

Assessment (Theory course)

SA I, II, Open book test; Cooperative learning report, Assignment; Journal paper review, Group

Presentation, Project report, Poster preparation, Prototype or Product Demonstration etc. (as applicable) , End Semester Examination

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Mr. Senthilkumar.N Global Lab and Consultancy Service Salem	Dr. Mohammed Siraj Ansari A, Scientist – C, Central Academy for State Forest Service, Directorate of Forest Education, Ministry of Environment, Forest and Climate Change, Burnihat, Assam		Dr. G.L.Sathiyamoorthy. Professor, Department of Civil Engineering
Recommended by BoS on			
Academic Council Approval		**Date**	

24CEE014	SURFACE WATER HYDROLOGY	L	T	P	J	C
		3	0	0	0	3
PE		SDG		6,11,13		

Pre-requisite courses	Fluid Mechanics	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Introduce the hydrological cycle and its components, incorporating IMD gridded rainfall datasets, remote sensing products and GIS-based spatial rainfall analysis.
2	Impart concepts of hydrological abstractions including evapotranspiration and infiltration using modern hydrological estimation methods.
3	Develop hydrograph analysis and rainfall-runoff modelling skills using contemporary hydrological simulation tools.
4	Enable students to perform flood estimation and routing studies for watersheds and reservoirs using computational approaches.
5	Learn the impacts of urbanization on the water cycle and apply sustainable urban drainage concepts using urban hydrological modelling tools.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyse historical precipitation data using IMD gridded datasets and GIS tools to quantify IDF relationships, perform frequency analysis and estimate Probable Maximum Precipitation.	An
CO 2	Assess effective precipitation by estimating evapotranspiration and infiltration losses using Penman-Monteith, Green-Ampt and NRCS-CN approaches under varying climatic conditions.	An
CO 3	Develop and validate runoff hydrographs using HEC-HMS and synthetic unit hydrograph techniques for watershed modelling applications.	E
CO 4	Design flood routing solutions using HEC-RAS and reservoir routing methods considering flood mitigation and dam safety requirements.	C
CO 5	Evaluate urban water cycles and urbanization impacts on runoff using EPA-SWMM, LID/SUDS concepts and sustainable urban drainage principles.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2

1	3	3		2	3						2	3	
2	3	3		2	2	2					2	3	
3		3	3	3	3			2			2	2	3
4		3	3	2	3	3		2		2		3	3
5		3	2	2	3	3	2			2	2		3

Course Content	
PRECIPITATION • Hydrologic cycle. • Types and forms of precipitation. • Measurement of precipitation. • Determination of adequacy of rain gauges. • Consistency analysis using Double Mass Curve. • Estimation of mean precipitation over an area. • Intensity-Duration-Frequency (IDF) relationships. • IMD gridded rainfall datasets and spatial rainfall analysis. • Thiessen Polygon and Kriging interpolation using GIS. • Remote sensing rainfall products (GPM-IMERG). • Probable Maximum Precipitation (PMP) and WMO procedures. • Climate change impacts on precipitation and non-stationary IDF concepts.	**9 Hours**
ABSTRACTIONS FROM PRECIPITATION • Interception and depression storage. • Evaporation process and methods of measurement. • Evapotranspiration concepts. • Penman-Monteith (FAO-56) reference evapotranspiration. • Infiltration process and measurement methods. • Infiltration indices (Φ-index and W-index). • Green-Ampt infiltration model. • NRCS-CN runoff estimation method. • Soil hydrologic groups and antecedent moisture conditions. • Climate change impacts on evapotranspiration and soil moisture.	**9 Hours**
HYDROGRAPHS • Components of hydrograph. • Factors affecting hydrograph shape. • Base flow separation techniques. • Unit Hydrograph theory. • Derivation of Unit Hydrograph. • S-Curve method. • Synthetic Unit Hydrograph. • CWC synthetic Unit Hydrograph concepts. • HEC-HMS hydrological modelling framework. • Watershed delineation and basin model development. • Clark Unit Hydrograph and SCS Unit Hydrograph methods. • Calibration and validation of hydrographs.	**9 Hours**
FLOODS AND FLOOD ROUTING **Floods** • Causes of floods. • Factors affecting flood flow. • Flood estimation methods. • Flood control measures. **Peak Discharge and Routing** • Flood frequency analysis.	**9 Hours**

• Gumbel's method. • Log-Pearson Type III distribution. • Reservoir routing. • Channel routing. • HEC-RAS hydraulic modelling. • Flood inundation mapping. • Dam-break analysis and emergency action planning. • Climate change impacts on flood estimation and routing.	
URBAN HYDROLOGY • Introduction to urbanized landscapes. • Water sustainability in cities. • Urban water cycle. • Components of urban water budget. • Methods of urban water budget computation. • Urbanization impacts on surface runoff. • EPA-SWMM modelling framework. • Urban stormwater drainage modelling. • Low Impact Development (LID) practices. • Sustainable Urban Drainage Systems (SUDS). • Water Sensitive Urban Design (WSUD). • Chennai Day Zero and urban water resilience. • Ethical responsibilities in urban drainage planning and management.	**9 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 45

Learning Resources

Textbooks:

1. K. Subramanya, *Engineering Hydrology*, McGraw Hill Education, 5th Edition, 2023.
2. Chow, Maidment and Mays, *Applied Hydrology*, McGraw-Hill Education, Latest Edition.
3. H.M. Raghunath, *Hydrology: Principles, Analysis and Design*, New Age International, Latest Edition.

References:

1. CWC, *Design Flood Estimation Guidelines*, Central Water Commission, Government of India, 2016.
2. WMO-No.1045, *Manual on Estimation of Probable Maximum Precipitation (PMP)*, World Meteorological Organization.
3. FAO Irrigation and Drainage Paper 56, *Crop Evapotranspiration – Penman-Monteith Method*.
4. USACE, *HEC-HMS Technical Reference Manual*, Version 4.12.
5. USACE, *HEC-RAS Hydraulic Reference Manual*, Version 6.x.
6. EPA, *Storm Water Management Model (SWMM) User Manual*, Version 5.2.
7. IS 5477 (Part 1): Methods for Hydrologic Investigations.
8. IS 11223: Guidelines for Fixing Spillway Capacity.

Online Resources:

1. India Meteorological Department (IMD) Gridded Rainfall Portal.
2. NASA Global Precipitation Measurement (GPM-IMERG) Data Portal.
3. HEC-HMS User Manual.
4. HEC-RAS User Manual.
5. EPA-SWMM User Manual.
6. QGIS User Manual.

Assessment (Theory course)

SA I, SA II, Open Book Test, Assignment, Journal Paper Review, Group Presentation, Case Study Analysis, Cooperative Learning Report, Poster Presentation, Mini Project, Model Demonstration,

Software-Based Hydrological Modelling Exercises, End Semester Examination.

Course Curated by		
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**
Dr.N.Ramsundram, Atkins Realis, Bangalore		. Nishant, Asst Professor, Department of Civil Engineering, KCT
Recommended by BoS on		
Academic Council Approval		**Date**

24CEE015 **PC**	**AIR AND NOISE POLLUTION CONTROL**	**L**	**T**	**P**	**J**	**C**
		3	**0**	**0**	**0**	**3**
		SDG	**3, 11, 13**			
Pre-requisite courses	-	**Data Book / Code book (If any)**	-			

Course Objectives:	
The purpose of taking this course is to:	
1	Understand various air pollutants in ambient and indoor environments, their sources and impacts.
2	Analyze air quality using indices and standards
3	Study dispersion of pollutants and meteorological influences.
4	Learn indoor air pollution sources and control strategies.
5	Understand noise pollution sources, effects, and control measures.

Course Outcomes		
After successful completion of this course, the students shall be able to		**Revised Bloom's Taxonomy Levels (RBT)**
CO 1	Apply knowledge of air pollutants, sources, and their effects on living and non-living systems	Ap
CO 2	Analyze atmospheric dispersion of pollutants and predict environmental impacts	An
CO 3	Evaluate indoor air pollution sources and design control measures	E
CO 4	Analyze air pollution control techniques and select appropriate equipment	An
CO 5	Develop strategies for noise pollution management and control	C

Course	**Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)**											**Program Specific Outcomes (PSO)**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	

	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	1	2	2	1	2		1	2	3	2
2	3	3	2	2	3	2	1	3		1	2	2	3
3	3	3	2	3	2	3	2	1		2	3	3	2
4	3	3	3	2	3	2	1	2		3	2	3	3
5	3	2	3	3	3	3	2	2		2	3	3	3

Course Content	
INTRODUCTION • Definition of clean air, nature and types of air pollutants • Sources and effects on humans, animals, vegetation, and materials • Stack emission standards and ambient air quality standards • Gaseous pollutants and control measures • Air pollution legislation and CPCB guidelines • Air Quality Index (AQI) and management in India • Disaster management and case studies	**9 Hours**
METEOROLOGY AND AIR QUALITY MODELLING • Geographical and meteorological factors affecting air pollution • Sampling techniques and classification • Ambient and stack sampling methods • Automobile pollution and pollutant analysis • Atmospheric stability, lapse rate, wind rose, inversion • Plume behavior and dispersion of pollutants • Gaussian plume model and its modifications	**9 Hours**
CATALYTIC COMBUSTION AND INDOOR AIR POLLUTION • Gaseous pollutant removal principles • Adsorption, catalytic combustion and oxidation • Indoor air pollutants: VOCs, inorganic gases, particulates • Bioaerosols, radon, and infectious disease transmission • Sick building syndrome and control strategies	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources
Textbooks:
1. Anjaneyulu D., *Air Pollution and Control Technologies*, Allied Publishers, 2002. 2. Rao M.N. & Rao H.V.N., *Air Pollution Control*, Tata McGraw-Hill, 2017. 3. Rao C.S., *Environmental Pollution Control Engineering*, New Age International, 2018. 4. *Air and Noise Pollution Control: Volume 1 (Handbook of Environmental Engineering) by Lawrence K. Wang & Norman C. Pereira*
References:
1. Patrick C.F., *Environmental Noise Pollution*, John Wiley & Sons, 1977. 2. Khanna B.K., *All You Wanted to Know About Disasters*, New India Publishing Agency, 2005. 3. Chen C, Zhao B. Review of relationship between indoor and outdoor particles: I/O ratio, infiltration factor and penetration factor. Atmos Environ. 2011;45(2):275–88. 4. Abt E, Suh HH, Allen G, Koutrakis P. Characterization of indoor particle sources:
Online Resources:
1. https://onlinecourses.nptel.ac.in/noc23_ce14/preview 2. https://nptel.ac.in/courses/105107213 3. https://nptel.ac.in/courses/105106491 4. https://www.scribd.com/document/848711345/Air-pollution-and-Control-Unit-14-Week-11 5. https://nptel.ac.in/courses/112104227

Assessment (Theory course)
SAI & SAII, Open Book Test, Learning Tasks (Concept Maps, Diagnostic Questions), (ESE).

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Dr.Krishnamurthi, Head Scientist,CSIR,NEERI,Nagpor	Dr. Sri Muruganandham, Professor AND Head, VIT,Vellore		Dr.A.Gandhimathi, Associate Professor,Department of Civil Engineering,KCT
Recommended by BoS on			
Academic Council Approval		**Date**	

24CEE016	INDUSTRIAL WASTEWATER TREATMENT	L	T	P	J	C
		3	0	0	0	3
PE		SDG	6,9,13,14,15			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	To introduce the sources, characteristics, and impacts of industrial wastewater, and the relevant environmental legislation to ensure compliance.
2	To enable students to understand cleaner production strategies for achieving sustainable industrial practices.
3	To provide knowledge on various industrial wastewater treatment technologies and their applications for achieving effective treatment, reclamation, and residue management.
4	To analyze real-world case studies of major polluting industries and develop insights into effective treatment and waste management practices.
5	To impart the significance of health and safety management in industries, focusing on occupational hazards, toxic exposure limits, and safety measures for diverse industrial environments.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the knowledge of industrial waste characteristics to assess their sources and impacts for ensuring compliance with environmental legislation.	Ap
CO 2	Analyze waste minimization strategies to recommend sustainable cleaner production techniques in industrial processes.	An
CO 3	Analyze various treatment technologies to suggest their suitability for treating industrial effluents and achieving environmental compliance.	An
CO 4	Interpret case studies of major polluting industries to propose effective waste treatment and management solutions for diverse industrial scenarios.	An
CO 5	Evaluate health and safety management measures to recommend effective strategies for mitigating occupational health hazards and enhancing industrial safety.	E

Course Outcomes (CO)	Program Outcomes (PO)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	3	2	1	2	3	2		1		2	2	2
2	2	3	3	2	2	2		1		2	2	2	3

3	3	3	3	2	3	2				2	2	3	3
4	2	3	3	3	2	3	2	2	2	2	2	3	3
5	2	2	2	1	1	3	3	2	2	2	2	1	3

Course Content	
INTRODUCTION Types of industries- Sources, Characteristics and Impacts of industrial waste– Population equivalent – Bioassay studies – ISI tolerance limits for discharging industrial effluents into surface water, into public sewers, and onto land for irrigation– Environmental legislation related to the prevention and control of industrial effluents and hazardous wastes.	**7 Hours**
CLEANER PRODUCTION Waste Management Approach – Prevention vs. Control of industrial pollution – Process Modification– Methods and materials changes - Volume and strength reduction – Waste minimization strategies – Zero Discharge Concept - Waste Audit —Recycle, reuse and byproduct recovery – Applications.	**8 Hours**
TREATMENT TECHNOLOGIES Equalisation – Neutralisation – Physico chemical treatment: Removal of suspended and dissolved organic solids – Removal of dissolved inorganics – Advanced oxidation – Heavy metal removal – Photocatalysis - Membrane Technology - Air Stripping and Adsorption - Individual and Common Effluent Treatment Plants (ETP's) – Wastewater reclamation concept - Residue & sludge management – Disposal.	**12 Hours**
CASE STUDIES ON MAJOR POLLUTING INDUSTRIES Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Pulp & Paper, distilleries, Refineries, fertilizer, thermal power plants, Industrial Estates – Case studies.	**10 Hours**
HEALTH AND SAFETY MANAGEMENT IN NDUSTRIES Importance of Industrial safety - Occupational Health Hazards, Classification of health hazards and their effects - Promoting safety and health training, biochemical action of toxic substance - type and degrees of toxic effects, threshold limits of exposure (TLV), STEL, IDLH, Ld/LC etc. – Occupational and Environmental safety measures in area specific industries.	**8 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources

Textbooks:

1. Nemerow, Nelson Leonard., 2007. "Industrial waste Treatment", Elsevier Science & Technology.
2. Ahmad Ashfaq., 2014. Industrial waste treatment technology", S.K. Kataria &Sons.

References:

1. M.N.Rao & A.K.Dutta, 1995. "Wastewater Treatment", Oxford - IBH Publication.
2. W.W. Eckenfelder Jr., 2000. "Industrial Water Pollution Control", 2000. 3rd ed. McGraw-Hill Book Company, New Delhi.
3. R.L.Stephenson and J.B.Blackburn, Jr., 1998. "Industrial Wastewater Systems Handbook", Lewis Publisher, New Yark.

Metcalf & Eddy/ AECOM, 2007, "water reuse Issues, Technologies and Applications", The McGraw-Hill companies.

4. H.M.Freeman, 1995. "Industrial Pollution Prevention Handbook", McGraw-Hill Inc., New Delhi.
5. Charles D.Reese, 2017. "Occupational Health and Safety Management: A Practical Approach",

3rd ed. CRC press, Taylor & Francis ltd.
Deshmukh, and L M., 2005. “Industrial safety management”, McGraw Hill publication

Online Educational Resources:

1. https://onlinecourses.nptel.ac.in/noc24_ce53/preview
2. https://www.udemy.com/course/the-complete-course-in-water-and-wastewater-treatment/?couponCode=LEARNNOWPLANS

Assessment (Theory course)
SA I & SA II, Formative Assessment, Activity and Learning Task(s), MCQ, End Semester Examination (ESE)

Course Curated by		
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**
Mr. E. Thinakaran Team Leader Underground Sewerage System: Government Project, Thiruvarur Municipality Thiruvarur	Dr. Mohammed Siraj Ansari A, Scientist – C, Central Academy for State Forest Service, Directorate of Forest Education, Ministry of Environment, Forest and Climate Change, Burnihat, Assam.	Dr. B. Nithyalakshmi, Assistant Professor II, Department of Civil Engineering
Recommended by BoS on		
Academic Council Approval		**Date**

24CEE017	WASTE MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
PE		SDG	3,11,12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Provide fundamental knowledge of solid and hazardous waste management, including handling, treatment, and disposal practices.
2	Introduce technologies for converting non-recyclable waste into useful energy, promoting sustainable waste utilization.
3	Create awareness about e-waste management and its impacts on human health, environment, and society.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyze waste management challenges by applying integrated waste management principles and sustainability practices.	An
CO 2	Develop and implement resource recovery strategies and safe treatment methods for municipal and industrial waste.	C
CO 3	Apply knowledge of hazardous and biomedical waste management techniques to ensure safe handling, storage, and disposal.	Ap
CO 4	Evaluate the potential for energy generation from diverse waste streams using thermal, biochemical, and mechanical processes.	E
CO 5	Design innovative and sustainable methods for e-waste management, focusing on recovery, recycling, and stakeholder collaboration.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	3				3		2			2		
2	3	3	3		2	3		2			2	2	
3	3	3	2	2		3	3				2	2	
4	3	3		3	3	3					3	3	2
5		3	3		3	3	2		2		3	2	2

Course Content	
INTRODUCTION • Principles of waste management. – Waste minimization. – Integrated waste management. – Waste management and environmental protection. – Waste management concept.	**9 Hours**

• Best management practices for sustainable development. – Information systems in waste management – Legal Aspects of Environmental Management. • Environmental Legislations in India – Swachh Bharat Mission and Smart Cities Program - MoEF Guideline.	
SOLID WASTE MANGEMENT • Introduction to Solid Waste Management – Municipal Solid Waste Characteristics and Quantities MSW Rules 2016 – Municipal Solid Waste Collection – Transportation – Segregation and Processing Disposal of Municipal Solid Waste Biochemical Processes and Composting. • Current Issues in Solid Waste Management – Disposal of Solid Waste-Municipal solid waste in Indian conditions, legal aspects of solid waste disposal, Plastic waste – Plastic waste disposal.	**9 Hours**
HAZERDEOUS WASTE AND BIOMEDICAL WASTE MANAGEMENT • Hazardous waste definition – Physical and Health hazards wastes – Hazardous Waste Management and Handling Rules – Characterization of hazardous wastes Source reduction of hazardous wastes. • Handling and storage of Hazardous wastes –Waste Compatability Chart – Hazardous Waste Transport- Manifest system – Transboundary movement of wastes –Basal Convention – Hazardous waste treatment technologies – Physical, chemical and thermal treatment of hazardous waste – Solidification – Chemical fixation – Encapsulation – Incineration. Secured landfills	**9 Hours**
ELECTRONIC WASTE • Present scenario of E-Waste management in India- Composition of E-Waste and its generation rates .Effect of E-waste on human health, environment and society. • Role of various stakeholders in E-waste management .Recover and recycling of Electronic Waste .Extraction of Rare-Earth Minerals. • Rules and Legislation .Formal Metal extraction processes from E-Waste; Life-Cycle-Analysis (LCA) The challenges of E-Waste management for smart cities.	**9 Hours**
ENERGY FROM WASTE • Characterization of wastes - Energy production form wastes through incineration, energy production through gasification of wastes - Energy production through pyrolysis and gasification of wastes, syngas utilization. - Densifications of solids, efficiency improvement of power plant and energy production from waste plastics. • Week Energyproduction from waste plastics, gas cleanup- Energy production from organic wastes through anaerobic digestion and fermentation, introduction to microbial fuel cells - Cultivation of algal biomass from wastewater and energy production from algae.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources
Textbooks:
1. Hazardous waste (management and handling) rules, 2001 2. Ramachandra T.V., Management of Municipal Solid Waste, Commonwealth Of Learning, Canada and Indian Institute of Science, Bangalore. 2006.
References:
1. Electronic Waste Management Rules 2016, Govt. of India, available online at CPCB website.

2. Hazardous waste management Charles A. Wentz. Second edition McGraw Hill International.1995
3. Efstratios N Kalogirou Waste to Energy technology and Global application,CRC Press 2017.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc24_ce77/preview
2. https://archive.nptel.ac.in/courses/105/106/105106056/
3. https://onlinecourses.nptel.ac.in/noc22_ce69/preview
4. https://archive.nptel.ac.in/courses/120/108/120108005/

Assessment (Theory course)
SAI & SAII, Open Book Test, Learning Tasks (Concept Maps, Diagnostic Questions), (ESE).

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Dr. Krishna Murthy, CSIR,NEERI, Nagpur			Mr. S. Nishanth, Asst Professor, Department of Civil Engineering, KCT, Coimbatore
Recommended by BoS on			
Academic Council Approval		**Date**	

24CEE018	IRRIGATION AND WATER RESOURCE MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
PE		SDG	6,11,13			

Pre-requisite courses	-	Data Book / Codes / Standards (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Expose students to different phases in Water Resources Management and National Water Policy.
2	Understand the components and classification of various impounding structures.
3	Classify irrigation methods and summarize irrigation management practices.
4	Develop knowledge on flood and drought management techniques.
5	Enable application of irrigation engineering principles in real-world problems.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply knowledge of water resources to plan and assess data for project formulation in India and Tamil Nadu	AP
CO 2	Apply water resource management techniques to solve flood and drought related issues	AP
CO 3	Analyze irrigation engineering principles to estimate crop water requirements and irrigation efficiencies	An
CO 4	Analyze canal irrigation structures and interpret forces acting on dams and canal systems	An
CO 5	Apply irrigation methods to prepare irrigation scheduling using modern technique	AP

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	3	2			3			2			3	
2	3	3	3			2	2		3			3	
3	2	3	3			2		2	2			3	
4	3	3	2	3		3	2					3	3
5	3	2	2			3	3	2	2	2	2	3	3

Course Content	
WATER RESOURCES - • Water resources of India and Tamil Nadu • Surface and Ground Water Resources • Concepts for planning water resources development • National Water Policy • Planning and assessment of data for project formulation	**9 Hours**
WATER RESOURCE MANAGEMENT • Planning of water storage reservoirs • Identification of reservoir locations and types • Principles of reservoir operation • Flood: basics, design flood estimation, management measures • Drought: concept and management measures • Application of Remote Sensing and GIS • Case studies	**9 Hours**
IRRIGATION ENGINEERING • Need, merits and demerits of irrigation • Duty, Delta and Base Period • Irrigation efficiencies • Crops and seasons • Crop water requirement • Consumptive and non-consumptive use • Methods for estimating consumptive use	**9 Hours**
CANAL IRRIGATION • Types of impounding structures: Dams • Classification and structure of dams • Gravity dams: forces and failure analysis • Diversion head works • Canal drops and types • Cross drainage works • Canal lining and design procedure • Kennedy's and Lacey's Regime theory	**9 Hours**
IRRIGATION METHODS AND MANAGEMENT • Direct and storage irrigation methods • Surface and subsurface irrigation methods • Drip and sprinkler irrigation systems and components • Irrigation scheduling and distribution • Participatory irrigation management • Organic farming • Case study	**9 Hours**

Theory Hours:	45	Tutorial Hours:	0	Practical Hours:	0	Project Hours:	0	Total Hours:	45

Learning Resources
Textbooks:
1. Punmia B.C., Pande B.B.L., Jain A.K., Irrigation and Water Power Engineering, Laxmi Publications, 16th Edition, 2018. 2. Linsley R.K. and Franzini J.B., Water Resources Engineering, McGraw-Hill, 4th Edition, 2013. 3. Garg S.K., Irrigation Engineering and Hydraulic Structures, Khanna Publishers, 2017
Online Resources:
1. NPTEL Courses on Water Resources Engineering

2. SWAYAM Irrigation Engineering Modules
3. Relevant case studies on GIS and Remote Sensing applications

Assessment
• Continuous Assessment Test I & II • Open Book Test, Assignments, Cooperative Learning, Journal Review, Group Presentation, Project Report, Poster/Prototype Demonstration (as applicable) • End Semester Examination

Course Curated By			
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**		**Internal Expert(s)**
Dr.N.Ramsundram, Manager, Atkins Project Director, Bangalore	Dr.Krisnmurthy, CSIR, NEERI, Nagpor		Dr. A. Gandhimathi, Associate Professor, Department of Civil Engineering, KCT
Recommended by BoS on			
Academic Council Approval	No:	**Date**	

24CEE025	CONSTRUCTION PERSONNEL MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
PE		SDG	3,5,8			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Equip students with knowledge of manpower planning and organizational structures in construction.
2	Critically assess the impact of individual and group behaviour on team performance.
3	Examine various management methods and strategies to resolve human resource challenges within the construction industry.
4	Assess the effectiveness of welfare measures in enhancing employee safety, compensation, and overall well-being.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the principles of manpower planning to develop effective staffing plans in construction projects.	Ap
CO 2	Analyze the structure and operations of construction organizations to enhance human resource development.	Ap
CO 3	Evaluate the impact of individual and group behavior on team performance and decision-making in construction projects.	An
CO 4	Examine various management and development methods to address special human resource problems in construction	An
CO 5	Understand welfare measures to determine their effectiveness in improving employee compensation, safety, and well-being.	Un

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	3	1	2	2	1	2	2	3	2	3	3
2	2	2	3	1	2	2	2	3	2	3	2	2	3
3	2	3	2	2	2	2	2	3	3	2	3	2	3
4	2	3	3	2	3	2	2	3	2	3	3	2	3
5	1	2	1	1	2	3	3	2	2	3	3	1	3

Course Content	
MANPOWER PLANNING Manpower Planning – Organizing – Staffing – Staffing Plan – directing and controlling – Managerial Staffing – Recruitment – Selection – Personnel Principles	**9 Hours**
ORGANIZATION	**9 Hours**

Organization – Span of Control – Organization Charts – Development and Operation of human resources — Placement, Training and Development.	
HUMAN BEHAVIOUR Basic individual psychology,motivation - Job design and performance management - Managing groups at work - self-managing work teams - Intergroup behaviour and conflict in organizations – Leadership – Behavioural aspects of decision-making and communication for people management	**9 Hours**
MANAGEMENT AND DEVELOPMENT METHODS Performance appraisal – Employee handbook and personnel manual – Job descriptions and organization structure and human relations – Special Human resource problems – Identification of training needs- training calendar – evaluation of training – Productivity of Human resources – Discipline and discharge.	**9 Hours**
WELFARE MEASURES Compensation – Wages and Salary, Employee Benefits, employee appraisal and assessment - Employee services – Safety and health – GPF – EPF – Group Insurance – Housing - Pension – Laws related to welfare measures.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources

Textbooks:

4. Memoria, C. B. (2023). Personnel Management. Himalaya Publishing House,
5. Mumbai.Dessler, G. (2019). Human Resource Management. Pearson Education.
6. Noe, R. A. (2017). Fundamentals of Human Resource Management. McGraw-Hill Education.
7. Mathis, R. L., & Jackson, J. H. (2016). Human Resource Management. Cengage Learning.

Reference books & Weblinks:

1. Kazi, A. S. (2020). Construction Project Management: A Practical Guide to Field Construction Management. CRC Press.
2. Kerzner, H. (2017). Project Management: A Systems Approach to Planning, Scheduling, and Controlling. Wiley.
3. Jha, K. N. (2014). Construction Project Management. Pearson Education India.

Online Resources:

1. http://www.hrmguide.co.uk
2. https://www.shrm.org
3. http://www.careerbuilder.com

Assessment (Theory course)

SA-I, SA-II, Group Presentation, Open Book Test, ,Assignments, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr. Suresh Kumar Senior Project Manager, L&T Construction **Mr. Amit Sharma** Vice President, Project Management, TATA Projects	**Dr. P.K. Viswanathan** Professor, Department of Civil Engineering, IIT Madras **Dr. M. Arivazhagan** Dean, School of Management Studies ,NIT Trichy	Dr.U.Sindhu Vaardini AP/Civil Mr.P.Aswin Bharath AP/Civil Dr. P.A.Prabakaran AP/Civil

Ltd.			
Recommended by BoS on			
Academic Council Approval	No:	**Date**	

24CEE026	Integrated Building Systems and Infrastructure	L	T	P	J	C
		3	0	0	0	3
PE		SDG	3,5,8			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the structural systems, material selection, and functional–aesthetic aspects of building enclosures.
2	Learn the environmental factors, building services, and system integration required for effective building performance.
3	Apply knowledge of construction, infrastructure systems, maintenance, and safety practices for sustainable project execution.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply principles of structural systems to demonstrate effective materials selection and enclosure systems.	Ap
CO 2	Analyze environmental aspects and building services to prioritize interior environmental quality.	An
CO 3	Apply system integration techniques to organize the interaction of structural, mechanical, and electrical systems.	Ap
CO 4	Analyze construction components of infrastructure projects to interpret their relevance to modern needs.	An
CO 5	Apply maintenance planning techniques to prepare fire-safe and pollution-free construction systems.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative teamwork	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2
1	2		2			3		2		3			2
2			2	2	3		3		3		3		
3	3	3			3		1						
4		3	2	1		3			3		3	3	3
5	3						2			3			

Course Content

STRUCTURAL SYSTEM Systems for enclosing Buildings, Functional aesthetic system, materials selection, and specification.	**9 Hours**
ENVIRONMENTAL ASPECTS AND SERVICES Qualities of enclosure necessary to maintain a specified level of interior environmental quality – Weather resistance – Thermal infiltration – Acoustic Control –Transmission	**9 Hours**

reduction – Air quality – Illumination.	
SYSTEM INTEGRATION Components -, Mechanical, Plumbing – Electricity –Vertical circulation and their interaction-Technological demands on construction management in infrastructure development projects.	**9 Hours**
CONSTRUCTION AND INFRASTRUCTURE Construction component of various infrastructure projects, highway, railway, airports, harbour. Prospects of infrastructure sector, current scenario and future needs.	**9 Hours**
MAINTENANCE AND SAFETY Planning systems for least maintenance materials and construction – Access for maintenance – Feasibility for replacement of damaged components – Maintenance free exposed and finished surfaces, ability of systems to protect fire – preventive systems – fire escape system– planning for pollution free construction- environmental constraints – Hazard free Construction execution.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources

Textbooks:

1. Mehta, P. K., & Monteiro, P. J. M. (2014). Concrete: Microstructure, Properties, and Materials. McGraw Hill Education.
2. Chudley, R., & Greeno, R. (2017). Building Construction Handbook. Routledge.
3. Arora, S. P., & Bindra, S. P. (2019). A Textbook of Building Construction. Dhanpat Rai Publications.
4. Barry, R. (2012). The Construction of Buildings – Volumes 1–5. Wiley-Blackwell.

Reference

1. Kibert, C. J. (2016). Sustainable Construction: Green Building Design and Delivery. John Wiley & Sons.
2. McMullan, R. (2017). Environmental Science in Building. Palgrave Macmillan.
3. Hall, F., & Greeno, R. (2018). Building Services Handbook. Routledge.
4. Bureau of Indian Standards (BIS) – National Building Code of India (NBC 2016).
5. The Chartered Institute of Building (CIOB) – Building Information and Safety Resources: https://www.ciob.org

Resources

1. National Programme on Technology Enhanced Learning (NPTEL): https://nptel.ac.in/courses
2. U.S. Green Building Council (USGBC): https://www.usgbc.org
3. Construction Industry Development Council (CIDC): https://cidc.in
4. BuildingSMART International – BIM Standards: https://www.buildingsmart.org
5. Institution of Civil Engineers (ICE): https://www.ice.org.uk

Assessment (Theory course)

SAI, SAII, Group Presentation, Open Book Test, ,Assignments, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr. Suresh Kumar Senior Project Manager, L&T Construction Mr. Amit Sharma	Dr. P.K. Viswanathan Professor, Department of Civil Engineering, IIT Madras Dr. M. Arivazhagan	Dr.U.Sindhu Vaardini AP/Civil Mr.P.Aswin Bharath AP/Civil Dr. P.A.Prabakaran AP/Civil

Vice President, Project Management, TATA Projects Ltd.	Dean, School of Management Studies, NIT Trichy		
Recommended by BoS on			
Academic Council Approval	No:	**Date**	

24CEE027	CONSTRUCTION METHODS AND EQUIPMENT MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
PE		SDG	3,5,8			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Introduce students to the basic construction methods used in civil engineering projects.
2	Familiarize students with the types, selection, and operation of various construction equipment.
3	Develop understanding of planning, productivity, and management aspects related to equipment and construction activities.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Identify suitable construction methods for various civil engineering works.	Un
CO 2	Understand the functions and operating principles of different construction equipment.	Un
CO 3	Apply basic planning and selection criteria for equipment based on project requirements.	Ap
CO 4	Analyze the efficiency and economics of equipment utilization.	An
CO 5	Explain modern practices and technologies used in equipment management.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative teamwork	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2
1	3	2	2	1	2	1	1	2	2	2	2	3	2
2	3	2	2	1	3	2	1	2	2	2	2	3	2
3	2	3	3	1	2	2	2	2	3	3	3	3	3
4	2	3	3	2	3	2	2	3	2	3	3	2	3
5	2	2	2	2	3	3	2	2	3	3	3	2	3

Course Content	
INTRODUCTION TO CONSTRUCTION METHODS Overview of construction industry – Classification of construction projects – Types of construction methods – Earthwork and excavation methods – Site preparation – Compaction techniques – Formwork and scaffolding – Concrete placement and curing methods.	**9 Hours**
EQUIPMENT FOR EARTHWORK AND COMPACTION Types and selection of earthmoving equipment – Excavators, bulldozers, scrapers, graders, loaders, and dumpers – Compaction equipment – Rollers and tampers – Factors affecting equipment selection – Equipment productivity and maintenance.	**9 Hours**

EQUIPMENT FOR MATERIAL HANDLING AND PRODUCTION Cranes, hoists, conveyors, and batching plants – Aggregate production and screening equipment – Concrete mixers and pumps – Paving equipment – Material transport systems – Safety aspects in handling construction equipment.	**9 Hours**
METHODS IN SPECIALIZED CONSTRUCTION Construction of foundations, substructures, and superstructures – Dewatering and grouting methods – Tunneling, trenching, and blasting techniques – Road, bridge, and pipeline construction methods – Introduction to prefabrication and precast methods.	**9 Hours**
EQUIPMENT PLANNING AND MANAGEMENT Equipment planning and scheduling – Estimation of equipment output – Equipment cost analysis, depreciation, and economic life – Equipment maintenance systems – Equipment ownership vs. leasing – Role of automation and emerging technologies in equipment management.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources

Textbooks:

1. Sharma, S.C. (2013). Construction Equipment and Management. Khanna Publishers.
2. Peurifoy, R. L., Schexnayder, C. J., & Shapira, A. (2018). Construction Planning, Equipment, and Methods.McGraw Hill Education.
3. Mahesh Varma. (2017). Construction Equipment and its Management. Metropolitan Book Co.

Reference books & Weblinks:

1. Nunnally, S. W. (2014). Construction Methods and Management. Pearson Education.
2. Dr. B. C. Punmia & K. K. Khandelwal. (2016). Construction Planning and Equipment. Laxmi Publications.
3. Jha, K. N. (2015). Construction Project Management. Pearson Education.

Online Resources:

1. National Programme on Technology Enhanced Learning (NPTEL): https://nptel.ac.in
2. Equipment World: https://www.equipmentworld.com
3. Construction Industry Development Council (CIDC): https://cidc.in

Assessment (Theory course)

SAI, SAII, Group Presentation, Open Book Test,, Assignments, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**
Mr. Suresh Kumar Senior Project Manager, L&T Construction Mr. Amit Sharma Vice President, Project Management, TATA Projects Ltd.	Dr. P.K. Viswanathan Professor, Department of Civil Engineering, IIT Madras Dr. M. Arivazhagan Dean, School of Management Studies, NIT Trichy	Dr.U.Sindhu Vaardini AP/Civil Mr.P.Aswin Bharath AP/Civil Dr. P.A.Prabakaran AP/Civil
Recommended by BoS on		

Academic Council Approval	No:	**Date**	

24CEE028	CONSTRUCTION SAFETY MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
PE		SDG	3,5,8			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the principles of construction safety management, including safety programmes, safety culture, and accident prevention measures
2	Learn safety planning and risk management techniques to identify hazards, control risks, and ensure safe construction operations.
3	Apply safety standards, auditing methods, and modern technologies to improve safety performance and promote a sustainable and hazard-free work environment.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the elements of an effective safety program to organize safety assessments and meetings on construction sites.	Ap
CO 2	Apply safety culture and management practices to ensure safe working conditions at construction sites.	Ap
CO 3	Analyze the causes and effects of construction accidents and identify preventive measures.	An
CO 4	Evaluate construction risks and plan suitable safety and emergency control measures.	An
CO 5	Examine safety standards and use modern technologies to enhance safety performance in construction projects.	An

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	3	1	2	2	2	1	2	3	3	2	3
2	2	3	3	1	2	2	2	2	3	3	3	2	3
3	2	3	2	2	2	2	2	3	3	2	3	2	3
4	2	3	3	2	3	2	2	3	2	3	3	2	3
5	1	2	2	1	3	3	3	2	2	3	3	1	3

Course Content	
SAFETY PROGRAMMES Introduction to construction safety management. Problem areas in construction safety. Elements of an effective safety programme. Job-site safety assessment, safety meetings, and incentive schemes for promoting safe work practices.	**9 Hours**
DESIGNING FOR SAFETY	**9 Hours**

Safety culture and worker behavior. Roles of workers, supervisors, and management in ensuring safety. Coordination of project activities for safety compliance. Role of safety officers, subcontractors, and workers' compensation in project safety.	
CONSTRUCTION ACCIDENTS Types and causes of construction accidents. Human and organizational factors affecting safety. Cost and consequences of construction injuries. Hazard identification, safety assessment, and legal responsibilities in construction projects.	**9 Hours**
SAFETY PLANNING AND RISK MANAGEMENT Safety planning during various project stages. Risk identification and control measures. Safety practices for excavation, scaffolding, lifting, and material handling. Use of personal protective equipment (PPE) and emergency response planning.	**9 Hours**
SAFETY STANDARDS AND MODERN PRACTICES Overview of national and international safety standards (Factories Act, OSHA, BIS, ISO 45001). Safety audits, inspections, and performance evaluation. Safety training and awareness programs. Application of BIM, drones, and IoT for monitoring construction site safety.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources

Textbooks:

1. Hinze, Jimmie W. (2017). Construction Safety. Prentice Hall, New Jersey.
2. Lingard, Helen & Rowlinson, Steve. (2005). Occupational Health and Safety in Construction Project Management.Taylor & Francis.
3. Reese, C.D. & Eidson, J.V. (2016). Handbook of OSHA Construction Safety and Health. CRC Press.

Reference books & Weblinks:

1. Goetsch, D.L. (2019). Construction Safety and the OSHA Standards. Pearson Education.
2. Kheni, N.A. (2021). Construction Health and Safety Management in Developing Countries. Routledge.
3. McDonald, M. (2020). Practical Guide to Construction Safety Management. Wiley.
4. Bureau of Indian Standards (BIS) – IS 3757: Code of Practice for Construction Safety Management.
5. National Safety Council – https://www.nsc.org
6. Occupational Safety and Health Administration (OSHA) – https://www.osha.gov

Online Resources:

1. National Institute for Occupational Safety and Health (NIOSH): https://www.cdc.gov/niosh/
2. Institution of Occupational Safety and Health (IOSH): https://iosh.com/
3. Construction Industry Development Council (CIDC) – Safety Portal: https://cidc.in/
4. International Labour Organization (ILO) – Construction Safety Guidelines: https://www.ilo.org/

Assessment (Theory course)

SAI, SAII, Group Presentation, Open Book Test, ,Assignments, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr. Suresh Kumar Senior Project Manager, L&T	Dr. P.K. Viswanathan Professor, Department of Civil	Dr.U.Sindhu Vaardini AP/Civil Mr.P.Aswin Bharath AP/Civil

Construction Mr. Amit Sharma Vice President, Project Management, TATA Projects Ltd.	Engineering, IIT Madras Dr. M. Arivazhagan Dean, School of Management Studies ,NIT Trichy		Dr. P.A.Prabakaran AP/Civil
Recommended by BoS on			
Academic Council Approval	No:	**Date**	

24CEE029	Railway Airport and Harbour Engineering	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9			

Pre-requisite courses	-	Code book	-

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the principles of railway engineering including alignment, track components and design.
2	Learn airport planning, runway design and air traffic management concepts.
3	Develop knowledge on harbour planning, coastal processes and port structures.
4	Analyze operational aspects and safety considerations in transportation systems.
5	Build competency in designing sustainable and efficient multi-modal transport infrastructure.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Explain railway engineering principles including alignment and track components	U
CO 2	Apply design concepts for railway tracks, yards and signalling systems	Ap
CO 3	Analyze airport planning, runway orientation and geometric design	An
CO 4	Apply concepts on pavement and traffic control	Ap
CO 5	Analyse harbour planning, coastal processes and port structures	An

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	2	1	2	1					3	1
2	3	1	1	2	1	2	1					3	1
3	3	2	1	2	1	2	1					3	1
4	3	1	1	2	1	2	1					3	1
5	3	1	1	2	1	2	1					3	1

Course Content

RAILWAY ENGINEERING BASICS Introduction – Role of railways in transportation – Railway gauges – Alignment and gradients – Permanent way components: rails, sleepers, ballast – Functions and requirements – Track geometry and coning of wheels – Rail joints.	**9 Hours**
RAILWAY DESIGN AND OPERATION Points and crossings – Turnouts – Railway stations and yards – Classification and layout – construction - Signalling systems – Interlocking – Track maintenance – Modern railway technologies (high-speed rail, metro systems).	**9 Hours**

AIRPORT ENGINEERING Airport planning – Site selection – Airport layout – Runway orientation using wind rose diagram – Runway geometric design – Taxiways and aprons – Airport markings and lighting.	**9 Hours**
AIRPORT PAVEMENT AND TRAFFIC CONTROL Types of airport pavements – Design principles of flexible and rigid pavements – Load classification number (LCN) – Aircraft characteristics – Air traffic control systems – Navigational aids – Airport capacity.	**9 Hours**
MODULE 5: HARBOUR ENGINEERING Harbour planning – Site selection – Coastal processes (waves, tides, currents) – Harbour layouts – Breakwaters, docks, wharves and jetties – Port operations – Environmental considerations and sustainability.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources
Textbooks:
1. Rangwala, S.C., *Railway Engineering*, Charotar Publishing House, 2015. 2. Saxena, S.C., Arora, S.P., *Airport Engineering*, CBS Publishers, 2012.
References:
1. Quinn, A.D., *Design and Construction of Ports and Harbours*, McGraw Hill. 2. Khanna, S.K., Justo, C.E.G., *Highway Engineering*, Nem Chand & Bros. 3. ICAO Standards and Recommended Practices. 4. IRC Codes and IS Codes for Transportation Engineering.
Online Educational Resources:
• https://nptel.ac.in/courses/105107123 • https://swayam.gov.in • https://www.icao.int

Assessment (Embedded course)
SA-1, SA-II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
[Name, Organization]	[Name, Institution]		[Mrs. Anita . S / AP/ CE]
Recommended by BoS on	XX/YY/2024		
Academic Council Approval	No.	**Date**	XX/YY/2024

24CEE030	Intelligent Transportation System	L	T	P	J	C
		3	0	0	0	3
PE		SDG	11			

Pre-requisite courses	-	Data Book / Codes / Standards (If any)	-

Course Objectives:	The purpose of taking this course is to:
1	Understand the architecture, components, and applications of ITS including sensing, communication, and control systems.
2	Develop the ability to analyse traffic data, design ITS solutions, and apply modern tools such as simulation and AI-based models.
3	Build competency to design and evaluate ITS solutions addressing real-world urban mobility challenges.
4	Gain exposure to global ITS practices, standards, and smart mobility innovations.

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO1	Explain ITS architecture, components, and communication technologies used in modern transportation systems	U
CO2	Apply sensing technologies and data acquisition methods for traffic monitoring and management	Ap
CO3	Analyse traffic data using ITS tools and evaluate system performance	An
CO4	Analyse ITS-based solutions for traffic management, safety, and public transport systems	An
CO5	Analyse emerging ITS technologies such as AI, IoT, and connected vehicles for sustainable mobility	An

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
CO1	3	2	1	-	2	-	-	-	1	-	2	2	1
CO2	3	3	2	2	3	-	-	-	1	-	2	3	2
CO3	3	3	2	3	3	1	-	-	1	-	2	3	2
CO4	3	3	3	2	3	2	1	2	2	2	2	3	3
CO5	3	2	3	2	3	3	2	1	2	2	3	2	3

Course Content

INTRODUCTION TO ITS & SYSTEM ARCHITECTURE Evolution of ITS - ITS components: sensing, communication, control - ITS architecture - (physical, logical) - Standards and protocols (ISO, IEEE) - Global ITS case studies	**9 Hours**
TRAFFIC DATA COLLECTION & SENSING TECHNOLOGIES	**9 Hours**

Traffic detectors: loop, radar, LiDAR, video analytics - GPS, mobile data, probe vehicles - Data fusion techniques - Big data in transportation - Data reliability and validation	
ITS COMMUNICATION SYSTEMS Wireless communication: DSRC, 5G, V2X - Communication protocols - Cloud computing and edge computing in ITS - Cybersecurity in ITS - IoT integration in transportation	**9 Hours**
TRAFFIC MANAGEMENT & CONTROL SYSTEMS Adaptive traffic signal control (SCOOT, SCATS) - Incident detection and management - Smart parking systems - Public transport ITS (AVL, APC, smart ticketing) - Integrated corridor management	**9 Hours**
ADVANCED ITS APPLICATIONS & FUTURE TRENDS Autonomous and connected vehicles - AI and ML applications in ITS - Smart cities and mobility-as-a-service (MaaS) - Sustainable ITS solutions - Ethical, legal, and policy issues	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources*

Textbooks

5. Papageorgiou, Markos., Applications of Automatic Control Concepts to Traffic Flow Modelling and Control, Springer (2012).
6. Sussman, Joseph., Perspectives on Intelligent Transportation Systems, Springer (2005)

Reference books/ Web Links

1. Vlahogianni, Eleni., "Artificial Intelligence in Transportation Systems." Transportation Research Journal.
2. Gartner, Nathan., Traffic Flow Theory and Control, Springer.
3. IEEE ITS Society Publications
4. NPTEL: Intelligent Transportation Systems
5. World Bank ITS Reports

Online Resources

1. https://nptel.ac.in
2. https://its.dot.gov
3. https://www.ieee.org

Assessment	
Formative	Summative
Assignments / Mini project, Quiz	SA- I, SA – II and End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
[Name, Organization]	[Name, Institution]	Ms. S. Anita Assistant Professor Department of Civil Engineering Kumaraguru College of Technology Coimbatore

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEE031	Mass Transit Management	L	T	P	J	C
		3	0	2	0	4
Professional Elective		SDG	SDG No's.-9			

Pre-requisite courses	-	Code book	IRC 37, IRC 58

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the principles and components of mass transit systems.
2	Learn planning and operational strategies for urban public transport.
3	Analyze demand, capacity, and performance of transit systems.
4	Evaluate management, economic, and policy aspects of transit systems.
5	Develop sustainable and efficient mass transit solutions for urban mobility.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Explain concepts and types of mass transit systems	U
CO 2	Apply transit planning and scheduling techniques	Ap
CO 3	Analyse passenger demand and system performance	An
CO 4	Analyse economic, operational and policy aspects of transit systems	An
CO 5	Apply sustainable and efficient mass transit solutions	Ap
CO 6		

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	3	3	2	3	2	2				2	3	3
2	3	3	3	3	3	2	2	2			2	3	3
3	3	3	3	3	3	2	2	3			2	2	3
4	3	2	3	3	2	2	2	2			2	3	3
5	3	1	2	2	2	2	2	3	3	2	2	2	3
6	3	3	3	3	3	2	3	3	3			3	3

Course Content

MODULE 1: INTRODUCTION TO MASS TRANSIT SYSTEMS Urban transportation problems – Need for mass transit – Types of mass transit systems: Bus Rapid Transit (BRT), Metro Rail, Light Rail Transit (LRT), Suburban rail – Characteristics and comparison – Role in sustainable urban mobility.	**9 Hours**
MODULE 2: TRANSIT PLANNING AND DEMAND ANALYSIS Transit planning process – Travel demand forecasting – Trip generation, distribution and assignment – Route planning – Stop location and spacing – Network design.	**9 Hours**

MODULE 3: TRANSIT OPERATIONS AND MANAGEMENT Scheduling and frequency – Fleet size estimation – Headway and capacity – Passenger flow characteristics – Fare collection systems – Intelligent transport systems in transit operations.	**9 Hours**
MODULE 4: ECONOMICS AND POLICY OF TRANSIT SYSTEMS Cost analysis – Capital and operating costs – Pricing strategies – Subsidies and funding – Public-private partnerships (PPP) – Urban transport policies and regulations.	**9 Hours**
MODULE 5: SUSTAINABLE AND SMART TRANSIT SYSTEMS Transit-Oriented Development (TOD) – Integration with non-motorized transport – Environmental impacts – Smart mobility solutions – Case studies of metro systems and BRT – Future trends in mass transit.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	45

Learning Resources

Textbooks:

1. Vuchic, V.R., *Urban Transit Systems and Technology*, Wiley, 2007.
2. Kadiyali, L.R., *Traffic Engineering and Transport Planning*, Khanna Publishers, 2013.

References:

1. Meyer, M.D., *Urban Transportation Planning*, McGraw Hill.
2. Black, A., *Urban Mass Transportation Planning*, McGraw Hill.
3. MoHUA, National Urban Transport Policy (India).
4. World Bank Reports on Urban Transport Systems.

Online Educational Resources:

1. https://nptel.ac.in/courses/105106119
2. https://swayam.gov.in
3. https://www.itdp.org

Assessment (Embedded course)

CAT 1, CAT 2, Activity and Learning Task(s), MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**
[Name, Organization]	[Name, Institution]	[Mrs. Anita . S / AP/ CE]

Recommended by BoS on	XX/YY/2024		
Academic Council Approval	No.	**Date**	XX/YY/2024

24CEE032	Ground Improvement Techniques	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9 & 11			

Pre-requisite courses	Soil Mechanics & Foundation Engineering	Data Book / Codes / Standards (If any)	-

Course Objectives:	The purpose of taking this course is to:
1	Introduce problematic soil identification and ground improvement necessity for civil engineering projects
2	Equip students with mechanical, hydraulic, and chemical modification techniques for weak soils
3	Develop skills to design and select appropriate ground improvement methods for site-specific conditions
4	Analyze advanced techniques like stone columns, geosynthetics, and deep mixing for foundation support
5	Enable evaluation of improvement effectiveness through field monitoring and case studies

Course Outcomes	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Identify problematic soils and select appropriate ground improvement techniques	U
CO 2	Analyze mechanical and hydraulic modification methods for soil densification	An
CO 3	Apply chemical stabilization and grouting techniques for soil strength enhancement	Ap
CO 4	Design stone columns, geosynthetics, and deep mixing solutions for foundations	An
CO 5	Evaluate performance of ground improvement through monitoring and case studies	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	1	2	2	1	1	1	2	3	2	3
2	3	3	2	2	3	2	1	1	2	2	3	3	2
3	3	3	2	3	2	3	2	1	2	3	2	3	2
4	3	3	3	2	3	2	1	2	3	2	3	3	3
5	3	2	3	3	3	3	2	2	2	3	3	3	2

Course Content

INTRODUCTION **9 Hours**

Role of ground improvement, problematic soils (expansive clays, collapsible sands, soft clays, loose sands), selection criteria, objectives, classification of techniques

(mechanical, hydraulic, chemical, inclusion), stabilization of expansive soils	
MECHANICAL MODIFICATION TECHNIQUES Shallow compaction (vibroflotation, dynamic compaction, surface rolling), deep compaction (sand compaction piles, stone columns), prefabricated vertical drains (PVDs) with preloading, electro-osmosis, soil freezing	**9 Hours**
HYDRAULIC AND CHEMICAL MODIFICATION Dewatering (well points, vacuum, deep wells), chemical stabilization (lime, cement, fly ash, bitumen), grouting (permeation, compaction, jet, fracture), deep soil mixing (DSM), enzymes and biopolymers	**9 Hours**
CONFINEMENT METHODS Stone columns design/construction, sand drains/wicks, geosynthetics (geotextiles, geogrids, geomembranes), reinforced earth walls/embankments, soil nailing, rock bolts, ground anchors	**9 Hours**
ADVANCED TECHNIQUES AND PERFORMANCE EVALUATION Thermal methods, vacuum consolidation, deep explosion, industrial waste stabilization, case studies, instrumentation for monitoring (settlement gauges, piezometers), design verification, sustainability assessment	**9 Hours**

Theory	Tutorial	Practical	Project	Total
Hours: 45	**Hours: 0**	**Hours: 0**	**Hours: 0**	**Hours: 45**

Learning Resources*
Textbooks
1. Purushothama Raj, P., Ground Improvement Techniques, Laxmi Publications, 2005. 2. Hausmann, M.R., Engineering Principles of Ground Modification, McGraw-Hill, 1990. 3. Sharma, S.K., Principles, Practice and Design of Highway Engineering, S.Chand, 2011. 4. Bell, F.G., Ground Engineer's Reference Book, Butterworth-Heinemann, 1987
Reference books/ Web Links
1. Moseley, M.P., Kirsch, K., Ground Improvement, CRC Press, 2004. 2. Indranatna, B., Carter, J., Ranjith, P., Geotechnical Engineering Handbook, CRC Press, 2011. 3. IS 15284:2003 (Design and Construction of Stone Columns), Bureau of Indian Standards.
Online Resources
1. https://nptel.ac.in/courses/105105108 2. https://ocw.mit.edu/courses/1.373/landfill-design-and-operation-fall-2003/ 3. https://www.digimat.in/nptel/courses/105105108L01.html.

Assessment	
Formative	Summative
Assignments / Mini project, Quiz	SA-I, SA-II and End Semester Examination (ESE)

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEE033 PE	GEOTHERMAL ENGINEERING	L	T	P	J	C
		3	0	0	0	3
		SDG	7, 9, 13, 11, 12			
Pre-requisite courses	Soil Mechanics	Data Book / Code book (If any)	-			

Course Objectives:	
The purpose of taking this course is to:	
CO 1	Introduce the fundamentals of geothermal energy and its role in sustainable energy systems.
CO 2	Explain heat transfer mechanisms in soils and rocks related to geothermal processes.
CO 3	Impart knowledge on exploration methods and resource assessment for geothermal energy.
CO 4	Introduce geothermal systems for space heating, cooling, and power generation.
CO 5	Provide fundamental understanding on ground heat exchangers, geothermal heat pumps, and environmental impacts.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Explain the origin, classification, and distribution of geothermal energy resources.	U
CO 2	Apply heat transfer principles to analyze subsurface thermal behavior of soils and rocks.	AP
CO 3	Evaluate geothermal site characteristics through exploration and thermal property measurement.	AN
CO 4	Design and assess ground heat exchanger systems for heating and cooling applications.	AN
CO 5	Discuss environmental and sustainability aspects of geothermal energy utilization.	AN

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	1	1	2	3	1	1	2	2	3	2
2	3	3	2	3	2	1	2	1	1	2	2	3	3
3	3	3	3	2	2	1	3	1	1	2	2	3	3
4	3	3	3	2	2	1	3	1	2	3	2	3	3
5	2	2	2	1	2	2	3	2	1	2	3	3	2

Course Content

INTRODUCTION TO GEOTHERMAL ENERGY — **9 Hours**

Earth's thermal structure and heat flow. Origin and classification of geothermal resources – hydrothermal, hot dry rock, magma-based, and geopressured systems.

Global and Indian scenario of geothermal resources. Comparison with other renewable energy sources.	
HEAT TRANSFER IN GEOMATERIALS Conduction, convection, and radiation in soils and rocks. Thermal properties: thermal conductivity, heat capacity, and thermal diffusivity. Factors affecting heat transfer in soils: water content, density, mineralogy, and temperature. Laboratory and field methods for thermal property determination.	**9 Hours**
GEOTHERMAL RESOURCE EXPLORATION AND ASSESSMENT Geological, geophysical, and geochemical exploration techniques. Geothermal gradient and heat flow measurement. Subsurface temperature logging and resistivity surveys. Resource classification and potential estimation. Case studies of Indian geothermal sites.	**9 Hours**
GEOTHERMAL ENERGY UTILIZATION SYSTEMS Direct use applications: space heating, aquaculture, greenhouse, and drying. Indirect use: binary cycle, flash, and dry steam power plants. Ground-source heat pumps – types, design principles, and performance evaluation. Borehole and horizontal heat exchangers – materials, installation, and thermal response.	**9 Hours**
ENVIRONMENTAL AND SUSTAINABILITY ASPECTS Environmental impacts: land subsidence, induced seismicity, gas emissions, groundwater contamination. Sustainable management of geothermal reservoirs. Integration with other renewable systems. Case studies on sustainable geothermal projects.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources

Textbooks:

1. Hochstein, M. P. (1990). Geothermal Energy Resources: An Introduction to Geothermal Studies. Cambridge University Press, Cambridge, UK.
2. Dickson, M. H., & Fanelli, M. (2003). Geothermal Energy: Utilization and Technology. UNESCO Publishing, Paris.
3. Rybach, L., & Muffler, L. J. P. (Eds.). (1981). Geothermal Systems: Principles and Case Histories. John Wiley & Sons, New York.
4. Garg, S. K., & Prasad, R. (2010). Geothermal Energy: Resources and Utilization in India. Allied Publishers, New Delhi.
5. Bloomquist, R. G. (2004). Geothermal Heat Pumps and Energy Recovery Systems. Taylor & Francis, London.

References:

1. Armstead, H. C. H. (1983). Geothermal Energy: Its Past, Present and Future Contributions to the Energy Needs of Man. E. & F. N. Spon Ltd., London.
2. Lund, J. W., & Freeston, D. H. (2001). World-Wide Direct Uses of Geothermal Energy 2000. Geothermics, 30(1), 29–68.
3. Kumar, D. (2013). Renewable Energy Engineering and Technology: A Knowledge Compendium. TERI Press, New Delhi.

Online Resources:

1. https://www.udemy.com/course/introduction-to-geothermal-energy-clean-power-careers/
2. https://www.edx.org/learn/energy-earth-sciences/universitat-politecnica-de-valencia-

specialization-in-shallow-geothermal-energy-skills-development-and-training-across-the-eu?index=product&queryId=c938c02ac07d59e4c910e1b23759fc7a&position=4

Assessment (Theory course)
SAI & SAII, Open Book Test, Learning Tasks (Concept Maps, Diagnostic Questions), (ESE).

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Ms Lakshmi R, Engineer – I, Technip FMC, Hyderabad	Dr Krishnan K, Assistant Professor, Amrita Vishwa Vidyapeetham, Coimbatore		Dr Gayathri V Dr Prasanna Venkatesh R Mr Sathiyanathan K
Recommended by BoS on	05.05.2025		
Academic Council Approval	No:28	**Date**	26.06.2025

24CEE034 PE	SLOPE STABILITY AND RETAINING STRUCTURES	L	T	P	J	C
		3	0	0	0	3
		SDG	9, 11, 13			

Pre-requisite courses	Soil Mechanics	Data Book / Code book (If any)	IS 456, IS 6403, IS 7894

Course Objectives:	
The purpose of taking this course is to:	
1	Introduce the fundamental concepts of slope stability and types of slope failures.
2	Explain methods for analyzing stability of slopes under different conditions.
3	Impart knowledge on lateral earth pressure theories.
4	Develop understanding of design principles of retaining structures.
5	Provide practical insight into stability checks and safe geotechnical design.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Explain types of slopes, failure mechanisms, and influencing factors.	U
CO 2	Apply analytical methods to determine factor of safety of slopes.	Ap
CO 3	Analyse slopes under seepage and loading conditions.	An
CO 4	Evaluate earth pressures acting on retaining structures.	An
CO 5	Design retaining structures considering stability requirements.	An

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	1	1	2	2	3	1	1	2	2	2
2	3	3	2	2	2	1	2	2	1	1	2	3	2
3	3	3	3	2	2	1	2	3	1	1	2	3	3
4	3	3	3	2	2	1	2	3	1	2	3	3	3
5	3	3	3	2	2	2	2	3	2	2	3	3	3

COURSE CONTENT

INTRODUCTION TO SLOPE STABILITY Definition and classification of slopes: natural and man-made slopes. Types of slope failures: rotational, translational, and compound failures. Factors affecting slope stability: soil properties, groundwater conditions, slope geometry, and external loads. Concept of factor of safety.	**9 Hours**
STABILITY ANALYSIS OF SLOPES	**9 Hours**

Infinite slope analysis under dry, submerged, and seepage conditions. Finite slope analysis using Swedish Circle Method and Ordinary Method of Slices. Introduction to Bishop's simplified method. Stability charts and Taylor's stability number.	
SLOPES UNDER SPECIAL CONDITIONS Effect of pore water pressure and seepage on slope stability. Flow nets and seepage analysis. Stability under rapid drawdown condition. Stability of embankments and earth dams. Introduction to seismic effects on slopes (pseudo-static approach).	**9 Hours**
EARTH PRESSURE THEORIES Concept of lateral earth pressure. Rankine's theory for active, passive, and at-rest conditions. Coulomb's wedge theory. Earth pressure on layered soils. Effect of surcharge, water table, and backfill conditions.	**9 Hours**
RETAINING STRUCTURES AND DESIGN Types of retaining walls: gravity, cantilever, and counterfort. Stability analysis of gravity and cantilever retaining walls: sliding, overturning, and bearing capacity. Drainage and backfill considerations. Introduction to reinforced earth walls and sheet piles.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources

Textbooks:

1. Arora, K. R. (2008). Soil Mechanics and Foundation Engineering. Standard Publishers, New Delhi.
2. Murthy, V. N. S. (2002). Geotechnical Engineering. CRC Press, New York.
3. Das, B. M. (2013). Principles of Geotechnical Engineering. Cengage Learning, USA.
4. Terzaghi, K., Peck, R. B., & Mesri, G. (1996). Soil Mechanics in Engineering Practice. Wiley, New York.

References:

1. Duncan, J. M., & Wright, S. G. (2005). Soil Strength and Slope Stability. Wiley, New York.
2. Bowles, J. E. (1996). Foundation Analysis and Design. McGraw-Hill, New York.
3. Coduto, D. P., Kitch, W. A., & Yeung, M. R. (2011). Foundation Design. Pearson, USA.

Online Resources:

1. https://www.coursera.org/learn/slope-engineering
2. https://www.udemy.com/course/retaining-walls-analysis-design/

Assessment (Theory course)

SAI & SAII, Open Book Test, Learning Tasks (Concept Maps, Diagnostic Questions), (ESE).

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Ms Lakshmi R, Engineer – I, Technip FMC, Hyderabad	Dr Krishnan K, Assistant Professor, Amrita Vishwa Vidyapeetham, Coimbatore	Dr Gayathri V Dr Prasanna Venkatesh R Mr Sathiyanathan K

Recommended by BoS on	05.05.2025		
Academic Council Approval	No:28	**Date**	26.06.2025

HONORS – Structural Engineering

24CEE061	DESIGN OF BRIDGES	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9 & 11			

Pre-requisite courses	-	Data Book / Codes / Standards (If any)	IRC:5-2015, IRC:6-2017, IRC:21-2000, IRC:112-2011, IS:456-2000

Course Objectives:	The purpose of taking this course is to:
1	Acquire knowledge on types, selection criteria, and components of various bridge systems
2	Gain skills in analysis and design of different bridge superstructures (slab, T-beam, box girder, composite) per IRC specifications
3	Develop competency in designing bridge substructures including piers, abutments, bearings, and foundations

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Classification, components, planning aspects, IRC loading standards and load distribution mechanisms	U
CO 2	Apply Loads and load distribution theories	Ap
CO 3	Analyze and design slab culverts, slab bridges, and specifications using IRC	Ap
CO 4	Design principles of T-beam bridges and Box Girder Bridges	An
CO 5	Design complete bridge substructures including piers, abutments, bearings, expansion joints, and foundations	An

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
CO1	3	2		3		3						3	2
CO2	3	2										3	2
CO3	3	3	3									3	2
CO4	3	3	3									3	2
CO5	3	2		3								3	2

Course Content

INTRODUCTION TO BRIDGE ENGINEERING Classification, components, site selection, investigations, waterway calculations, scour	09 Hours

depth, economic span, aesthetics	
LOADS AND LOAD DISTRIBUTION IRC loading standards (Class AA, A, B), load combinations, Courbon's theory, Hendry-Jaeger method, grillage analogy, effective width	**09 Hours**
DESIGN OF SLAB CULVERTS AND SLAB BRIDGES Box culverts, straight and skew slab bridges, limit state design, IRC Class AA analysis, pipe culverts	**09 Hours**
T-BEAM AND BOX GIRDER BRIDGES T-beam proportioning, cross girder and main girder design, box girder behavior, grillage analysis, shear lag effect	**09 Hours**
BRIDGE SUBSTRUCTURE AND FOUNDATIONS Pier types, abutments, bearings (elastomeric, PTFE, pot), expansion joints, pile foundations, well foundations	**09 Hours**

Theory Hours:	**45**	**Tutorial Hours:0**	**Practical Hours:0**	**Project Hours:0**	**Total Hours:** 45

Learning Resources*

Textbooks

7. Krishna Raju, N., *Design of Bridges*, Oxford and IBH Publishing (2014)
8. Victor, D.J., *Essentials of Bridge Engineering*, Oxford and IBH Publishing, 6th Edition (2018)

Reference books/ Web Links

5. Ponnuswamy, S., *Bridge Engineering*, Tata McGraw-Hill (2007)
6. Jagadeesh, T.R. and Jayaram, M.A., *Design of Bridge Structures*, Prentice Hall of India (2013)
7. IRC Codes: IRC:5-2015, IRC:6-2017, IRC:21-2000, IRC:112-2011
8. https://irc-india.co.in/

Online Resources

1. https://onlinecourses.nptel.ac.in/noc22_ce63/preview
2. https://crridom.gov.in/bridge-engineering-and-structures

Assessment	
Formative	Summative
Assignments, Quiz	SA - I, SA – II and End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
[Name, Organization]	[Name, Institution]	Mr. G. Karthikeyan , APII/ Civil

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEE062	OFFSHORE STRUCTURES	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9			

Pre,requisite courses	-	Data Book / Codes / Standards (If any)	-

ohhh

Course Objectives:	The purpose of taking this course is to:
1	Introduce offshore engineering and common offshore structures used for oil, gas, wind and marine applications.
2	Provide a basic understanding of waves, wind and current effects on offshore structures.
3	Familiarize students with types of offshore platforms, their components and functional requirements.
4	Introduce simple design concepts for fixed and floating structures

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Describe different types and functions of offshore structures..	U
CO 2	Explain basic wave, wind and current forces acting on offshore structures.	U
CO 3	Apply simple design ideas to fixed platforms (jacket, gravity) and floating structures.	AP
CO 4	Identify common offshore foundations and understand their purpose and behaviour.	U
CO 5	Summarize construction, installation, operation and maintenance practices.	U
CO 6	Prepare a simple conceptual design layout for an offshore platform.	AP

	Program Outcomes (PO) (Strong,3, Medium , 2, Weak,1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life,Long Learning	PSO,1	PSO,2
1	3	2	1	1		2	1	1	1		1	2	2
2	3	2	1	1		2	1	1	1		1	2	2
3	3	2	1	1		2	1	1	1		1	2	2
4	3	2	1	1		2	1	1	1		1	2	2
5	3	2	1	1		1	1	1	1		1	2	1
6	3	2	1	1		1	1	1	1		1	1	1

Course Content

INTRODUCTION TO OFFSHORE ENGINEERING Offshore Engineering - Definition and significance of offshore engineering, Types of offshore structures, fixed, floating and compliant structures, applications in oil & gas and offshore wind, environmental conditions at sea, functional requirements of offshore systems.	**9 Hours**
ENVIRONMENTAL LOADS ON OFFSHORE STRUCTURES • Basic wave properties – Wave height, period, spectra (qualitative), wind and current characteristic	**9 Hours**

• Introduction to wave forces - Qualitative understanding of Morison equation, simple wave and current force estimation, load combinations.	
FIXED OFFSHORE STRUCTURES • Jacket platforms – Components, bracing systems, gravity-based structures, deck layout and topside functions. • Structural Behavior - Simple structural behaviour, load path, basic design checks (axial capacity, bracing forces), case studies.	**9 Hours**
FLOATING STRUCTURES AND MOORING SYSTEMS • Floating structures - Types of floating platforms, semisubmersible, SPAR, TLP, ships, buoyancy and stability concepts, motions: heave, surge, sway, pitch, roll • Mooring Systems - Introduction to mooring systems, catenary amd taut moorings, overview of risers – floating wind turbines	**9 Hours**
OFFSHORE FOUNDATIONS, CONSTRUCTION AND INSTALLATION • Installation of offshore structures - Foundations: piles, monopiles, caissons, scour protection, fabrication of offshore platforms, load-out, transport and installation • Safety and maintenance – Case studies from Indian offshore fields (Mumbai High, KG Basin).	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources*

Textbooks

1. Gerwick, B.C., *Construction of Marine and Offshore Structures*, CRC Press (2007).
2. Reddy, D.V., & Arockiasamy, M., *Offshore Structures*, Oxford & IBH Publishing).

Reference books/ Web Links

1. Templeton, J.S. & McClelland, B. Design of Offshore Structures, Gulf Publishing
2. API Recommended Practices (RP2A, RP2T, RP2SK, etc.) – American Petroleum Institute..
3. Sarpkaya, T. & Isaacson, M. Mechanics of Wave Forces on Offshore Structures, Van Nostrand Reinhold.

Online Resources

1. NPTEL Course: *Introduction to Offshore Structures* – IIT Madras.
2. NPTEL Course: *Dynamics of Ocean Structures* – IIT Madras
3. http://www.offshore-technology.com

Assessment	
Formative	Summative
Assignment, quiz, mini, projects, case,study presentations	SA-I, SA-II and End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEE063	Finite Element Method	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9			

Pre-requisite courses	24CEI202 Solid Mechanics 24CET303 Structural Analysis	Data Book / Codes / Standards (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Introduce the fundamental mathematical concepts and approximate methods underlying the finite element method.
2	Equip students with the ability to formulate and solve one-dimensional structural problems like bars, trusses, and beams.
3	Provide an understanding of two-dimensional finite element formulations including plane stress and plane strain conditions.
4	Familiarize students with isoparametric elements and the implementation of numerical integration techniques.
5	Develop the competency to apply finite element techniques to field problems and civil engineering applications.

Course Outcomes:		**Bloom's Taxonomy Level (BTL)**
After successful completion of this course, the students shall be able to:		
CO 1	Understand the basic concepts of FEM, boundary value problems, and approximate analytical methods like Rayleigh-Ritz and Galerkin.	U
CO 2	Formulate shape functions, stiffness matrices, and load vectors to analyze one-dimensional bar, truss, and beam elements.	Ap
CO 3	Analyze two-dimensional continuum problems using Constant Strain Triangles (CST) and rectangular elements.	An
CO 4	Apply isoparametric formulations and Gaussian quadrature to evaluate element matrices for complex geometries.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											**Program Specific Outcomes (PSO)**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	-	1	-	-	-	-	-	2	2	1
2	3	3	2	2	2	-	-	-	-	-	2	3	2
3	3	3	2	2	2	-	-	-	-	-	2	3	2
4	3	3	2	2	3	-	-	-	-	-	2	3	3
5	3	3	2	2	2	1	-	-	-	-	2	2	2

Course Content

INTRODUCTION AND MATHEMATICAL BACKGROUND General steps of the finite element method. Engineering applications. Review of basic equations of elasticity. Boundary value problems. Approximate methods of structural analysis: Principle of minimum potential energy, Rayleigh-Ritz method, and Galerkin's method.	**9 Hours**
ONE-DIMENSIONAL ELEMENTS One-dimensional bar element: Shape functions, derivation of stiffness matrix and load vectors. Assembly of global matrices and application of boundary conditions. Analysis of 2D plane trusses. Beam element: Hermite shape functions, stiffness matrix, and load vector. Analysis of continuous beams.	**9 Hours**
TWO-DIMENSIONAL CONTINUUM ELEMENTS Concepts of plane stress and plane strain. Two-dimensional formulation. Constant Strain Triangle (CST): Shape functions, strain-displacement matrix, and stiffness matrix. Linear Strain Triangle (LST). Four-noded rectangular element and its applications.	**9 Hours**
ISOPARAMETRIC FORMULATION AND NUMERICAL INTEGRATION Concept of isoparametric, sub-parametric, and super-parametric elements. Isoparametric formulation of 4-node quadrilateral element. Jacobian transformation. Numerical integration techniques: Gaussian quadrature (1D and 2D) and evaluation of element stiffness matrices.	**9 Hours**
APPLICATIONS IN CIVIL ENGINEERING Axisymmetric formulation: Axisymmetric triangular element, derivation of stiffness matrix and load vectors. Scalar field problems: Formulation of 1D and 2D steady-state heat transfer. Analogous problems in civil engineering (e.g., seepage / groundwater flow).	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	45

Learning Resources*

Textbooks

1. Chandrupatla, Tirupathi R., and Ashok D. Belegundu., Introduction to Finite Elements in Engineering. Pearson Education, New Delhi (2015).
2. Bhavikatti, S. S., Finite Element Analysis. New Age International Publishers, New Delhi (2015).

Reference books/ Web Links

1. Logan, Daryl L., A First Course in the Finite Element Method. Cengage Learning, Stamford (2016).
2. Reddy, J. N., An Introduction to the Finite Element Method. McGraw-Hill Education, New York (2020).
3. Bathe, Klaus-Jürgen., Finite Element Procedures. Prentice Hall, New Jersey (2006).

Online Resources

6. https://archive.nptel.ac.in/courses/105/105/105105041/
7. https://archive.nptel.ac.in/courses/112/104/112104116/

Assessment	
Formative	Summative
Assignments / Mini project, Quiz, Learning Tasks	SA-I, SA-II and End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
[Name, Organization]	[Name, Institution]	Mr. Satheesh Kumar KRP, CE

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEE064	STRUCTURAL REHABILITATION AND HERITAGE CONSERVATION	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9, 11			

Pre,requisite courses	-	Data Book / Codes / Standards (If any)	-

ohhh

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the philosophy and principles behind the conservation of heritage and historical structures.
2	Acquire knowledge of deterioration mechanisms and assessment methods for old and heritage buildings.
3	Learn the materials and techniques used in structural rehabilitation and restoration of masonry and concrete heritage structures.
4	Develop competency in designing strengthening and conservation strategies consistent with international conservation ethics.

Course Outcomes:		Bloom's Taxonomy Level (BTL)
After successful completion of this course, the students shall be able to		
CO 1	Explain the need, philosophy, and principles of repair and rehabilitation.	(U)
CO 2	Identify causes of deterioration in historical and heritage structures.	(U)
CO 3	Assess the condition and structural performance of heritage structures using NDT and documentation techniques.	(AP)
CO 4	Recommend appropriate rehabilitation and retrofitting strategies for heritage buildings.	(AP)
CO 5	Apply international and national conservation guidelines in preparing a structural conservation plan.	(AP)

	Program Outcomes (PO) (Strong,3, Medium , 2, Weak,1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life,Long Learning	PSO,1	PSO,2
1	2	2	1	1		2	1	1	1		1	2	2
2	2	2	1	1		2	1	1	1		1	2	2
3	2	2	1	1		2	1	1	1		1	2	2
4	2	2	1	1		2	1	1	1		1	2	2
5	2	2	1	1		1	1	1	1		1	2	1

Course Content

INTRODUCTION TO REPAIR AND REHABILITATION	9 Hours
• Definition and philosophy of heritage - Classification of heritage structures, principles of conservation, international charters.	

• Need for rehabilitation – heritage and sustainability linkages, Indian context and challenges in heritage conservation.	
MECHANISMS OF DETERIORATION AND DAMAGE ASSESSMENT • Deterioration – Material decay in stone, brick masonry, and timber, environmental effects, structural distress patterns in old structures • Damage assessment - Visual inspection and documentation, preparation of condition maps, NDT and semi-destructive testing for heritage structures.	**9 Hours**
MATERIALS AND TECHNIQUES FOR CONSERVATION • Traditional materials – lime mortar, natural stone, brick, timber, compatible repair materials – lime-based mortars, pozzolanic materials, injection grouts, FRP and stainless, steel anchors, • Techniques - Surface cleaning and protection – consolidation and re-pointing – waterproofing and drainage improvements.	**9 Hours**
STRUCTURAL REHABILITATION AND RETROFITTING TECHNIQUES • Principles of structural retrofitting – Underpinning, jacketing, tie rods, arches, vault strengthening, and seismic retrofitting, base isolation and damping, integration of modern materials in heritage structures, maintaining reversibility and minimal intervention principles.	**9 Hours**
HERITAGE MANAGEMENT, DOCUMENTATION AND CASE STUDIES • Documentation of heritage structures – Measured drawings, photographic and digital recording, 3D laser scanning – preparation of conservation plans – legal frameworks (ASI, UNESCO World Heritage Guidelines) • Case studies of structural conservation - Qutub Minar, Brihadeeswara Temple, Charminar, and Rani ki Vav.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources*

Textbooks

1. Jagadish, K.S., Venkatarama Reddy, B.V., & Nanjunda Rao, K.S., *Alternative Building Materials and Technologies*, New Age International, New Delhi (2018).
2. Feilden, B.M., *Conservation of Historic Buildings*, Routledge, London (2003).

Reference books/ Web Links

1. Ashurst, J. & Dimes, F.G., *Conservation of Building and Decorative Stone*, Butterworth-Heinemann, London (2017).
2. Hardy, M., *Structural Conservation of Historic Monuments*, Routledge (2019).
3. ICOMOS & UNESCO Guidelines for Heritage Conservation.

Online Resources

1. NPTEL Course: *Heritage Conservation and Management*, IIT Roorkee.
2. https://nptel.ac.in/courses/105105212

Assessment	
Formative	Summative
Assignment, quiz, mini, projects, case study, presentations	SA-I, SA-II and End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEE065	PRE- ENGINEERED BUILDINGS	L	T	P	J	C
		3	0	0	0	3
PE		SDG	Nil			

Pre-requisite courses	-	Data Book / Codes / Standards (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	U**nderstand the need, benefits, and limitations** of Pre-Engineered and prefabricated steel buildings.
2	**Learn and apply modular coordination and grid planning** using standard dimensions, tolerances, and building code specifications.
3	**Study and classify the main structural components** like foundations, columns, beams, roof, floor, and wall panels for proper assembly and erection.
4	**Design PEB structural elements and their joints** to safely transfer axial loads, moments, and shear forces.
5	**Use knowledge of erection, launching, lifting, and transportation techniques** to prepare professional and safe construction process plans for real projects.

Course Outcomes:		
After successful completion of this course, the students shall be able to:		**Bloom's Taxonomy Level (BTL)**
CO 1	**Prepare** the plan for a Pre-Engineered Building system and **demonstrate** how its components are selected for given requirements.	Ap
CO 2	**Illustrate** modular grids for Pre-Engineered Buildings and **organize** the building layout using code-based dimensions and tolerances.	An
CO 3	**Examine** the structural classification of Pre-Engineered Building elements and **differentiate** their assembly behavior during erection.	An
CO 4	**Analyze** the design method of Pre-Engineered Building components and **select** suitable joint systems to resist axial, moment, and shear forces.	E
CO 5	**Design** a Pre-Engineered Building using combined launching, lifting, transport techniques and **develop** a professional construction process plan.	C

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	1	1	1	1	1	1	1	2	3	2
2	3	3	3	2	3	1	1	2	2	1	2	3	2

3	3	3	3	3	2	1	1	2	2	1	2	3	2
4	3	2	2	3	3	1	1	2	2	2	2	3	2
5	3	2	2	2	3	1	1	2	2	2	2	3	3

Course Content

INTRODUCTON Prefabricated construction, necessity, advantages, disadvantages, Mass produced steel, Industrialized buildings.	**06 Hours**
PLANNING AND SPECIFICATONS Modular coordination, basic module, planning and design modules, modular grid systems, National Building Code Specifications, standardization, dimensioning of products, preferred dimensions and sizes, tolerances and deviations, layout and process.	**09 Hours**
STRUCTURAL CLASSIFICATIONS Prefabricates classification, foundation, columns, beams, roof and floor panels, wall panels, box prefabricates, erection and assembly.	**09 Hours**
DESIGN OF ELEMENTS Design of prefabricated elements, Lift points beams, slabs, columns, wall panels, footings, design of joints to transfer axial forces, moments and shear forces.	**09 Hours**
LAUNCHING TECHNIQUES Construction techniques, large panel construction, lift slab system, Glover system, Constains's Jack - block system, Constain V-plate system, Bison system, Silber –Kuhi system, control of construction processes	**07 Hours**
EQUIPMENTS FOR TRANSPORTATON Equipments for horizontal and vertical transportation.	**05 Hours**

Theory Hours:	**45 Hrs**	**Tutorial Hours:**	**Practical Hours:**	**Project Hours:**	**Total Hours: 45 hrs**

Learning Resources

Textbooks

1. K. S. Vivek und P. Vyshnavi, (2017)) Pre - Engineered Steel Building, Limit State Design of Structural Members, LAP LAMBERT Academic Publishing
2. Alexander Newman, (2014) Metal Building Systems, Design and Specifications, Third Edition, McGraw-Hill Education

Reference books/ Web Links

1. Hass, A.M. (1983), Precast Concrete, Design and Applications, Taylor & Francis, UK.
2. Phillips, W.R. and Sheppard, D.A. (1980), Plant cast, Precast and Prestressed Concrete, McGraw Hill, New York.
3. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland BetorVerlag, 1978.
4. IS 15916:2010 – Building design and erection using prefabricated concrete – Code of practice.

Online Resources

1. http://www.iitk.ac.in/nicee/wcee/article/11_16.PDF
2. https://precast.org/education/classes/

Assessment	
Formative	Summative
Assignments / Mini project), Quiz, Lab	SA- I, SA-II and End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**

[Name, Organization]	[Name, Institution]	[Name, Department]

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEE066	Energy Efficient Buildings	L	T	P	J	C
		3	0	0	0	3
PE		SDG	7, 9, 11, 13			

Pre-requisite courses	-	Data Book / Codes / Standards (If any)	ECBC, IGBC Guidelines

Course Objectives:	
The purpose of taking this course is to	
1	Introduce the fundamental concepts of climate-responsive design and human thermal comfort.
2	Equip students with the knowledge of passive design strategies for heating, cooling, and daylighting.
3	Provide an understanding of energy-efficient active systems, including HVAC and lighting.
4	Familiarize students with green building rating systems and national energy codes.
5	Develop the competency to perform basic energy audits and assess the economic viability of sustainable retrofits.

Course Outcomes:		Bloom's Taxonomy Level (BTL)
After successful completion of this course, the students shall be able to		
CO 1	Understand the principles of climate, heat transfer, and human thermal comfort in the built environment.	U
CO 2	Apply passive solar design strategies to optimize natural ventilation, heating, and daylighting.	Ap
CO 3	Analyze the performance and integration of energy-efficient active systems (HVAC, lighting, renewables).	An
CO 4	Evaluate building designs based on standard green building rating systems (LEED, IGBC, GRIHA) and ECBC codes.	E
CO 5	Apply energy auditing techniques and life-cycle cost analysis for building energy management.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	2	1	-	2	3	1	-	-	2	2	2
2	3	3	3	2	2	3	3	-	-	1	2	3	2
3	3	3	2	2	2	2	3	-	-	2	2	3	3
4	2	2	2	2	2	3	3	2	2	2	3	2	3
5	3	3	2	3	3	2	3	2	2	3	3	3	3

Course Content

CLIMATE AND THERMAL COMFORT Introduction to energy efficiency in buildings. Climate classification, macro and microclimate. Elements of climate: solar radiation, temperature, wind, humidity. Thermal comfort factors, thermal indices, Psychrometric chart. Heat transfer in buildings: conduction, convection, radiation. U-values, thermal mass, and thermal lag.	**9 Hours**
PASSIVE DESIGN STRATEGIES Site planning and orientation. Building form and envelope. Shading devices: types and design. Passive heating techniques: Trombe wall, sunspace, direct gain. Passive cooling techniques: evaporative cooling, earth air tunnels, wind towers, radiative cooling. Natural ventilation principles and daylighting strategies.	**9 Hours**
ACTIVE SYSTEMS & RENEWABLES Introduction to energy-efficient HVAC systems. Psychrometric processes in air conditioning. Energy-efficient lighting systems: lamps, luminaires, daylight integration, and smart controls. Integration of renewable energy in buildings: Solar PV, solar water heaters, Building Integrated Photovoltaics (BIPV). Building automation and management systems (BMS).	**9 Hours**
GREEN BUILDING CODES & RATINGS Concept of Green Buildings and Net Zero Energy Buildings (NZEB). Overview of Energy Conservation Building Code (ECBC) and its compliance approaches. Green building rating systems in India: LEED India, IGBC rating systems, GRIHA. Sustainable building materials, eco-labels, and embodied energy.	**9 Hours**
ENERGY AUDIT AND ECONOMICS Types of energy audits: preliminary and detailed. Energy management programs and methodologies. Instruments for energy auditing. Economic analysis: Life cycle costing (LCC), simple payback period, return on investment (ROI). Retrofitting of existing buildings for energy efficiency. Case studies of successful energy-efficient buildings.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	45

Learning Resources

Textbooks

1. Krishnan, Arvind., Climate Responsive Architecture: A Design Handbook for Energy Efficient Buildings. McGraw-Hill Education, New Delhi (2001).
2. Majumdar, Mili., Energy-Efficient Buildings in India. TERI Press, New Delhi (2001).

Reference books/ Web Links

1. Clarke, J. A., Energy Simulation in Building Design. Butterworth-Heinemann, Oxford (2001).
2. Bureau of Energy Efficiency., Energy Conservation Building Code (ECBC). Ministry of Power, Government of India, New Delhi (2017).
3. IGBC., IGBC Green New Buildings Rating System. Indian Green Building Council, Hyderabad (2020).

Online Resources

1. https://nptel.ac.in/courses/105102175 (Energy Efficiency, Acoustics & Daylighting in building)
2. https://nptel.ac.in/courses/105102195 (Sustainable Architecture)

Assessment	
Formative	Summative
Assignments / Mini project, Quiz, Learning Tasks	SA-I, SA-II and End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
[Name, Organization]	[Name, Institution]	Mr. Satheesh Kumar KRP, CE

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

HONORS
ENVIRONMENTAL ENGINEERING

24CEE067	Environmental, Social, and Governance (ESG)	L	T	P	J	C
		3	0	0	0	3
PE		SDG	6, 9, 11, 12, 13			
Pre-requisite courses	-	Data Book / Code book (If any)	-			

Course Objectives:	
The purpose of taking this course is to:	
1	Sustainability challenges in civil engineering projects and infrastructure development
2	Environmental Impact Assessment to evaluate the ecological impact of construction activities
3	Social responsibility concepts to assess labour safety, community impacts, and stakeholder engagement in infrastructure projects.
4	Regulatory guidelines of Ministry of Environment, Forest and Climate Change and Central Pollution Control Board in construction project management.
5	Design and evaluate sustainable civil engineering projects, including green buildings and smart city initiatives.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply ESG principles to analyse sustainability challenges in civil engineering projects and infrastructure development	U
CO 2	Apply environmental assessment techniques such as Environmental Impact Assessment to evaluate the ecological impact of construction activities.	AN
CO 3	Apply social responsibility concepts to assess labour safety, community impacts, and stakeholder engagement in infrastructure projects.	U
CO 4	Apply governance frameworks and regulatory guidelines of Ministry of Environment, Forest and Climate Change and Central Pollution Control Board in construction project management.	AN
CO 5	Apply ESG strategies and metrics to design and evaluate sustainable civil engineering projects, including green buildings and smart city initiatives.	AP

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	1	2	2	1	2		1	2	3	2
2	3	3	2	2	3	2	1	3		1	2	2	3
3	3	3	2	3	2	3	2	1		2	3	3	2
4	3	3	3	2	3	2	1	2		3	2	3	3
5	3	2	3	3	3	3	2	2		2	3	3	3

Course Content	
Fundamentals of ESG in Civil Engineering Introduction to ESG and sustainability in infrastructure -Role of civil engineers in sustainable development – ESG vs Corporate Social Responsibility (CSR) -Overview of United Nations Sustainable Development Goals (SDGs) – Lifecycle approach in construction (planning → demolition) - ESG risks in infrastructure projects	**9 Hours**
Environmental Aspects in Civil Engineering (E) Environmental impact assessment (EIA) -Climate change and infrastructure resilience Sustainable construction materials (green concrete, recycled materials) -Water resource management and conservation -Waste management in construction & demolition-green buildings and rating systems like Indian Green Building Council (IGBC) and Leadership in Energy and Environmental Design	**9 Hours**
Social Responsibility in Infrastructure Projects (S) Labour safety and construction site management -Community impact assessment (displacement, rehabilitation)-Inclusive infrastructure (universal design, accessibility)-Public health and sanitation engineering -Stakeholder engagement in large projects - Case studies: dams, highways, smart cities	**9 Hours**
Governance in Construction & Infrastructure (G) Corporate governance in construction firms -Contract management and transparency -Anti-corruption and ethical practices in public projects-Regulatory bodies in India: Ministry of Environment, Forest and Climate Change (MoEF&CC), Central Pollution Control Board (CPCB)-ESG compliance and reporting Business Responsibility and Sustainability Reporting (BRSR-framework in India) -Risk management in infrastructure projects	**9 Hours**
ESG Implementation in Civil Engineering Projects Sustainable urban planning and smart cities -ESG integration in project lifecycle (design to execution) -ESG metrics and reporting for construction projects -Sustainable finance and green bonds -Case studies: metro rail, highways, green buildings -Future trends: net-zero infrastructure, climate-resilient cities	**9 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 45

Learning Resources
Textbooks:
1.
References:
1. Environmental Studies" – Erach Bharucha 2. IGBC Green Building Manuals – Confederation of Indian Industry MoEF&CC Environmental Guidelines (India) 3. "Sustainable Construction in India" – TERI Publications 4. "Sustainable Construction: Green Building Design and Delivery" – Charles J. Kibert 5. "Principles of Sustainable Finance" – Dirk Schoenmaker 6. "Environmental Impact Assessment: A Practical Guide" – Betty Bowers Marriott 7. "Corporate Governance" – Christine Mallin
Online Resources:
1. https://www.worldbank.org/en/topic/sustainabledevelopment https://www.globalreporting.org/ 2. https://www.sebi.gov.in/ (BRSR guidelines) 3.https://www.un.org/sustainabledevelopment/ https://www.worldgbc.org/ 4.https://igbc.in/ https://www.usgbc.org/leed

Assessment (Theory course)
SAI & SAII, Open Book Test, Learning Tasks (Concept Maps, Diagnostic Questions), (ESE).

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
		Dr.G.L.Sathiyamoorthy,Professor,Department of Civil Engineering, KCT	
Recommended by BoS on			
Academic Council Approval		**Date**	

24CEE068	CARBON SEQUESTRATION	L	T	P	J	C
		3	0	0	0	3
PE		SDG	7,9,12,13			

Pre-requisite courses	-	Data Book / Codes / Standards (If any)	-

Course Objectives:	The purpose of taking this course is to:
1	provide a scientific foundation on global carbon cycles and climate change.
2	build understanding of carbon capture, transport, utilization, and storage technologies.
3	develop analytical skills to evaluate CCS/CCU pathways and their techno-economic feasibility.
4	examine environmental, regulatory, and policy frameworks governing carbon sequestration.
5	enable students to design sustainable carbon mitigation strategies for various sectors.

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO1	explain the global carbon cycle, GHG emissions, and climate drivers requiring carbon sequestration	U
CO2	compare and analyze various carbon capture technologies used in industrial sectors	An
CO3	apply engineering principles to design CO_2 transport, storage, and utilization systems	Ap
CO4	evaluate environmental, economic, and policy aspects of CCS/CCU projects	E
CO5	propose integrated carbon management strategies for net-zero transitions	C

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	1	1	3	3	1	1	1	3	2	1
2	3	3	2	2	2	1	1	1	1	1	3	3	2
3	3	3	1	2	3	1	1	1	2	2	2	3	3
4	3	3	2	2	1	3	3	2	2	2	3	2	3
5	3	3	1	2	2	3	2	2	2	2	3	3	3

Course Content

Climate Drivers & Carbon history: Earth's carbon reservoirs and fluxes - Natural vs anthropogenic caused climate drivers, feedback mechanism- Greenhouse gases, radiative forcing, global warming and their effects - Carbon cycle, global carbon budget, calculating carbon budget in terms of equivalent atmospheric CO_2, history of atmospheric CO_2 through geological time, methods to monitor atmospheric CO_2, proxy for past CO_2 reconstruction, ice-core and marine sedimentary records - IPCC climate projections &	**9 Hours**

carbon budget - Net Zero, mitigation pathways	
Carbon storage and monitoring: Geological storage, rocks for CO_2 storage, storage in reservoirs, seals, traps, aquifers and depleted oil fields, CO_2 storage during enhanced oil recovery, saline aquifer, deep unmineable coal beds, deep sea basalt, trapping mechanisms, geomechanically properties of CO_2 geological storage, physical processes during CO_2 storage, leakage and monitoring, measurement and verification techniques during CO_2 storage, risks and challenges in CO_2 storage, possible hazards associated with carbon sequestration, economic considerations	**9 Hours**
Carbon removal: Ocean fertilization (FLOHAFEX Experiment), enhanced terrestrial weathering, ocean alkalinity enhancement, pros and cons of foresting deserts, limitations for planting trees, Carbon neutrality, existing and future technologies for removing Carbon directly from the atmosphere, Carbon dioxide scrubber, Carbon dioxide air capture, clean coal, amine gas treating, membrane gas separation, and metal-organic framework, radiative forcing geoengineering technologies, negative emissions technologies	**9 Hours**
Sustainable carbon products: CO_2 to fuels, chemicals, building materials - Carbonation products ($CaCO_3$, $MgCO_3$) - Biochar, BECCS (Bioenergy with CCS) - Direct Air Capture (DAC) technologies - Techno-economic analysis of CCS/CCU systems	**9 Hours**
Climate change policies and pricing: Strategies for mitigation of climate change, global climate action, IPCC assessment and IEA reports - mitigation policies for climate change, Paris climate agreement 2017, Kyoto protocol, Carbon capture and sequestration potential in India. Carbon market mechanisms - Carbon tax, cap-and-trade - LCA for carbon sequestration projects -Ethics, environmental issues & public perception	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources

Textbooks

1. Metz, B., Carbon Dioxide Capture and Storage, Cambridge University Press, 2005.
2. Herzog, H., Carbon Capture, MIT Press, 2018.

Reference books/ Web Links

1. IPCC Special Report, "Carbon Capture and Storage," 2005; AR6 Mitigation Report.
2. Haszeldine, R., "Carbon Capture and Storage," Phil. Trans. Royal Society A, 2009.
3. Lackner, K., "Climate Engineering and CO_2 Sequestration," Wiley, 2012.
4. Keith, D., "Direct Air Capture," Science, 2018.
5. IEA, "Global Status of CCS," Annual Reports.

Online Resources

1. IPCC Climate Reports: https://www.ipcc.ch
2. International Energy Agency (IEA) – CCS Hub: https://www.iea.org/topics/ccus
3. Global CCS Institute: https://www.globalccsinstitute.com
4. US DOE NETL CCS Portal: https://www.netl.doe.gov/
5. UN SDG Knowledge Base: https://sdgs.un.org

Assessment (Embedded Course)

CAT, Activity and Learning Task(s) , Mini project, MCQ, End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	Expert(s) from Higher Education Institutions	Internal Expert(s)
Dr. Mohammed Siraj Ansari A Scientist -C, Central Academy for State Forest Service Directorate of Forest Education	Dr. S. Shanthakumar, Professor & Director, Centre for Clean Environment, Vellore Institute of Technology (VIT), Vellore -632 014	Dr. A. Geethakarthi, Civil Engineering

Approved by: BoS Chairman	
BoS Approval date:	

24CEE069	Blue Economy	L	T	P	J	C
		3	0	0	0	3
PE		SDG	7, 8, 12, 13, 14			

Pre-requisite courses	-	Data Book / Codes / Standards (If any)	-

Course Objectives:	The purpose of taking this course is to:
1	Introduce the concept of the Blue Economy as a sustainable development model integrating economic, social, and environmental dimensions.
2	Provide understanding of marine ecosystems, governance frameworks, and conservation strategies.
3	Develop entrepreneurial competencies in ocean-based sectors.
4	Familiarize students with business models, financing mechanisms, and market opportunities.
5	Enable students to design sustainable and socially inclusive Blue Economy solutions.

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Explain the concept, principles, and significance of the Blue Economy	U
CO 2	Explain and interpret policy frameworks and conservation strategies for marine sustainability	U
CO 3	Apply entrepreneurial concepts to identify opportunities in Blue Economy sectors	Ap
CO 4	Analyze business models, markets, and financing strategies	An
CO 5	Apply sustainability principles to propose solutions for environmental, social, and economic challenges in the Blue Economy	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	-	-	2	1	-	1	-	2	1	1
2	2	3	1	1	-	3	2	-	1	-	2	1	1
3	2	2	3	1	1	2	1	2	2	2	2	2	3
4	2	3	2	2	1	2	1	2	2	3	2	2	3
5	2	2	3	2	-	3	3	2	2	1	3	2	2

Course Content

Introduction to Blue Economy — **9 Hours**

Concept, scope and significance of the Blue Economy – Blue Economy vs Green Economy - Principles and pillars of Blue Economy: economic growth, environmental sustainability and social inclusion - Role of oceans in economic development and livelihoods - Classification and utilization of ocean resources: fisheries, aquaculture, marine tourism, offshore energy and seabed resources - Contribution of Blue Economy to national GDP and global economy - Overview of Blue Economy initiatives in India: Sagarmala, Deep Ocean Mission, Blue Revolution

Governance, Policy and Marine Conservation Ocean governance and need for regulatory frameworks - International frameworks: UNCLOS, Sustainable Development Goal 14, global marine agreements - National policies and regulatory frameworks for marine resource management in India - Marine ecosystems: structure and functions of coastal and ocean ecosystems (mangroves, coral reefs, estuaries) - Marine biodiversity and ecosystem services - Sustainable practices in fisheries and aquaculture - Coastal zone management (ICZM) - Marine pollution: sources, types (plastic, oil spills, industrial discharge) and control measures control	**9 Hours**
Role of Science, Technology and Innovation in Blue Economy Role of science and technology in sustainable ocean resource management - Ocean observation techniques: satellites, buoys, sensors and data collection techniques - Applications of remote sensing and GIS in ocean monitoring and coastal mapping - Applications of AI, IoT and big data in marine sectors - Technological developments in fisheries and aquaculture: smart fishing systems, precision aquaculture- Marine biotechnology: bio-resources, pharmaceuticals and industrial applications - Marine renewable energy technologies: offshore wind, wave and tidal energy - Innovation and startup ecosystem in Blue Economy	**9 Hours**
Entrepreneurship, Business Models and Financing Entrepreneurship opportunities in Blue Economy sectors- Identification of business opportunities in marine industries - Business models for marine-based enterprises : value proposition, customer segments, revenue streams and cost structures - Market analysis: demand assessment, competition and pricing strategies in marine sectors - Value chain in marine industries: harvesting, processing, storage, transportation and marketing of marine products - Financing mechanisms and Public-private partnerships	**9 Hours**
Environmental Management & Challenges Environmental issues in marine ecosystems: pollution (plastic waste, microplastics, oil spills and eutrophication) and overexploitation - Climate change and its impact on oceans and coastal regions - Blue carbon ecosystems: role of mangroves, seagrasses and wetlands in climate mitigation - Disaster risk management and resilience in coastal regions - Ecosystem-based management and circular economy principles - Role of local communities and stakeholders in marine conservation - Emerging challenges and future prospects: deep-sea mining, marine spatial planning and ocean governance	**9 Hours**

Theory Hours:	Tutorial Hours:	Practical Hours:	Project Hours:	Total Hours:

Learning Resources*

Textbooks

9. Vierros, Marjo; De Fontaubert, Charlotte. *The potential of the blue economy: increasing long-term benefits of the sustainable use of marine resources for small island developing states and coastal least developed countries (English).* Washington, D.C.: World Bank and United Nations Department of Economic and Social Affairs (DESA) (2017).

   http://documents.worldbank.org/curated/en/523151496389684076

10. Blue Economy and Blue Finance: Toward Sustainable Development and Ocean Governance", ADB Institute Press, (2022), ISBN 978-4-89974-251-7.

Reference books/ Web Links

9. Malaysia Institute of Maritime Affairs (MIMA)., *Blue Economy Initiatives for Sustainable Development Agenda in Maritime Sector: Profound Social Capital and Technology Implications*., Malaysia Institute of Maritime Affairs (MIMA), Kuala Lumpur

10. Hotaling, Liesl., Spinrad, Richard W., *Preparing a Workforce for the New Blue Economy: People, Products and Policies*., Elsevier, Amsterdam (2021).

11. Leal Filho, Walter., Salvia, Amanda Lange., Eustachio, Joao Paulino Pires., Dinis, Maria Alzira Pimenta., *Handbook of Sustainable Blue Economy*., Springer, Cham (2024).

12. Pauli, Gunter., *The Blue Economy: 10 Years, 100 Innovations, 100 Million Jobs*., Paradigm Publications, Taos, New Mexico (2010).

13. Ram, Roshan Kumar., Kumar, Pravesh., Srivastava, Prem Prakash., Chandravanshi, Sanjay., Revolutionizing Aquaculture and Fisheries: Innovations and Technologies for a Sustainable Blue Economy., New India Publishing Agency, New Delhi (2025).

14. Vala, Anjana K., Dudhagara, Dushyant R., Marine Biotechnology: A Gateway to Blue Economy., CRC

Press, Boca Raton (2025).

15. World Wildlife Fund (WWF)., Principles for a Sustainable Blue Economy., World Wildlife Fund (WWF), Gland, Switzerland (2015)

Online Resources

8. https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr26_ed06
9. https://alison.com/course/blue-economy
10. https://www.edx.org/learn/economics-finance/state-bank-of-india-blue-economy-sustainable-aquaculture
11. https://learn.udafoundation.in/courses/blue-economy/?v=212bd1cfe3fb

Assessment	
Formative	Summative
Assignments / Mini project), Quiz, Lab	CAT- I, CAT – II and End Semester Examination (ESE)

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
Ms. Lakshmi R, Engineer – I, Technip FMC, Hyderabad	Mr. Danish D R Project Scientist, IIT Madras	Ms. S. Rajalakshmi Assistant Professor Department of Civil Engineering KCT

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEE070	Sustainable Technology and Circular Economy	L	T	P	J	C
		3	0	0	0	3
PE		SDG	7,12,13			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	To understand the basic concepts of sustainability and circular economy, including global ideas from the United Nations and their relevance to India.
2	To learn about different sustainable technologies used in energy, water, and materials for efficient use of resources.
3	To study the application of circular economy practices in sectors like industry, agriculture, and urban systems with Indian examples.
4	To gain knowledge of environmental policies, economics, and business models, including ESG guidelines by Securities and Exchange Board of India.
5	To develop skills to use tools like Life Cycle Assessment (LCA) and sustainability metrics for solving real-world problems.

Course Outcomes		
After successful completion of this course, the students shall be able to		**Revised Bloom's Taxonomy Levels (RBT)**
CO 1	Explain the fundamental concepts of sustainability and circular economy, including global frameworks such as those by the United Nations.	U
CO 2	Apply sustainable technologies in energy, water, and material systems for efficient resource utilization.	AP
CO 3	Analyze circular economy practices in sectors like manufacturing, agriculture, and urban systems with Indian examples.	AN
CO 4	Evaluate environmental policies, economic tools, and sustainability frameworks, including ESG guidelines by Securities and Exchange Board of India.	E
CO 5	Assess the effectiveness of sustainable technologies and circular practices in addressing real-world environmental challenges.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative teamwork	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2
1	2	2				2	3	2		2		2	
2	3	2	2	2	2	2	3					3	2
3	2	3	2	2		2	3		2	2		3	2
4	2	3	2			3	3	2			2	2	2
5	2	3	2	2	2	3	3					3	2

Course Content	
SUSTAINABILITY FOUNDATIONS AND CIRCULAR ECONOMY PRINCIPLES • Basic concepts of sustainability – environmental, economic, and social dimensions; triple bottom line approach • Global frameworks – Sustainable Development Goals (SDGs) by United Nations; planetary boundaries and climate change science • Linear vs Circular Economy – principles of reduce, reuse, recycle, recover, redesign • Industrial ecology and systems thinking – material flow cycles, feedback systems • Circular economy models – biological and technical cycles; cradle-to-cradle approach • Indian context – circular economy initiatives by NITI Aayog; Swachh Bharat Mission; informal waste sector integration	**9 Hours**
SUSTAINABLE TECHNOLOGIES AND RESOURCE EFFICIENCY • Energy storage and smart grids – batteries, grid integration, decentralized systems • Water and resource efficiency – wastewater treatment, desalination, rainwater harvesting • Sustainable materials – green construction materials, biomaterials, low-carbon cement • Digital technologies – AI, IoT, blockchain for resource optimization and circular tracking • Industry 4.0 applications in sustainability – automation, predictive maintenance, digital twins • Indian context – National Solar Mission; EV ecosystem; role of Ministry of New and Renewable Energy	**9 Hours**
CIRCULAR ECONOMY IN SECTORS AND APPLICATIONS • Manufacturing sector – industrial symbiosis, zero-waste production, cleaner production techniques • Agriculture and food systems – circular agriculture, composting, bio-economy, food waste valorization • Urban systems – smart cities, sustainable infrastructure, waste-to-energy technologies • Plastics and e-waste management – recycling technologies, Extended Producer Responsibility(EPR) • Construction and built environment – circular construction, demolition waste reuse • Indian case studies – plastic waste rules, e-waste management rules, Smart Cities Mission, Dharavi recycling model	**9 Hours**
ENVIRONMENTAL ECONOMICS, POLICY AND BUSINESS MODELS • Environmental economics – externalities, carbon footprint, life cycle costing • Circular business models – product-as-a-service, sharing economy, remanufacturing • Policy instruments – regulations, taxes, subsidies, carbon pricing mechanisms • ESG (Environmental, Social, Governance) frameworks and sustainability reporting • Global agreements – Paris Agreement, climate finance mechanisms • Indian context – ESG regulations by Securities and Exchange Board of India; carbon market development; green finance initiatives	**9 Hours**
IMPLEMENTATION TOOLS, METRICS AND FUTURE TRENDS • Life Cycle Assessment (LCA) – methodology, tools, carbon and water footprint analysis • Material Flow Analysis (MFA) and circularity indicators • Sustainability metrics – KPIs, SDG indicators, environmental performance indices • Project planning – stakeholder analysis, risk assessment, sustainability audits • Emerging trends – net-zero technologies, climate tech, circular innovation ecosystems • Advanced tools – simulation and modeling of sustainable systems; applications in infrastructure and urban planning	**9 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 45

Learning Resources

Textbooks:

1. Singh, P., Yadav, K., and Daga, S., Circular Economy and Sustainable Innovation: Pathways and Applications for a Greener Future, Springer, 2025.
2. Ramakrishna, S. and Ramasubramanian, B., Handbook of Materials Circular Economy Springer, 2024.
3. Prasad, M.N.V. and Smol, M., Sustainable and Circular Management of Resources and Waste Towards a Green Deal, Elsevier, 2023.
4. Singh, R. and Kumar, V. (Eds.), Sustainable Innovations and Digital Circular Economy, Springer, 2025.

References:

1. Geissdoerfer, M., Savaget, P., Bocken, N.M.P., and Hultink, E.J., The Circular Economy – A New Sustainability Paradigm?, Journal of Cleaner Production, 2017.
2. Kirchherr, J., Reike, D., and Hekkert, M., Conceptualizing the Circular Economy: An Analysis of 114 Definitions, Resources, Conservation & Recycling, 2017.
3. Ghisellini, P., Cialani, C., and Ulgiati, S., A Review on Circular Economy: The Expected Transition to a Balanced Interplay of Environmental and Economic Systems, Journal of Cleaner Production, 2016.
4. Murray, A., Skene, K., and Haynes, K., The Circular Economy: An Interdisciplinary Exploration of the Concept and Application in a Global Context, Journal of Business Ethics, 2017.
5. Korhonen, J., Honkasalo, A., and Seppälä, J., Circular Economy: The Concept and Its Limitations, Ecological Economics, 2018.

Online Resources:

1. nptel.ac.in/courses/124106813
2. nptel.ac.in/courses/127105018

Assessment (Theory course)
SA I & SAII, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Recommended by BoS on		
Academic Council Approval		**Date**

24CEE071	OCCUPATION HEALTH, SAFETY, AND WELL BEING	L	T	P	J	C
		3	0	0	0	3
PE		SDG	3,8,9,12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Understand the basics of Occupational Health and Safety (OHS) and its importance in industries.
2	Learn OSHA regulations, safety policies, and accident investigation methods.
3	Understand ergonomic principles to improve workplace safety and efficiency.
4	Gain knowledge of workplace safety systems like fire safety, electrical safety, and emergency plans.
5	Apply industrial hygiene and health protection practices in engineering and environmental sectors.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Understand occupational hazards, accident causation, investigation methods, and OSHA regulations related to workplace safety.	U
CO 2	Apply ergonomic principles, human factors, and hazard cognition techniques to improve workplace safety and efficiency.	Ap
CO 3	Analyze workplace safety systems including fire protection, electrical safety, and emergency response planning	An
CO 4	Analyze workplace health risks, disease transmission, and protective measures including PPE and safety programs	An
CO 5	Evaluate industrial hygiene practices, exposure limits, and safety measures in water, wastewater, and construction industries.	E

Course Content

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11			
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2	3	1	2	1	3	3	1	1	1	1	1	2	
2	2	3	3	2	2	2	2	2	1	2	2	2	3	
3	2	3	3	2	2	3	2	2	1	2	2	2	3	
4	2	3	2	2	1	3	3	2	2	2	1	1	3	
5	2	3	2	2	2	3	3	2	2	2	2	2	3	

OCCUPATIONAL HAZARD AND CONTROL PRINCIPLES — **9 Hours**

Relevance of OHS in Global Industrial Scenario and Impacts on Economy. Job opportunities as Safety Engineers. OSHA Limitations and the Need for Change. Safety, History and Development, National Safety Policy. Occupational Safety and Health Act (OSHA), Occupational Health and Safety Administration - Laws governing OSHA and right to know. Accident – causation, investigation, investigation plan, Methods of acquiring accident facts, Supervisory role in accident investigation. Program Workers' Compensation - Unsafe Acts vs. Unsafe Conditions.

ERGONOMICS AT WORKPLACE Ergonomics Task analysis, Preventing Ergonomic Hazards, Workspace. Envelops, Visual Ergonomics, Ergonomic Standards, Ergonomic Programs. Hazard cognition and Analysis, Human Error Analysis – Fault Tree Analysis – Emergency Response. Indoor Air Quality: Asbestos Awareness - Blood-borne Pathogen	**9 Hours**
SAFETY SYSTEMS AT WORKPLACE Fire Triangle, Fire Development and its severity, Effect of Enclosures, Statutory and other standards, Fire Prevention & Protection System, Classification of Fire and Fire Extinguishers. Electrical Safety: Standard and Lockout/Tagout - Product Safety: Technical Requirements of Product Safety - Process Safety Management. Exit Routes, Emergency Action Plans, and Confined Spaces & Entry	**9 Hours**
HEALTH CONSIDERATIONS AT WORKPLACE Types of diseases and their spread, Health Emergencies - Principles of Personal Protective Equipment/Clothing, types, and advantages. Effects of exposure and treatment for engineering industries, municipal solid waste. Environment management plans (EMP) for safety and sustainability. Forklift Safety/Heat Stress/Ladder Safety /Scaffold Safety.	**9 Hours**
PRINCIPLES OF INDUSTRIAL HYGIENE Water and wastewater treatment plants, Handling of chemical and safety measures in water and wastewater treatment plants and labs, Construction material manufacturing industries like cement plants, RMC Plants, precast plants, and construction sites. Policies, roles, and responsibilities of workers, managers, and supervisors. Occupational exposure limits, OSHA record-keeping, Principles of good practice.	**9 Hours**

Theory Hours: 45	**Tutorial Hours: 0**	**Practical Hours: 0**	**Project Hours: 0**	**Total Hours: 45**

Learning Resources

Textbooks:

1. Goetsch D.L, "Occupational Safety and Health for Technologists", Engineers and Managers Prentice Hall, 1999.
2. Heinrich H.W, "Industrial Accident Prevention-A Scientific Approach", McGraw-Hill Book Company, 2007.

References:

1. Colling D.A., "Industrial Safety Management and Technology", Prentice Hall, 1990.
2. Della D.E. and Giustina Van Nostrand Reinhold, "Safety and Environmental Management", 1st Edition 1996.

Online Educational Resources:

12. https://www.udemy.com/course/certificate-in-occupational-health-and-safety/?couponCode=LEARNNOWPLANS
13. https://www.shiksha.com/online-courses/international-general-certificate-in-occupational-health-and-safety-course-nebol1

sessment (Theory course)

I & SA II, Formative Assessment, Activity and Learning Task(s)*, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Er. E. Thinakaran, Project Director, P & C Adyar Water Projects (P) Ltd, Chennai, Tamil Nadu -600 037	Dr. R. Saraswathi, Professor, Department of Civil Engineering, Coimbatore Institute of Technology, Coimbatore – 641 014.		Dr. B. Nithyalakshmi Dr. A. Gandhimathi, Department of Civil Engineering
Recommended by BoS on	XX/YY/2024		
Academic Council Approval	No.	**Date**	XX/YY/2024

24CEE013	Nanotechnology in Environmental Engineering	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	understand the synthesis and fabrication and characteristics of nanomaterials
2	synthesis and apply nanotechnology in diverse research and industrial fields and to access their impacts onto the environment
3	learn the principles of nano- catalysis, membranes, nanofiltration and other methods in the processes of water treatment processes

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	identify and understand various approaches for nanomaterial synthesis	U
CO2	characterize and analyse the synthesized nanomaterials	Ap
CO3	synthesize and characterize nano-membrane and nanomaterial	An
CO4	identify the impact of nanoparticle and its toxicity to the environment	U

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)					
	1	2	3	4	5	6
	Independent Research and Development	Technical Report and documentation	Mastery over domain specialization	Advanced scientific knowledge through appropriate tools and research methods	Design and apply technological advancements for complex Engineering	Sustainable Solutions with Emphasis on Safety and Environmental factors
1	3	2			3	2
2	3	2	2		3	2
3	3	2			3	2
4		2	3		3	2

Course Content

Introduction and Synthesis of Nanomaterials History –Overview of existing application of nanomaterials in water and wastewater treatment; Synthesis of nanomaterials: magnetic nanoparticles, Carbonaceous nanoparticles; nanocomposites; clay supported nanoparticles, aerogels- Methods of synthesis: Sol-Gel method, microemulsion method, electrospinning method, plasma technique, Chemical Vapour Deposition (CVD)	**9 Hours**
Methods for Structural and Chemical Characterization of Nanomaterials Separation techniques- Morphology studies: scanning electron microscopy (SEM) - Surface charge and optical properties of nanoparticles: zeta potential, UV-Vis Spectrometry-Elemental composition of single nanoparticles using EDAX, elemental composition of bulk nanoparticles- X-ray diffraction (XRD) – Fourier Transform- Infra red Spectroscopy (FTIR)	**8 Hours**

Nanomembranes Technology Overview of membrane technology- Types of membrane filtration, microfiltration, ultra filtration, nanofiltration, reverse osmosis – Transport principles - Membrane fabrication and characterization- Nanoparticle membrane reactor	**10 Hours**
Nanomaterials as Adsorbents and Oxidants Metals oxides (Titanium oxides, Iron oxides, Copper, Zinc) – Carbon nano-adsorbents: CNTs Carbon nanotubes (single and multiwalled), Fullerenes- Molecularly imprinted polymers for removal of micropollutants- Advanced Oxidation Process: Photocatalytic oxidation, Fenton process	**9 Hours**
Fate and Toxicity of Nanoparticles and Nanomaterials Processes determining the fate of NMs /NPs in environment: aggregation, reaction, adsorption, deposition; ecotoxicity of NMs/NPs; - Effect on human health and environment- Introduction to nanosensors	**9 Hours**

Theory Hours: 45	**Tutorial Hours: 0**	**Practical Hours: 0**	**Project Hours: 0**	**Total Hours: 45**

Learning Resources:

Textbooks:

1. Ajay Kumar Mishra, "Application of Nanotechnology in Water Research", Scrivener Publishing LLC. 2014
2. Eugene T, Michele De Kwaadsteniest, "Nanotechnology in Water Treatment Applications", Caister Academic Press, 2010
3. Lens P., Virkutyte J., Jegatheesan V., and Al-Abed S., "Nanotechnology for Water and Wastewater Treatment', IWA Publishing, 201

Reference books & Weblinks:

1. Barai, D. P., Chichghare, K. K., Chawhan, S. S., & Bhanvase, B. A. (2021). *Nanomaterials for En vironm Environmental Engineering and Energy Applications*
2. Biswas, J. K., & Rai, M. (2024). *Nanotechnology for Environmental Management*. Publisher
3. Handbook of Nanotechnology, Edi-Bharat Bhushan, Springer, 2004
4. Ledwani, L., & Sangwai, J. S. (Eds.). (2020). *Nanotechnology for Energy and Environmental Eng ineering*

Online Resources (Weblinks)

1. Nanotechnology and the Environment: Applications and Implications - 575.763 | Hopkins EP Online (jhu.edu)
2. https://www.igmpi.ac.in/nanotechnology
3. https://archive.nptel.ac.in/courses/118/107/118107015/

Assessment (Theory course)

SA I and SA II, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**
Dr. Mohammed Siraj Ansari A Scientist -C, Central Academy for State Forest Service Directorate of Forest Education Ministry of Env., Forest and Climate Change (MoEF& CC), Burnihat, Assam – 793 101	Dr. N. R. Sasirekha Assistant Professor, CAS in Crystallography and Biophysics, University of Madras, Guindy Campus, Chennai 600 025	Dr. A. Geethakarthi, Department of Civil Engineering

Recommended by BoS on			
Academic Council Approval	No: 27	**Date**	24.08.2024

HONORS
Infrastructure Engineering & Management

24CEE073	TOTAL QUALITY MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
PE		SDG	3,5,8			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Introduce the fundamental concepts, principles, and evolution of quality and Total Quality Management (TQM).
2	Develop an understanding of TQM principles such as customer satisfaction, continuous improvement, and the contributions of quality pioneers.
3	Equip students with statistical tools and techniques used for quality control and process improvement.
4	Familiarize students with modern quality systems, standards, and certification procedures including ISO 9000 and Six Sigma.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Explain the fundamental concepts, dimensions, and importance of quality and Total Quality Management.	Un
CO 2	Apply the principles of customer satisfaction, continuous improvement, and Just-In-Time in managing quality.	Ap
CO 3	Analyze statistical data using basic quality control tools and control charts for process monitoring.	An
CO 4	Utilize TQM tools such as QFD, Benchmarking, and Taguchi methods to enhance product and process quality.	Ap
CO 5	Evaluate and interpret quality standards, ISO 9000 requirements, and audit processes for certification and documentation.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	1	1	2	2	1	1	1	3	3	2
2	2	3	2	2	2	2	1	2	1	2	2	3	3
3	3	3	2	3	3	1	1	1	1	2	2	3	2
4	2	2	3	2	3	1	1	1	1	2	2	3	3
5	2	2	2	3	2	3	3	2	2	3	3	3	2

Course Content	
INTRODUCTION Definition of Quality, Dimensions of Quality, Quality Characteristics, Quality Improvement, History of Quality Control, Quality Circles, Obstacles to TQM Implementation.	**9 Hours**
TQM PRINCIPLES Customer satisfaction – Customer Perception of Quality, Customer Complaints,	**9 Hours**

Customer Retention, Contributions of Deming, Juran, 5S, Kaizen, Just-In-Time	
STATISTICAL PROCESS Statistical fundamentals- Measure of Central Tendency & Dispersion, population and sample, Basics of Control Charts.	**9 Hours**
TQM TOOLS The seven old tools of quality, New seven Management tools, Benchmarking, Taguchi quality loss function, CPM & PDPC, Building the house of quality, Quality Function Deployment (QFD), Concept of six sigma	**9 Hours**
QUALITY SYSTEMS & STANDARDS Introduction to ISO 9000, Clauses of ISO 9000, ISO Certification, Supplier quality issues, ISO 9001:2000 requirements, Quality Auditing , Quality Documentation.	**9 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 45

Learning Resources

Textbooks:

8. Dale H.Besterfiled, "Total Quality Management", Pearson Education, 2016 .
9. Feigenbaum.A.V. "Total Quality Management", McGraw Hill, 2013.
10. James R.Evans& William M.Lidsay, "The Management and Control of Quality", South-Western (Thomson Learning), 2008.
11. Oakland.J.S. "Total Quality Management", Butterworth – Hcinemann Ltd., Oxford, 2011.

Reference books & Weblinks:

4. Peter Pande "The Six Sigma Way" Tata McGraw Hill Book Co. Ltd., Delhi, 2000, 3rd Edition.
5. Narayana V. and Sreenivasan, N.S. "Quality Management – Concepts and Tasks", New Age International 2007.
6. Zeiri. "Total Quality Management for Engineers", Wood Head Publishers.2009
7. Bhaskar S. "Total Quality Management", Anuradha Agencies, Chennai. (2007- revised edition).

Online Resources:

4. https://ocw.mit.edu/courses
5. https://nptel.ac.in/courses/112107186
6. https://asq.org/quality-resources

Assessment (Theory course)

SAI, SAII, Group Presentation, Open Book Test, Assignments, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
3. **Mr. Suresh Kumar** Senior Project Manager, L&T Construction 4. **Mr. Amit Sharma** Vice President, Project Management, TATA Projects Ltd.	3. **Dr. P.K. Viswanathan** Professor, Department of Civil Engineering, IIT Madras 4. **Dr. M. Arivazhagan** Dean, School of Management Studies ,NIT Trichy	4. Dr.U.Sindhu Vaardini AP/Civil 5. Mr.P.Aswin Bharath AP/Civil 6. Dr. P.A.Prabakaran AP/Civil

Recommended by BoS on			
Academic Council Approval	No:	**Date**	

24CEE074	HOUSING PLANNING AND MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9, 11, 12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	The objective of the course is to train the students to have a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects.
2	The course focuses on cost effective construction materials and methods.
3	Emphasis is given on the principles of sustainable housing policies and programmes

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply principles of sustainable housing to assess the objectives and strategies of national housing policies.	Ap
CO 2	Analyze housing programs and slum housing projects to propose effective solutions using GIS and MIS tools.	An
CO 3	Apply housing project layouts by integrating site analysis, building by-laws, and development control regulations	Ap
CO 4	Analyze cost-effective construction techniques and materials to suggest green building solutions.	An
CO 5	Apply housing finance models to study the viability and sustainability of public-private partnership projects.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	1	1	3	2	1	1	2	3	3	2
2	2	3	2	3	2	2	2	2	1	2	2	3	3
3	3	2	3	2	3	2	1	2	2	2	2	3	3
4	2	2	3	2	3	3	2	2	2	3	3	3	2
5	2	2	2	3	3	3	3	2	2	3	3	3	3

Course Content

INTRODUCTION TO HOUSING Meaning of house, home, household, apartments, and special buildings. Importance of housing and need for planning. Overview of National and State housing policies. Basics of sustainable housing and infrastructure needs. Organizations involved in housing at national, state, and local levels.	**9 Hours**
HOUSING PROGRAMMES AND POLICIES Different types of housing schemes: plotted development, apartments, gated communities, and townships. Slum housing: improvement, redevelopment, and relocation. Role of government, private sector, and NGOs in housing development. Use of GIS and MIS in housing projects.	**9 Hours**

PLANNING AND DESIGN OF HOUSING PROJECTS Land selection and soil suitability for housing. Building byelaws, planning norms, and RERA overview. Layout planning and design of housing units. Preparation of housing project reports and feasibility studies.	**9 Hours**
CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS New methods of housing construction. Use of modern, low-cost, and eco-friendly building materials. Green building concept and importance of sustainability. Role of Building Centres and floor space index.	**9 Hours**
HOUSING FINANCE AND PROJECT APPRAISAL Basics of housing project financing and cost estimation. Sources of housing finance and subsidy schemes. Concept of Public–Private Partnership (PPP) and Viability Gap Funding. Pricing and evaluation of housing projects.	**9 Hours**

Theory Hours:	45	Tutorial Hours:	0	Practical Hours:	0	Project Hours:	0	Total Hours:	45

Learning Resources

Textbooks:

1. Meera Mehta and Dinesh Mehta, “Metropolitan Housing Markets", Sage Publications Pvt Ltd., New Delhi, 2004.
2. Francis Cherunilam and Odeyar D Heggade, "Housing in India", Himalaya Publishing House, Bombay, 2008.
3. Wiley-Blackwell,"Neufert Architects"Data,4th Edition, Blackwell Publishing Ltd, 2012
4. Donald Watson and Michael J.Crosbie, "Time Saver Standards for Architectural Design",8thEdition, Tata McGraw Hill Edition,2011

Reference books & Weblinks:

1. Walter Martin Hosack,"Land Development Calculations", McGraw Hill2ndEdition, USA2010
2. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2004.
3. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHSHabitat, Nairobi, 2010
4. Government of India, National Housing Policy,2007

Online Resources:

1. https://nptel.ac.in/courses/105107219
2. https://unhabitat.org
3. https://nhb.org.in

Assessment (Theory course)

SAI, SAII, Group Presentation, Open Book Test, ,Assignments, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
1. **Mr. Suresh Kumar** Senior Project Manager, L&T Construction 2. **Mr. Amit Sharma** Vice President, Project Management, TATA Projects Ltd.	1. **Dr. P.K. Viswanathan** Professor, Department of Civil Engineering, IIT Madras 2. **Dr. M. Arivazhagan** Dean, School of Management Studies ,NIT Trichy	1. Dr.U.Sindhu Vaardini AP/Civil 2. Mr.P.Aswin Bharath AP/Civil 3. Dr. P.A.Prabakaran AP/Civil

Recommended by BoS on			
Academic Council Approval	No:	**Date**	

24CEE076	METRO RAIL ENGINEERING	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9			

Pre-requisite courses	-	Code book	-

Course Objectives:	
The purpose of taking this course is to:	
1	**Provide a comprehensive understanding** of metro rail systems, their evolution, planning lifecycle, regulatory framework, and urban relevance.
2	**Develop technical knowledge** of metro infrastructure components such as alignment design, tunnels, stations, tracks, viaducts, depots, and rolling stock.
3	**Explain operational systems,** including traction power supply, electrification, signalling, communication, control, and safety protocols used in metro networks.
4	**Introduce construction technologies and digital tools** such as BIM, digital twins, mechanized construction, IoT, and AI relevant to metro project execution and maintenance.
5	**Analyze metro systems' socio-economic, environmental, financial, and urban development impacts,** including TOD strategies, sustainability, PPP models, and future-oriented smart metro innovations.

Course Outcomes		
After successful completion of this course, the students shall be able to		**Revised Bloom's Taxonomy Levels (RBT)**
CO1	Differentiate metro systems from other transit modes and evaluate corridor planning decisions.	U
CO2	Assess metro alignment and infrastructure components ensuring comfort & safety.	An
CO3	Explain rolling stock, traction, power supply & signalling principles used in metro systems.	Ap
CO4	Select appropriate construction techniques and digital technologies for metro project execution and maintenance.	An
CO5	Evaluate sustainability, financing, urban integration & development impacts of metro systems.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
CO1	3	3	2	2	1	2	1	1	2	2	1	3	1
CO2	3	3	3	2	2	1	1	1	2	1	1	3	2
CO3	3	2	2	1	2	1	1	1	2	1	1	2	2
CO4	2	2	2	2	3	1	1	1	2	1	2	2	3
CO5	2	2	1	2	1	2	2	1	3	3	2	2	2

Course Content	
INTRODUCTION TO METRO SYSTEMS • Evolution of metro systems (global & Indian context) • Metro vs. suburban rail, BRTS, and LRT – comparative analysis • Metro rail standards & regulatory framework (MoHUA, DMRC, RDSO, UIC, IEC) Case studies: Delhi Metro, Hong Kong MTR, Singapore MRT • Project lifecycle in metro rail: feasibility, DPR, approvals, funding • Corridor alignment selection (elevated, underground, at-grade) • Land acquisition, utility shifting, and stakeholder coordination. • Environmental & social impact assessment in metro projects	**3 Hours**
METRO RAIL INFRASTRUCTURE ENGINEERING • Alignment selection (elevated, underground, at-grade) o Track geometry design for metros: curvature, gradients, transition curves o Horizontal/vertical alignment integration for passenger comfort & safety. o Case studies of challenging alignments in Indian metros. • Infrastructure Engineering: o Tunnels: NATM, TBM technologies, cut & cover. o Station box construction o Viaducts and Bridges. o Depot layout design, yard planning, and workshop integration • Structural health monitoring for metro infrastructure • BIM and digital twins in metro project delivery	**5 Hours**
ROLLING STOCK FOR METRO RAIL • Metro vehicle design (lightweight materials, stainless steel, aluminium) • Bogie systems for sharp curves and high-frequency services • Traction systems (AC drive, VVVF inverters, regenerative braking) • Train control, crashworthiness, and passenger comfort (air conditioning, noise, vibration) • Innovations: driverless trains (GoA 3 & GoA 4), energy-efficient rolling stoc	**4 Hours**
ELECTRIFICATION & POWER SUPPLY • Third rail vs. overhead catenary system (OCS) in metros Substation design and traction power distribution • Energy optimization: regenerative braking, energy storage (flywheel, battery systems) Integration of solar and renewable energy into metro networks • Smart grid & SCADA applications in metros	**4 Hours**
SIGNALLING & TRAIN CONTROL SYSTEMS • Conventional vs. modern signalling (fixed block, moving block) • Communications-Based Train Control (CBTC) – principles and deployment • Train protection systems (ATP, ATO, ATS) • Cybersecurity in signalling and communication networks • Case study: CBTC deployment in Delhi, Bengaluru, and Copenhagen metro	**5 Hours**
URBAN INTEGRATION & POLICY • Metro as a catalyst for urban development • Transit-Oriented Development (TOD) – policies & practices • First and last mile connectivity (e-buses, shared mobility, NMT) Socio-economic and environmental impacts of metro projects • Financing & PPP models for metro systems (BOT, EPC, DBFOT)	**5 Hours**
CONSTRUCTION TECHNOLOGY & METHODOLOGIES • Modern mechanized construction methods in metro projects Precast segmental construction and modular methods • BIM and digital twins in metro construction • 3D printing & advanced materials in metro civil works Drone • LiDAR surveying for alignment monitoring	**4 Hours**
METRO OPERATIONS & MAINTENANCE • Service planning, scheduling, and frequency optimization • Headway management and dwell time analysis • Asset management: predictive and condition-based maintenance • Depot management and workshop practices • Digital operations: IoT-enabled sensors, AI for predictive maintenance	**5 Hours**
SAFETY, RISK & SUSTAINABILITY	**5 Hours**

• Safety protocols in construction & operation
• Emergency evacuation, disaster management, and resilience planning Noise, vibration, and environmental mitigation strategies
• Sustainability in metro projects (energy-efficient systems, green operations)
  ○ Energy-efficient materials and green construction practices.
  ○ Noise, vibration, and dust mitigation in construction
  ○ Carbon footprint assessment of metro projects
  ○ LEED & GRIHA certifications for stations and depots
  ○ Case study: Delhi Metro's carbon credit success (first metro to earn CDM credit)	

SMART & FUTURE METRO TECHNOLOGIES • Driverless metro systems – design & operations (GoA 4 automation) • Digital twins for metro networks • Big Data, AI, and IoT in metro planning and operation Smart energy management systems in metros • Blockchain applications in metro ticketing and asset tracking	**5 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources

Textbooks:

1. S. D. Sharma & S. K. Arora – Rapid Transit Systems and Metro Rail Engineering, S. Chand Publications, Latest Edition.
2. B. L. Gupta – Metro Rail Engineering, Satya Prakashan, New Delhi.
3. Vukan R. Vuchic – Urban Transit Systems and Technology, John Wiley & Sons.
4. National & International Metro Standards Manuals:
   4.1. DMRC Standard Specifications and Practices Manual (SSPM)
   4.2. MoHUA Metro Rail Policy (2017 and revisions)

References:

1. Vukan R. Vuchic – Urban Transit: Operations, Planning and Economics, John Wiley & Sons.
2. B. I. Singal & G. Abhichandani – Metro Rail Projects in India: A Study of Project Performance and Sustainability, Springer.
3. NJ Delisle & J.R. Anderson – Modern Construction Techniques for Rail Infrastructure, McGraw Hill.
4. Uwe Weidmann & O. Nashid – Transport Systems: Planning, Technology and Operation, ETH Zürich Notes.
5. RDSO, UIC & IEC Specifications, Technical Handbooks & Rolling Stock Design Guidelines.

Online Educational Resources:

Assessment (Theory course)

SA I, SA II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)

Recommended by BoS on	XX/YY/2025		
Academic Council Approval	No.	**Date**	XX/XX/2025

24CEE077	GEOENVIRONMENTAL ENGINEERING	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9, 11, 15			

Pre-requisite courses	Soil Mechanics	Data Book / Codes / Standards	-

Course Objectives:

The purpose of taking this course is to:

1	Introduce the importance of geoenvironmental engineering in sustainable waste and soil management.
2	Provide a fundamental understanding of the nature, sources, and effects of waste and contaminants on soil and groundwater.
3	Explain contaminant transport and site characterisation methods.
4	Impart knowledge on containment and remediation techniques with a focus on bioremediation and eco-friendly methods.
5	Introduce the design of engineered landfills and the reuse of waste materials for sustainable geotechnical applications.

Course Outcomes:		**Revised Bloom's Taxonomy Level (RBT)**
After successful completion of this course, the students shall be able to		
CO 1	Identify and classify various waste and pollutants that affect soil and groundwater.	U
CO 2	Apply contaminant transport principles and site characterisation methods.	Ap
CO 3	Apply containment and remediation techniques for contaminated sites.	Ap
CO 4	Analyse the design and performance of engineered landfill systems.	An
CO 5	Apply reuse and stabilisation of waste materials in geotechnical problems.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	1	1	2	2	1	1	1	1	2	1
2	3	3	1	2	2	2	1	1	1	1	1	3	2
3	3	3	2	2	2	3	2	1	1	1	1	3	2
4	3	3	2	1	1	3	2	1	1	1	1	3	2
5	3	3	3	1	1	3	2	1	1	1	2	3	3

Course Content	
INTRODUCTION TO GEOENVIRONMENTAL ENGINEERING Role and importance of Geoenvironmental Engineering. Sources and classification of wastes: industrial, municipal, and hazardous. Causes and consequences of soil pollution. Soil–pollutant interactions and the factors influencing them. Basic mechanisms: sorption, ion exchange, and adsorption behaviour. Case studies: examples of soil contamination and failure.	**9 Hours**
CONTAMINANT TRANSPORT AND SITE CHARACTERIZATION Contaminant transport mechanisms: advection, diffusion, and dispersion. Chemical and	**9 Hours**

biological interactions in soil. Sampling and characterisation of contaminated sites: soil, rock, hydrological, and chemical data. Laboratory and field tests for soil contamination. Introduction to non-destructive techniques: electromagnetic and seismic methods.	
CONTAINMENT AND REMEDIATION OF CONTAMINATED SITES Containment systems: vertical and horizontal barriers, liners, covers, and grout curtains. Geosynthetic materials: GCLs, geomembranes, composite liners. Remediation techniques: Soil washing and stabilisation/solidification. Bioremediation – microbial degradation, bioaugmentation, and bioventing. Phytoremediation – mechanisms, advantages, and applications. Electrokinetic remediation, thermal desorption, and permeable reactive barriers. Pump-and-treat and in-situ flushing for groundwater cleanup. Criteria for selecting suitable remediation technologies. Eco-friendly and sustainable remediation methods.	**9 Hours**
ENGINEERED LANDFILLS Waste characteristics and site selection for landfills. Components of engineered landfills: liner systems, leachate collection, gas venting, and final cover. Monitoring systems for leachate, gas, and groundwater. Design considerations for liner and cover systems. Environmental laws and regulations – SWM Rules (2016), Hazardous Waste Rules (MoEFCC). Case studies: design and performance of Indian landfill systems.	**9 Hours**
WASTE UTILIZATION AND STABILIZATION Common waste materials: fly ash, red mud, slag, plastics, tyres, municipal sludge, and construction debris. Physical, chemical, and biological characteristics. Waste reuse in geotechnical works: embankments, backfills, subgrades, and soil stabilisation. Sustainable waste management concepts – circular economy and carbon sequestration potential. Case studies: successful reuse of waste materials.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**-**	**Practical Hours:**	**-**	**Project Hours:**	**-**	**Total Hours:**	**45**

Learning Resources

Textbooks

11. Datta, M., Reddy, K. R., De, A., Geoenvironmental Practices and Sustainability, Springer, Singapore (2017).
12. Singh, D. N., Mohamed, A. O., Paleologos, E. K., Fundamentals of Geoenvironmental Engineering: Understanding Soil, Water, and Pollutant Interaction and Transport, Butterworth-Heinemann (Elsevier), New Delhi (2018).
13. Rao, G. V., Solid Waste Management and Engineered Landfills, New Age International Publishers, New Delhi (2018).

Reference books/ Web Links

16. Sharma, H. D., Reddy, K. R., Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies, John Wiley & Sons, New York (2004).
17. Daniel, D. E., Geotechnical Practice for Waste Disposal, Chapman & Hall, London (1993).
18. Rao, G. V. R., Rao, V. D., Environmental Geotechnology, New Age International Publishers, New Delhi (1999).
19. Datta, M., Geoenvironmental Engineering: Principles and Applications, PHI Learning Pvt. Ltd., New Delhi (2018).
20. Mitchell, J. K., Soga, K., Fundamentals of Soil Behavior, John Wiley & Sons, Hoboken, NJ, USA (2005).

Online Resources

1. https://nptel.ac.in/courses/105102160
2. https://nptel.ac.in/courses/105101196
3. https://nptel.ac.in/courses/105101200
4. https://nptel.ac.in/courses/120105559

Assessment	
Formative	Summative
Assignments, Quiz	SA - I, SA – II and End Semester Examination (ESE)

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
		Dr Prasanna Venkatesh R, CE Dr Gayathri V, CE Mr Sathiyanathan K, CE

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	

24CEE078	SOIL EXPLORATION AND INSTRUMENTATION	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9 & 11			

Pre-requisite courses	Soil Mechanics	Data Book / Codes / Standards (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Introduce fundamentals of soil exploration planning, methods, and sampling for geotechnical investigations.
2	Develop skills to select and use geotechnical instrumentation for performance monitoring.
3	Equip students to apply in situ tests and geophysical methods for subsurface characterization.
4	Analyze exploration data for deriving design parameters in civil engineering projects.
5	Enable interpretation of field data and preparation of investigation reports for sustainable design

Course Outcomes :		Revised Bloom's Taxonomy Level (RBT)
After successful completion of this course, the students shall be able to:		
CO 1	Understand soil exploration principles and plan investigation programs for various structures	U
CO 2	Analyze sampling techniques and boring methods for undisturbed soil collection	An
CO 3	Apply in situ tests (SPT, CPT, PLT) to evaluate soil properties	Ap
CO 4	Evaluate geophysical methods and instrumentation for subsurface monitoring	An
CO 5	Integrate exploration data for geotechnical design and reporting	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	3	2	3	2	2	2	2	2	2	2	3	2
2	3	3	2	3	2	2	2	2	2	2	2	3	2
3	2	2	3	3	3	2	2	2	2	2	2	3	2
4	2	2	3	3	3	2	2	2	2	2	2	3	2
5	2	2	2	3	2	2	2	2	2	2	2	2	2

Course Content

SOIL EXPLORATION PLANNING AND METHODS Basic concepts of soil exploration, objectives, stages (reconnaissance, preliminary, detailed), spacing and depth of borings for buildings/bridges/dams/highways, geophysical methods (seismic refraction/resistivity).	9 Hours
SAMPLING AND BORING TECHNIQUES Disturbed/undisturbed sampling, samplers (split spoon, Shelby tube, piston, core barrel), boring methods (auger, wash, rotary drilling, percussion), sample preservation/transportation, borehole logs.	9 Hours
IN SITU TESTS Standard Penetration Test (SPT), Cone Penetration Test (CPT/DCPT/SCPT), plate load test, vane shear test, pressuremeter; corrections, interpretation for soil parameters.	9 Hours
GEOPHYSICAL AND ADVANCED METHODS Electrical resistivity profiling/sounding, seismic methods (refraction, cross-hole), SASW; offshore exploration basics, data correlation with lab tests.	9 Hours
GEOTECHNICAL INSTRUMENTATION AND REPORTING Instrumentation objectives: piezometers (standpipe/vibrating wire), inclinometers, extensometers, earth pressure cells, strain gauges; data acquisition, interpretation; exploration report formats.	9 Hours

Theory	Tutorial	Practical	Project	Total
Hours: 45	**Hours: 0**	**Hours: 0**	**Hours: 0**	**Hours: 45**

Learning Resources*
Textbooks
14. Bowles, J.E., *Foundation Analysis and Design*, McGraw-Hill, 1996. 15. Dunnicliff, J., *Geotechnical Instrumentation for Monitoring Field Performance*, Wiley, 1993. 16. Arora, K.R., *Soil Mechanics and Foundation Engineering*, Standard Publishers, 2019. 17. Venkatramaiah, C., *Geotechnical Engineering*, Universities Press, 2016.
Reference books/ Web Links
1. Punmia, B.C., Soil Mechanics and Foundations, Laxmi Publications, 2017. 2. Coduto, D.P., Foundation Design: Principles and Practices, Pearson, 2016. 3. IS 1892:1979 (Guide for Subsurface Investigations), Bureau of Indian Standards.
Online Resources
1. https://nptel.ac.in/courses/105105052 (Advanced Foundation Engineering). 2. https://ocw.mit.edu/courses/1.361/advanced-soil-mechanics-fall-2004/ (MIT Soil Mechanics). 3. https://www.digimat.in/nptel/courses/105105052L01.html.

Assessment	
Formative	Summative
Assignments, Mini project, Quiz	SA-I, SA-II and End Semester Examination (ESE)

Course Curated By		
Expert(s) from Industry	Expert(s) from Higher Education Institutions	Internal Expert(s)

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	