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

PEO 1: To provide strong foundation to graduates to pursue a successful profession or higher studies and take part in providing feasible solution for societal problems resulting in sustainable development of infrastructures.

PEO 2: To enrich competence of graduates to implement emerging techniques for planning, analysis, design and execution of civil engineering projects through lifelong learning

PEO 3: To imbibe ethics and professionalism among the graduates that is to be practiced in their profession

PROGRAM SPECIFIC OUTCOMES (PSOs)

Our Graduates will be able to:

PSO 1: The graduates will be able to Plan, Analyze, Design and Prepare technical reports for Civil Engineering structures as per BIS.

PSO 2: The graduates will be able to 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 the 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 AI	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	24INT102	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	24CET206	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	24CET209	Highway Engineering	Embedded	PC	3	0	2	0	4
								Total Credits	**22**
								Total Contact Hours/week	**31**

Semester V- Smart Structures & Digital Construction									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1.	24HSP007	Building Professional Readiness	Theory	HS	1	0	0	0	1
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		Internship	Project	PW	0	0	0	2	2
5	24CEE3xx	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	**29**

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		Indian Constitution	Theory	HS	2	0	0	0	0
5	24CEE3xx	Professional Elective-2	Theory	PE	3	0	0	0	3
6	24CEE3xx	Professional Elective-3	Theory	PE	3	0	0	0	3
7	24CEI306	Design of Masonry and Reinforced Concrete Elements	Embedded	PC	3	0	2	0	4
8	24CET307	Foundation Engineering	Theory	PC	3	0	0	0	3
9	24CET308	Design of Steel Structures	Theory	PC	3	0	0	0	3
10	24CEI309	Construction Project Management	Theory	PC	3	0	2	0	4
								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	24CEI301	Estimation, Costing & Valuation	Theory	HS	3	0	0	3	3
2	24CEE4xx	Professional Elective - 4	Theory	PE	3	0	0	0	3
3	24CEE4xx	Professional Elective - 5	Theory	PE	3	0	0	0	3
4	24CEE4xx	Professional Elective - 6	Theory	PE	3	0	0	0	3
5	24CEJ401	Project Phase I	Project	PW	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	PW	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		Indian Knowledge Systems (IKS)	Theory	1	IV
2		Indian Constitution	Theory	0	VI
3		Disaster Management and Preparedness	Theory	2	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**	52
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)	**1**	1
Total	**160-165**	**165**

Semester	**HS**	**BS**	**ES**	**PC**	**PE**	**OE**	**Intern**	**PW**	**Mandate**	**Total**
I	2	9	8			1				**20**
II	4	8	12			1				**25**
III	4	4	1	11		1	1			**22**
IV	1	4	3	11		2			1	**22**
V	1			17	3	2	2			**25**
VI	2			13	6	2			0	**24**
VII	4				9			3		**15**
VIII								12		**12**
Total	**18**	**25**	**24**	**52**	**18**	**9**	**3**	**15**	**1**	**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 Structural Visualization	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 Civil Engineering Materials	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

Vertical II: Environmental & Water Resources Engineering									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24CEE008	Environmental Impact Assessment and Life Cycle Analysis	Theory	PE	3	0	0	0	3
2	24CEE009	Surface water Hydrology	Theory	PE	3	0	0	0	3
3	24CEE010	Air and Noise Pollution Control	Theory	PE	3	0	0	0	3
4	24CEE011	Industrial Wastewater Treatment	Theory	PE	3	0	0	0	3
5	24CEE012	Climate change and Sustainable Management	Theory	PE	3	0	0	0	3
6	24CEE013	Waste Management	Theory	PE	3	0	0	0	3
7	24CEE014	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	24CEE015	Construction Personal Management	Theory	PE	3	0	0	0	3
2	24CEE016	Building Information Management	Theory	PE	3	0	0	0	3
3	24CEE017	Construction Methods and Equipment Management	Theory	PE	3	0	0	0	3
4	24CEE018	Construction Safety Management	Theory	PE	3	0	0	0	3
5	24CEE019	Railways, Airports, and Harbour Engineering	Theory	PE	3	0	0	0	3
6	24CEE020	Intelligent Transportation System	Theory	PE	3	0	0	0	3
7	24CEE021	Mass Transit Management	Theory	PE	3	0	0	0	3
8	24CEE022	Ground Improvement Techniques	Theory	PE	3	0	0	0	3
9	24CEE023	Geothermal Engineering	Theory	PE	3	0	0	0	3
10	24CEE024	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 Team Collaborative 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 Tami	**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 Tholkappiyam 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)

CAT, 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 , 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	Suriya Prakash 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 exercises.	**6 Hours**
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			

Course Content	
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	**9 Hours** **6 Hours**
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	**9 Hours** **6 Hours**
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.	**9 Hours** **6 Hours**
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	**9 Hours** **6 Hours**

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.	**9 Hours**
Practical Component: • Estimation of hardness in grey water sample • Estimation of Dissolved oxygen in grey water sample	**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)

CAT, 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	6 Hours
• 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.	

• 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

24HSJ102	FLUENCY THROUGH PRACTICE (Common to all Departments)	L	T	P	J	C
		0	0	0	4	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 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
- Cross-Cultural Communication and Global Ethics Intellectual Property and

60 Hours

Copyrighting Publication – English for research Writing Digital Communication & Social Responsibility	

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

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	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	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, 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 – II (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	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	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)

CAT, 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

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

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

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 • Basic concept of Fluid and its properties – density, specific weight, viscosity, surface tension, capillarity, compressibility • Pressure measurement – manometers, pressure transducers	**9 Hours**
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	~~Nil~~

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 Team 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	~~Nil~~	Data Book / Code book (If any)	~~NA~~

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	9 Hours
• 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:** • 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	2	0	2
		SDG	4,9 ,11,17			

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

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	**30 Hours**

• Layout Preparation and Plotting: Creating drawing sheets with title blocks, 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

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

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

Course Objectives:

The purpose of this course is to:

1	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	Develop problem-solving skills by using these numerical methods to model and solve real- world engineering and scientific problems involving first-order differential equations.
4	Critically analyze the performance of different numerical methods in terms of accuracy, stability, and computational efficiency for solving partial differential equations in practical engineering applications.
5	Apply probability theory to model and solve real-world problems involving uncertainty, risk analysis, and decision-making in engineering, business, and science.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply numerical methods such as Newton–Raphson and Gauss–Jordan techniques to solve algebraic, transcendental, and linear systems of equations arising in engineering applications.	Ap
CO 2	Construct interpolation polynomials and use them for numerical differentiation and integration employing Trapezoidal and Simpson's rules to approximate functions and definite integrals.	Ap
CO 3	Implement numerical techniques including Taylor series, Euler, Improved Euler, Runge–Kutta, and Milne's predictor–corrector methods for solving ordinary differential equations (ODEs).	Ap
CO 4	Solve two-dimensional Laplace's equations using finite difference techniques and visualize potential distributions on rectangular domains relevant to engineering and electrostatics problems.	Ap
CO 5	Analyze and model real-world problems involving uncertainty using fundamental probability concepts.	An
CO 6	Examine the Normal distribution and its properties, and apply it to model and solve engineering and scientific problems involving random variations.	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	3	3	-	-	2	-	-	-	-	-	1	-	-
3	3	2	-	-	2	-	-	-	-	-	2	-	-
4	3	3	-	-	3	-	-	-	-	-	2	-	-
5	3	3	-	-	3	-	-	-	-	-	2	-	-
6	3	2	-	-	3	-	-	-	-	-	2	-	-

Course Content

NUMERICAL SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS — **9 Hours**

Fixed point Iteration method, Newton's method –Solution of linear system by Gauss Jordan method - Iterative method: Gauss Seidel method – Inverse of a matrix by Gauss Jordan method-Jacobi method for finding eigenvalues.

Practical Component — **6 Hours**

- Gauss Jordan method.
- Newton Raphson method.

INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION — **9 Hours**

Newton's forward, backward and divided difference interpolation, Cubic spline interpolation – Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal and Simpson's 1/3 and 3/8 rules.

Practical Component — **6 Hours**

- Newton's divided difference interpolation
- Numerical integration by Simpsons rule

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS — **9 Hours**

Taylor's series method – Euler and Improved Euler methods, fourth order Runge-Kutta method for solving first order equations – Multistep method: Milne's predictor and corrector method, Adams Bashforth method

Practical Component — **6 Hours**

- Numerical solution of ODE by Euler's method.
- Numerical solution of ODE by Milne's method.

SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS — **9 Hours**

Solution of one-dimensional heat equation using Bender Schmidt and Crank Nicholson difference schemes –Solution of one-dimensional wave equation by explicit scheme. Finite difference techniques for the solution of two-dimensional Laplace's equation on rectangular domain.

Practical Component — **6 Hours**

- Solution of one-dimensional heat equation using Bender Schmidt method.

• Solution of one-dimensional wave equation by explicit scheme	
PROBABILITY AND RANDOM VARIABLES Axioms of probability - Conditional probability – Total probability – Bayes' theorem – Random variable – Distribution function – properties – Probability mass function-Probability density function –Normal distributions – Properties. **Practical Component** • Introduction to R Programming • 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

SA I and 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)
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. Dr. S.Meena Priyadarshini Assistant Professor II Department of Mathematics,KCT 2. Ms.S.Sivasakthi Assistant Professor (SRG) Department of Mathematics, KCT

Recommended by BoS on	28.11.2025		
Academic Council Approval	No:	**Date**	

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)	NIL

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 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Modern 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	
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 flow using a Orificemeter. • Determination of velocity using Pitot Tube.	**30 Hours**

- 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 - Dresden (ABCD Centre) Department of Ocean Engineering	1. Ms.S.Rajalakshmi / 2. Mr.KRP.Satheesh Kumar AP/Civil KCT

	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)	NA

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

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	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). **Practical Component:** • Generating Graphs, Charts and Diagrams from Tabular data	**9 Hours** **3 Hours**
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)	Nil

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	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	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	**09 Hours**

for deformation analysis.	
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	Nil	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

24CEI301	ENVIRONMENTAL ENGINEERING	L	T	P	J	C
		3	0	2	0	4
PC		SDG	3,6,11			

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

Course Objectives	
The purpose of taking this course is to	
1	To analyze water quality parameters and understand the factors influencing various categories of water demand.
2	To gain knowledge of the principles, functions, and applications of unit operations and processes used in water and wastewater treatment.
3	To understand the design, operation, and management of water distribution networks and building plumbing systems.
4	To estimate sewage generation under different flow conditions and evaluate the hydraulics involved in the design of sewer 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 to plan sustainable public water supply systems.	An
CO 2	Analyze the performance and applicability of various unit operations and processes to determine suitable treatment options for efficient water treatment systems.	An
CO 3	Analyze and develop water distribution networks and building plumbing systems to ensure reliable supply.	An
CO 4	Analyse wastewater generation patterns and design hydraulically efficient sewer systems,	An
CO 5	Analyse and select appropriate sewage treatment methods and sludge management practices based on performance requirements.	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			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

PLANNING FOR WATER SUPPLY SYSTEM Public water supply system – Planning - Objectives – Estimation of population forecasting and water demand – Sources of water and its characteristics and physical, chemical and biological characteristics – 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 **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, sedimentation cum coagulation tanks and sand filters – disinfection – Operation and maintenance of water treatment plants. Principles and functions of aeration – Iron and manganese removal, Defluoridation and demineralization – water softening - desalination – Reverse Osmosis. **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- Operation and maintenance – leak detection, methods. Principles of water supply in buildings – House service connection– Pipe appurtenances - Systems of plumbing and types of plumbing **Practical Component** • Determination of residual and available chlorine for water sample • Determination of Solids in wastewater sample.	**7 Hours** **4 Hours**
SEWER DESIGN Sources of wastewater generation – Estimation of DWF & WWF –Hydraulics of flow in sewers – Design of sanitary and storm sewers – Sewers appurtenances – Sewage plumbing system for buildings - Effluent standards - Reclamation and reuse of sewage **Practical Component** • Determination of BOD • COD for wastewater sample.	**9 Hours** **4 Hours**
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 with effluent disposal arrangements. Basic concepts on Advanced sewage treatment methods – Concepts on Sludge management. **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**

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 Edition2017

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, PartA, 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 PC	SOIL MECHANICS	L	T	P	J	C
		3	0	2	0	4
		SDG	9, 11, 12, 13, 15			
Pre-requisite courses	Nil	Data Book / Code book (If any)	NA			

Course Objectives:	
The purpose of taking this course is to:	
1	Provide a fundamental understanding on the formation of soil, its properties and classification.
2	Explain the methods of computing total stress, effective stress, and stress distribution due to external loading.
3	Introduce the principles of permeability and flow through soils to assess seepage and related problems.
4	Build conceptual understanding on the analysis of compaction and consolidation characteristics of soil.
5	Impart knowledge on the analysis shear strength characteristics of soil and its testing procedure.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Understand the index properties of soils and apply the Indian Standard Classification System to identify and classify soils based on index parameters.	U & Ap
CO 2	Analyse total and effective stress due to the overburden soil and vertical stress distribution due to external loading conditions using theoretical and empirical methods.	An
CO 3	Compute soil permeability and seepage characteristics by interpreting the flow net diagram for practical applications.	An
CO 4	Assess compaction and compressibility characteristics to predict the settlement of soil under various loading conditions.	An
CO 5	Analyse shear strength properties of cohesive and cohesionless soils.	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	3	1	2	1	1	1	2	1	1	2	3	1
2	3	3	2	3	2	1	1	2	1	1	2	3	2
3	3	3	2	3	2	1	1	2	1	1	2	3	3
4	3	3	2	3	3	1	1	2	1	2	2	3	3
5	3	3	3	3	2	2	1	2	1	1	2	3	2

Course Content	
CLASSIFICATION OF SOIL	9 Hours

Historical development of soil Engineering - Origin and general types of soils - soil structure, clay minerals - Three-phase system and mass-volume relationships - Index properties - Identification and classification of soils (Indian Standard Soil Classification System - ISSCS).	
EFFECTIVE STRESS AND VERTICAL STRESS DISTRIBUTION Soil water - capillary phenomena - Concept of effective and neutral stresses - Vertical stress distribution in soil - Boussinesq and Westergaard's equation - Newmark's influence chart – equivalent point load and other approximate methods - pressure bulb.	**9 Hours**
PERMEABILITY AND SEEPAGE Permeability - Darcy's law - determination of coefficient of permeability in the laboratory – Factors affecting permeability - Effect of seepage on effective stress – Quicksand condition - Seepage flow head, gradient, pressure - steady state flow- two-dimensional- flow net.	**9 Hours**
COMPACTION, COMPRESSIBILITY, AND CONSOLIDATION Compaction - laboratory and field compaction - Compressibility and consolidation- Terzaghi's one-dimensional consolidation theory - pressure void ratio relationship- pre-consolidation pressure - component of settlement – calculations on total settlement and time rate of settlement - coefficient of consolidation - curve fitting methods – Introduction to simulating consolidation problem using Plaxis LE software.	**9 Hours**
SHEAR STRENGTH Mohr's circle - principal stresses - Shear strength - Mohr-Coulomb failure criterion - shear strength tests in the Laboratory - different drainage conditions - shear strength parameters of cohesive and cohesionless soil - Skempton's pore water pressure parameters.	**9 Hours**
Practical **I. DETERMINATION OF INDEX PROPERTIES** 1. Specific gravity of soil solids 2. Grain size distribution – Sieve analysis 3. Grain size distribution Hydrometer analysis 4. Liquid limit and plastic limit tests 5. Shrinkage limit and Differential free swell tests. **II. DETERMINATION OF IN-SITU DENSITY AND COMPACTION CHARACTERISTICS** 6. Field density Test (Sand replacement method, Core cutter method) 7. Determination of moisture–density relationship using the standard Proctor compaction test. **III. DETERMINATION OF ENGINEERING PROPERTIES OF SOIL** 8. Permeability determination (Constant head and falling head methods) 9. One-dimensional consolidation test (Determination of coefficient of consolidation only) (Demonstration) 10. Direct shear test in cohesionless soil 11. Unconfined compression test in cohesive soil 12. Laboratory vane shear test in cohesive soil 13. Tri-axial compression test in cohesionless soil (Demonstration)	**30 Hours**
Theory Hours: 45 **Tutorial Hours: 0** **Practical Hours: 30** **Project Hours: 0** **Total Hours: 75**	
Learning Resources	
Textbooks:	
1. Arora, K. R. (2014). Soil Mechanics and Foundation Engineering. Standard Publishers Distributors, New Delhi.	

2. Punmia, B. C., Jain, A. K., & Jain, A. K. (2017). Soil Mechanics and Foundations. Laxmi Publications, New Delhi.
3. Ranjan, G., & Rao, A. S. R. (2014). Basic and Applied Soil Mechanics. New Age International Publishers (formerly Wiley Eastern Limited), New Delhi.
4. Murthy, V. N. S. (2011). Soil Mechanics and Foundation Engineering. CBS Publishers & Distributors Pvt. Ltd., New Delhi.
5. Das, B. M. (2010). Principles of Geotechnical Engineering (7th ed.). Cengage Learning (formerly Thomson Brooks/Cole), Stamford, CT.

References:

1. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations". Prentice-Hall, 2006.
2. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt.Ltd, New Delhi, 2010.

Online Resources:

1. https://nptel.ac.in/courses/105101084
2. https://nptel.ac.in/courses/105103097
3. https://nptel.ac.in/courses/105104147
4. https://nptel.ac.in/courses/105105168

Assessment (Embedded 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

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

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

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	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	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 Indeterminate Structures - Equilibrium and Compatibility conditions - Force and Displacement methods of analysis.	**4 Hours**

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 project), Quiz	I, SA II and End Semester Examination (ESE)

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**

24CET310	CONCRETE TECHNOLOGY	L	T	P	J	C
		3	0	2	0	4
PC		SDG	9			

Pre-requisite courses	Building Materials and Construction Practices	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	Acquire knowledge about the properties and testing of cement and aggregates.
CO 2	Develop skills in selecting and evaluating chemical and mineral admixtures for concrete.
CO 3	Gain competency in designing concrete mixes for various applications.
CO 4	Understand testing methods and interpret test results for concrete workability and strength.
CO 5	Explore and apply special concrete types for specific construction challenges.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Apply the knowledge of cement and aggregates to evaluate their suitability for different concrete applications.	Ap
CO2	Analyze the effects of chemical and mineral admixtures on concrete properties to optimize mix designs for specific requirements.	An
CO3	Apply mix design principles to prepare concrete mixes for varying construction scenarios.	Ap
CO4	Interpret test results for workability and strength to assess the quality of both fresh and hardened concrete.	An
CO5	Apply the use of special concretes to demonstrate solutions for construction challenges.	Ap
CO 6	Apply the knowledge of cement and aggregates to evaluate their suitability for different concrete applications.	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	1	1	2	1	1	1	1	1	1	3	2	1
2	3	3	2	2	2	1	1	1	1	1	1	3	3	2
3	3	2	3	2	2	1	1	2	1	2	1	3	2	1
4	3	3	2	3	2	1	1	2	2	2	1	3	3	2
5	3	2	2	2	3	2	2	2	2	2	2	3	3	3

Course Content

CEMENT AND AGGREGATES Types, composition, hydration of cement - Properties: setting time, strength, fineness - Aggregate types and properties - Tests: sieve analysis, impact, crushing, abrasion	**9 Hours**
Practical Component: • Fineness test on cement • Setting time of cement • Sieve analysis of aggregates	**6 Hours**
ADMIXTURES IN CONCRETE Chemical admixtures: plasticizers, retarders, accelerators - Mineral admixtures: fly ash,	**9 Hours**

silica fume, GGBS - Impact on workability, strength, and durability. **Practical Component:** • Effect of superplasticizer on concrete workability	**6 Hours**
MODULE Name: CONCRETE MIX DESIGN Principles 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. **Practical Component:** • Mix design for M20 and M30 grades	**9 Hours** **6 Hours**
PROPERTIES OF CONCRETE Workability tests: slump, compaction factor - Hardened concrete: compressive, split tensile, flexural strength - NDT methods: rebound hammer, UPV **Practical Component:** • Slump test • Compressive strength test • Rebound hammer test	**9 Hours** **6 Hours**
SPECIAL CONCRETES Light weight concrete - High strength concrete - Fibre reinforced concrete – Ferrocement - Ready mix concrete – Self compacting concrete - Shotcrete – Polymer concrete - High performance concrete- Geo-polymer Concrete – 3D concrete printing. **Practical Component:** • Casting and testing of fiber-reinforced concrete • Casting and testing of SCC concrete	**9 Hours** **6 Hours**

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

sessment (Theory)
T, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

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

sessment (Practical course)
o Workbook, Experimental Cycle tests, viva-voce, etc…

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
[Name, Organization]	[Name, Institution]		[Name, Department]
Recommended by BoS on	-		
Academic Council Approval	No.	**Date**	

SEMESTER VI

24CET307	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 (If any)	NA

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		Revised Bloom's Taxonomy Levels (RBT)
CO1	Apply soil exploration methods (auguring, boring, rotary drilling, geophysical methods) for site investigation.	Ap
CO2	Analyze bearing capacity (Terzaghi, BIS, Skempton/Hansen) and settlement of shallow foundations from in-situ tests.	An
CO3	Analyze the suitability of different shallow foundations by evaluating the relationship between site-specific soil parameters and codal provisions	An
CO4	Analyze load capacity/settlement of single piles and pile groups using static/dynamic methods.	An
CO5	Analyze the impact of soil-structure interaction on the stability of retaining walls by comparing Rankine's analytical theory with Culmann's graphical approach and evaluate the effectiveness of geosynthetic reinforcement in mitigating internal versus external failure modes.	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	1							2	3	2	2	2	2	
2	3	3		1		2		2			3	3	3	1
3	3	3	3			2	3	3			2	3	3	
4	3	2	2	1		2	2				3	3	3	
5	3	2	2		1	2		3		2	1	2		

Course Content

SITE INVESTIGATION AND FOUNDATION SELECTION	9 Hours
ppe/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 per soil condition	
BEARING CAPACITY AND SETTLEMENT Foundation location/depth – Codal provisions – Bearing capacity (homogeneous deposits): Terzaghi & BIS– Factors affecting capacity (water table, eccentricity, inclination) – In-situ tests (plate load, SPT, SCPT) – Allowable pressure – Seismic considerations – Settlement (granular/clay): total/differential.	**9 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).	**9 Hours**
PILE FOUNDATIONS Pile types/functions (precast driven, cast-in-situ bored) – Selection factors – Single pile capacity (granular/cohesive): static/dynamic formulas, in-situ tests – Negative skin friction/uplift – Group capacity (Feld, Converse-Labarre, block failure) – Group efficiency concepts – Pile group settlement – Load tests – Under-reamed piles.	**9 Hours**
RETAINING WALLS Plastic equilibrium – Active/passive states (Rankine: cohesionless/cohesive) – Critical failure plane – Earth pressure (simple walls, line loads) – Culmann graphical method – Stability analysis – Introduction to slope stability: infinite/finite slopes, causes of failure, basic remediation concepts - Geosynthetics applications	**9 Hours**

Learning Resources*

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

Textbooks

1. Arora K.R., Soil Mechanics and Foundation Engineering, Standard Publishers, 7th Edition, 2014
2. Punmia B.C., Jain A.K., Jain A.K., Soil Mechanics and Foundations, Laxmi Publications, 17th Edition, 2017

Reference books/ Web Links

1. Ranjan G., Rao A.S.R., Basic and Applied Soil Mechanics, Wiley Eastern Ltd., 2nd Edition, 2014
2. Murthy V.N.S., Soil Mechanics and Foundation Engineering, CBS Publishers, 5th Edition, 2011
3. Das B.M., Principles of Foundation Engineering (SI Units), Cengage Learning
4. IS 1904:2016 – Code of Practice for Foundation Design
5. IS 456:2000 – Plain and Reinforced Concrete

Online Resources

1. NPTEL Course: "Foundation Engineering" by IIT Kharagpur (nptel.ac.in)
2. L&T EduTech: "Principles of Foundation Engineering" (lntedutech.com)

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

Course Curated by		
Expert from Industry	**Expert from Higher Education Institutions**	**Internal Expert**

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

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

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

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 construction projects, project life-cycle - Principles of project management, project management functions- project scope management -Elements of cost estimation - Estimating methods -Project budgeting, bidding.	**9 Hours**
PROJECT PLANNING AND SCHEDULING **Bar** chart planning – CPM Network construction: Activities and events, logic and	**9 Hours**

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	
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	**1. Dr. P.K. Viswanathan**	1. Mr.A.Aswin Bharath

Senior Project Manager, L&T Construction **2. Mr. Amit Sharma** Vice President, Project Management, TATA Projects Ltd.	Professor, Department of Civil Engineering, IIT Madras **2. Dr. M. Arivazhagan** Dean, School of Management Studies, NIT Trichy	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

24CEI309	ESTIMATION COSTING & VALUATION	L	T	P	J	C
		3	0	2	0	4
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**
Practical Component Introduction to CostX workspace. Importing 2D CAD drawings and 3D BIM models. Setting up projects and defining measurement units.	**6 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**
Practical Component Performing 2D and 3D quantity take-offs for architectural and structural elements using CostX dimension groups.	**6 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**
Practical Component Generating and customizing workbooks in CostX. Automating cost reports and exporting data for detailed estimates.	**6 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**
Practical Component Introduction to Bentley Synchro. Importing 3D models and project schedules to set up a 4D planning environment.	**6 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**
Practical Component 5D Cost Integration: Linking cost data and quantity take-offs to 3D elements and project schedules in Bentley Synchro for dynamic cost evaluation.	**6 Hours**

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

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)
3. Bentley Systems., Synchro Pro Training Guide and Fundamentals. Bentley Systems (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
		0	0	0	6	3
PW		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	**90 Hours**

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.	

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

sessment	
rmative	mmative
signments / Mini project), Quiz, Lab	view-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

rmative	mmative
signments / Mini project), Quiz, Lab	view-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	PSO-3
CO1	3	2	-	-	-	1	1	-	-	-	-	2	1	-
CO2	3	3	2	-	3	1	2	-	-	-	-	3	2	1
CO3	3	3	2	2	3	2	2	-	-	-	-	3	2	1
CO4	2	2	3	2	2	3	3	2	-	-	2	2	3	2
CO5	3	3	3	2	3	2	2	2	2	2	2	3	3	2

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	
sessment	
rmative	mmative
signments, Quiz	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)**
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:	

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	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

Course Content

INTRODUCTION	09 Hours
Need for prefabrication – Principles of prefabrication – Modular coordination – Standardization – Materials – Systems – Production – Transportation – Erection.	

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

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	mmative
Assi gnments / 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 Mr. Nandhakumar P /AP II/ Civil

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

24CEE004	SUSTAINABLE CIVIL ENGINEERING MATERIALS	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9,11,12,13			

Pre-requisite courses	Construction Materials, Concrete Technology, Building Materials and Testing Laboratory	Data Book / Codes / Standards (If any)	IS 10262-2019

Course Objectives:

The purpose of taking this course is to:

1	Introduce the need for sustainability in construction and the environmental impacts of conventional civil engineering materials.
2	Provide knowledge on alternative, eco-friendly, and low-carbon materials, including SCMs, recycled materials, industrial byproducts, and bio-based materials.
3	Develop understanding of material properties, performance characteristics, durability, and suitability for various construction applications.
4	Enable students to apply sustainability principles in designing green concrete mixes, selecting materials, and evaluating environmental benefits.
5	Build competency in assessing materials using tests, standards, and sustainability indicators, including carbon footprint and life-cycle assessment.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Describe the need for sustainability in construction and assess the environmental impacts of conventional and alternative civil engineering materials.	U
CO2	Identify and classify various sustainable materials—including SCMs, recycled aggregates, industrial by-products, and bio-based materials—based on their engineering characteristics.	U
CO3	Analyse the physical, chemical, mechanical, and durability properties of sustainable civil engineering materials to determine their suitability for different applications.	U
CO4	Apply sustainability principles to design eco-friendly concrete mixes and select appropriate materials for structural and non-structural elements.	U
CO5	Evaluate the overall sustainability performance of materials using testing standards, carbon footprint estimation, and life-cycle assessment methods.	U

	Program Outcomes (PO)											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	3	1	2	2	2	2	3	3	3
2	3	2	1	1	1	2	1	2	3	2	2	3	2	2
3	3	3	2	2	2	2	2	1	2	2	2	3	2	2
4	3	2	3	2	3	2	2	2	2	1	2	2	2	2
5	3	3	2	3	2	2	2	2	1	2	1	2	3	3

Course Content	
Sustainability & Material Selection: Fundamentals of sustainable development in infrastructure, environmental impact of conventional materials, circular economy, green building rating systems (LEED, GRIHA, IGBC), smart construction materials, indicators such as embodied energy, durability, recyclability. **Practical Component: Nil**	**9 Hours**
Supplementary Cementitious Materials (SCMs): Fly ash, GGBS, silica fume, metakaolin, nano-silica: sources, chemistry, pozzolanic/hydraulic mechanisms; effect on fresh/hardened concrete properties; durability and sustainability benefits; sustainable mix design guidelines. **Practical Component: Nil**	**9 Hours**
Alternative Binders & Eco-Concretes: Geopolymer concretes, alkali-activated materials, LC3, low-carbon cements; processing and curing methods; performance evaluation and case studies; integration of smart materials (sensors in concrete, self-monitoring materials) **Practical Component: Nil**	**9 Hours**
Recycled, Industrial & Waste-Derived Materials: Recycled aggregates from C&D waste, industrial by-products (slag, red mud, quarry dust), agricultural residues (RHA, wood ash), plastic/rubber waste incorporation; material processing, quality control, applications in pavements/blocks; constraints and performance issues. **Practical Component: Nil**	**9 Hours**
Biomaterials, Durability & Sustainability Assessment: Bio-based materials (bamboo, hempcrete, bio-fibre composites), low-embodied-energy walling and roofing systems; durability testing (chloride ingress, carbonation, abrasion, fire resistance); Life-Cycle Assessment (LCA), carbon footprint, environmental product declarations, material selection framework for green infrastructure. **Practical Component: Nil**	**9 Hours**

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

Learning Resources*

Textbooks

1. P.K. Mehta & Paulo J.M. Monteiro, Concrete: Microstructure, Properties and Materials, McGraw-Hill.
2. M.S. Shetty, Concrete Technology: Theory and Practice, S. Chand.
3. A.M. Neville, Properties of Concrete, Pearson.
4. R. Siddique & P.C. Aitcin, Sustainable Construction Materials and Technologies, CRC Press.
5. Jamie Goggins (Ed.), Sustainable Materials in Building Construction, Elsevier.

Reference books/ Web Links

1. R. Siddique, Waste Materials and By-Products in Concrete, Springer.
2. Naik, Tarun R., Sustainable Construction and Building Materials, Elsevier.
3. K. Ganesan et al., Modern Concrete Materials – Advances in Development & Characterization, Taylor & Francis.
4. IS 383, IS 456, IS 10262, IS 3812, IS 16714 – Indian Standards for materials, SCMs, and concrete mix design.
5. R. Yu & V. P. Nguyen, Sustainable Cement-based Materials, Woodhead Publishing.

Online Resources

1. https://nptel.ac.in
2. https://bis.gov.in
3. https://ascelibrary.org
4. https://www.sciencedirect.com
5. https://www.unep.org

6. https://igbc.in

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)**
Mr.S.Karthikeyan,Chief Engineer, RAVS Construction pvt.ltd,Salem	[Name, Institution]	A.Vishnu,Assistant Professor/CE

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

MODULE 1: ADVANCED DESIGN PHILOSOPHY 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).	**9 hours**
MODULE 2: 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**

MODULE 3: DESIGN OF FLAT SLABS Direct design method, equivalent frame method, punching shear, reinforcement detailing, drop panels and column heads.	**9 Hours**
MODULE 4: 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**
MODULE 5: 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
Online Educational Resources:

sessment (Theory course)
T, 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	To gain knowledge about the types of vibration and damping
2	To understand dynamic response of SDOF and MDOF systems
3	To study active and passive vibration control devices
4	To 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 **Practical Component: Nil**	**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,	**9 Hours**

Duhamel integral. **Practical Component: Nil**	–
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. **Practical Component: Nil**	**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 **Practical Component: Nil**	**9 Hours**
DESIGN OF STRUCTURAL ELEMENTS: Design of RC beams, columns and shear walls as per IS code provisions. **Practical Component: Nil**	**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/

sessment (Theory course)
T, 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	PSO-3
CO1	3	2	-	-	-	1	2	-	-	-	-	2	1	-
CO2	3	3	2	-	3	1	2	-	-	-	-	3	2	1
CO3	3	3	2	2	3	2	3	-	-	-	-	3	2	1
CO4	2	2	3	2	2	3	3	2	-	-	2	2	3	2
CO5	3	3	3	2	3	2	3	2	2	2	2	3	3	2

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	**9 Hours**

integration in buildings - Data acquisition and monitoring	
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

sessment	
rmative	mmative
signments, Quiz	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)**
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	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

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
ourse 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
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 ENVIRONMENTAL IMPACT ASSESSMENT (EIA)	9 Hours
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. ofessor , Department of Civil Engineering
Recommended by BoS on			
Academic Council Approval		**Date**	

24CEE009	SURFACE WATER HYDROLOGY	L	T	P	J	C
		3	0	0	0	3
PE		SDG	6,11,13			

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

Course Objectives:	
The purpose of taking this course is to:	
1	To Introduce the Concept of Hydrological Cycle and its Components / Parameters of the System
2	To Impart the Concepts of Hydrograph
3	To Learn the Impacts of Urbanization on Water Cycle

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyze historical precipitation data to quantify intensity, duration, and frequency, integrating statistical and mathematical tools	An
CO 2	Assess effective precipitation by estimating interception, depression storage, evaporation, and infiltration losses, utilizing scientific principles and field methods.	An
CO 3	Develop and interpret flood and runoff hydrographs by applying hydrograph theory and Modeling techniques.	E
CO 4	Design flood routing methodologies for watersheds by applying mathematical and simulation tools, considering environmental sustainability.	C
CO 5	Evaluate urban water cycles and the impacts of urbanization on surface runoff using urban hydrology models and sustainability principles.	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	3			3							3	
2	3	3				2						3	
3		3	3	2						2		2	
4		3	3		3	3				2		2	
5		3				3					2		3

Course Content	
PRECIPITATION Hydrologic cycle – Types of Precipitation – Forms of Precipitation – Measurement of Precipitation – Determination of Adequacy of Rain gauges – Check for consistency – Estimation of Mean Precipitation Over an Area – Maximum Intensity-Duration-Frequency Relationship –Probable Maximum Precipitation	**9 Hours**

ABSTRACTIONS FROM PRECIPITATION Interception – Depression storage – Evaporation Process – Methods of Measurement – Infiltration– Measurement – Estimation of Infiltration indices.	**9 Hours**
/DROGRAPHS Components of Hydrograph – Factors affecting Hydrograph – Base Flow Separation – Unit Hydrographs – Derivation of Unit Hydrographs – S-Curve – Synthetic Unit Hydrograph.	**9 Hours**
FLOODS AND FLOOD ROUTING • **Floods** Causes of Flood – Factors Affecting Flood Flow – Methods of Estimation – Flood Control. • **Peakdischarge** Flood Peak Estimation – Flood Frequency Studies – Gumbel's Method – Reservoir Routing – Channel Routing.	**9 Hours**
URBAN HYDROLOGY Introduction – Urbanised Landscape – Water Sustainability in Cities – Water Supply, Storm Water and Wastewater Urban Water Cycle – Components of Water Budget – Methods of Computation – Urbanization Impact on Surface Runoff.	**9 Hours**

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

Learning Resources
Textbooks:
1. Applied Hydrology – Ven Te Chow and David R. Maidment, McGraw-Hill, 2nd Edition, 2013. 2. Engineering Hydrology – K. Subramanya, Tata McGraw-Hill, 4th Edition, 2013.
References:
1. Hydrology – H. M. Raghunath, New Age International, 3rd Edition, 2016. 2. Applied Hydrology – K. N. Mutreja, Tata McGraw-Hill, 1986.
Online Resources:
1. United States Geological Survey – Water Budgets: Foundations for Effective Water-Resources and Environmental Management **2.** https://water.usgs.gov/watercensus/AdHocComm/Background/WaterBudgets-Foundations-for-Effective-Water-Resources-and-Environmental-Management.pdf
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)**
Dr.N.Ramsundram, Atkins Realis,Bangalore		.Gowtham,Asst Professor,Department of Civil Engineering,KCT
Recommended by BoS on		

Academic Council Approval		**Date**	

24CEE011	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

	Program Outcomes (PO)											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	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

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)**
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**	

24CEE013	WASTE MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
PE		SDG	3,11,12			

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

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 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	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. • 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	**9 Hours**

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,Nagpor		Mr.S.Nishanth,Asst Professor,Department of Civil Engineering,KCT,Coimbatore	
Recommended by BoS on			
Academic Council Approval		**Date**	

24CEE015	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 Organization – Span of Control – Organization Charts – Development and Operation of human resources — Placement, Training and Development.	**9 Hours**
HUMAN BEHAVIOUR Basic individual psychology,motivation - Job design and performance management -	**9 Hours**

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	
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:

1. Memoria, C. B. (2023). Personnel Management. Himalaya Publishing House,
2. Mumbai.Dessler, G. (2019). Human Resource Management. Pearson Education.
3. Noe, R. A. (2017). Fundamentals of Human Resource Management. McGraw-Hill Education.
4. 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)

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**	

24CEE016	BUILDING INFORMATION 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 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			M
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 reduction – Air quality – Illumination.	**9 Hours**
SYSTEM INTEGRATION Components -, Mechanical, Plumbing – Electricity –Vertical circulation and their	**9 Hours**

interaction-Technological demands on construction management in infrastructure development projects.	
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 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**	

24CEE017	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	Dr. P.K. Viswanathan Professor, Department of Civil Engineering, IIT Madras Dr. M. Arivazhagan Dean, School of Management	Dr.U.Sindhu Vaardini AP/Civil Mr.P.Aswin Bharath AP/Civil Dr. P.A.Prabakaran AP/Civil

Management, TATA Projects Ltd.	Studies, NIT Trichy		
Recommended by BoS on			
Academic Council Approval	No:	**Date**	

24CEE018	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 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.	**9 Hours**

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)

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)
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**	

24CEE023 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)	NA

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 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	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

TRODUCTION TO GEOTHERMAL ENERGY rth'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.	**9 Hours**

AT TRANSFER IN GEOMATERIALS nduction, 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**
OTHERMAL RESOURCE EXPLORATION AND ASSESSMENT ological, 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**
OTHERMAL ENERGY UTILIZATION SYSTEMS ect 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**
VIRONMENTAL AND SUSTAINABILITY ASPECTS vironmental 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

24CEE024 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

TRODUCTION TO SLOPE STABILITY finition 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 inite 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.	**9 Hours**
SLOPES UNDER SPECIAL CONDITIONS	**9 Hours**

ect 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).	
EARTH PRESSURE THEORIES ncept 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 pes 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.PrasanVenkatesh R Mr Sathiyanatha K

Recommended by BoS on	05.05.2025		
Academic Council Approval	No:28	**Date**	26.06.2025