KUMARAGURU COLLEGE OF TECHNOLOGY,

An autonomous Institution affiliated to Anna University, Chennai

COIMBATORE – 641 049.

B.E MECHATRONICS ENGINEERING

CURRICULUM AND SYLLABUS

2024 BATCH ONWARDS

I to IV SEMESTERS

VISION

To achieve excellence in academic and industrial automation research and innovative product development driven by mechatronics systems

MISSION

- Impart the right blend of knowledge and skills to students and enable them to apply it in real life situations.
- Motivate the students towards interdisciplinary research to cater to the local and global needs.
- Achieve innovation in developing industrial products with social responsibility

PROGRAM SPECIFIC OBJECTIVES (PSOs)

The Program Specific Objectives of Mechatronics Engineering Program are to prepare the graduates:

PSO1: Design and develop Mechatronics systems to solve the complex engineering problem by integrating electronics, mechanical and computing systems.

PSO2: To analyze and provide solution for the real time engineering problems related to instrumentation, control, automation, and robotics.

PROGRAM OUTCOMES (POs) (as per New NBA document)

Graduates of the Mechatronics Engineering Undergraduate Program should have the ability to:

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM EDUCATIONAL OBJECTIVES(PEOs)

PEO1	Graduates will design and develop innovative, sustainable products by applying multidisciplinary engineering knowledge
PEO2	Graduates will identify, analyze, and solve complex engineering problems using fundamental concepts of mechatronics, while continuously engaging in lifelong learning.
PEO3	Graduates will pursue higher education or careers in multicultural and international environments, demonstrating proficiency in both oral and written communication.
PEO4	Graduates will assume leadership roles and contribute effectively to team-based projects, demonstrating a strong sense of professional ethics and social responsibility

KUMARAGURU COLLEGE OF TECHNOLOGY
B.E – Mechatronics Engineering - Curriculum
(For students admitted from 2024-25 onwards)

Semester I										
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	**Pre-requisite**
1.	24HST101	Heritage of Tamils	Theory	HS	1	0	0	0	1	
2.	24MAI111	Linear Algebra and Calculus	Embedded	BS	3	0	2	0	4	
3.	24CYI101	Electronic Materials chemistry	Embedded	BS	3	0	2	0	4	
4.	24MET104	Engineering Mechanics	Theory	ES	3	0	0	0	3	
5.	24MRT100	Basics of Mechatronics system	Theory	BS	1	0	0	0	1	
6.	24MEI101	Engineering Graphics	Embedded	ES	2	0	2	0	3	
7.	24INP102	Innovation Practicum - 1	Practical	ES	0	0	2	0	1	
8.	24ADP001	Basics of AI	Practical	ES	0	0	2	0	1	
9.	24HSP111	Holistic Wellness - 1	Practical	HS	0	0	2	0	1	
10.	24INO1--	FCLF – General Stack - 1	Practical	OE	0	0	2	0	1	
								Total Credits	20	
								Total Contact Hours/week	27	

SEMESTER II										
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	**Pre-requisite**
1.	24MAI121	Advanced calculus and Laplace transforms	Embedded	BS	3	0	2	0	4	
2.	24HST103 / 24HST104	Effective Communication / Professional Communication	Theory	HS	2	0	0	0	2	
3.	24CSI101	Logical Thinking and Problem Solving	Embedded	BS	3	0	2	0	4	
4.	24PHI102	Applied physics for circuit engineering	Embedded	BS	3	0	2	0	4	
5.	24MRT101	Electronic Devices and Circuits	Theory	PC	3	0	0	0	3	
6.	24INP103	Innovation Practicum - 2	Practical	ES	0	0	2	0	1	
7.	24HST102	Tamils and Technology	Theory	HS	1	0	0	0	1	
8.	24HSP112	Holistic Wellness - 2	Practical	HS	0	0	2	0	1	
9.	24INP101	Design Thinking	Practical	ES	0	0	2	0	1	
10.	24INO1--	FCLF - General Stack - 2	Practical	OE	0	0	2	0	1	
								Total Credits	**22**	

									Total Contact Hours/week	29
Semester III										
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	**Pre-requisite**
1.	24HSP005	Mastering Conversations	Practical	HS	0	0	2	0	1	
2.	24MAT231	Partial Differential Equations and Transforms Techniques	Theory	BS	3	1	0	0	4	
3.	24INM201	Universal Human Values II: Understanding Harmony	Theory	HS	1	0	0	0	1	
4.	24MRI202	Electrical Machines	Embedded	PC	2	0	2	0	3	
5.	24MRT203	Digital Electronics and Microcontroller	Theory	PC	3	0	0	0	3	
6.	24MRT204	Mechanics of solids	Theory	ES	2	1	0	0	3	
7.	24MRT205	Fluid mechanics and Thermal Science	Theory	ES	3	1	0	0	4	
8.	24MRJ206	Internship I	Internship	PRJ	0	0	0	0	1	
9.	24INP201	Innovation practicum -3	Practical	ES	0	0	2	0	1	
10.	24MRP207	Electronics Devices and Digital electronics Laboratory	Practical	PC	0	0	2	0	1	
11.	24INO---	FCLF General Stack -3	Practical	OE	0	0	2	0	1	
								Total Credits	23	
								Total Contact Hours/week	27	
Semester IV										
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	**Pre-requisite**
1.	24HSP006	Mastering Group Discussion and Presentation Skills	Practical	HS	0	0	2	0	1	
2.	24INM202	Environmental science and sustainability	Embedded	HS	1	0	2	0	2	
3.	24MAI241	Applied numerical methods and Probability for Engineers	Embedded	BS	3	0	2	0	4	
4.	24MRI208	Sensors and Instrumentation	Embedded	PC	2	0	2	0	3	
5.	24MRI209	Industrial Electronics and drives	Embedded	PC	2	0	2	0	3	24MRI202
6.	24MRT210	Theory of Machines	Theory	PC	2	1	0	0	3	
7.	24MRI211	Fluid power systems	Embedded	PC	2	0	2	0	3	
8.	24IN0----	FCLF Emerging Stack - 1	Practical	OE	0	0	2	0	1	

9.	24INO----	FCLF Technical Stack -1	Practical	OE	0	0	2	0	1	
10.	24MRP212	Python for edge devices	Practical	PC	0	0	2	0	1	
11.	24INP202	Innovation practicum -4	Practical	ES	0	0	2	0	1	
12.	24INM102	Indian Knowledge Systems in Science and Engineering	Theory	HS	1	0	0	0	1	
								Total Credits	24	
								Total Contact Hours/week	34	

Semester V

S.No	Course code	Course Title	Course Mode	CT	L	T	P	J	C	Pre-requisite
1.	24HSP007	Building Professional Readiness	Theory	HS	0	0	2	0	1	
2.	24MRI313	Microcontroller and Embedded Systems	Embedded	PC	3	0	2	0	4	24MRI203
3.	24MRT314	Control Engineering	Theory	PC	2	1	0	0	3	24MAT231
4.	24MRI315	Robotics Engineering	Embedded	PC	2	0	2	0	3	
5.	24MRT316	Design of Machine Elements	Theory	PC	2	1	0	0	3	
6.	24MRI317	Manufacturing Technology	Embedded	PC	2	0	2	0	3	
7.	24INO---	FCLF Emerging Stack - 2	Lab	OE	0	0	2	0	1	
8.	24INO---	FCLF Technical Stack - 3	Practical	OE	0	0	2	0	1	
9.	24MRJ318	Internship II	Internship	PRJ	0	0	0	0	2	
10.	24MRE***	Professional electives I	Theory	PE	3	0	0	0	3	
								Total Credits	24	
								Total Contact Hours/week	28	

Semester VI

S.No	Course code	Course Title	Course Mode	CT	L	T	P	J	C	Pre-requisite
1.	24MR****	Foreign Languages	Theory	HS	2	0	0	0	1	
2.	24MRI319	Industrial automation and IOT	Embedded	PC	2	0	2	0	3	
3.	24MRT320	Mobile Robotics	Theory	PC	3	0	0	0	3	
4.	24MRI321	Computer aided Manufacturing	Embedded	PC	3	0	2	0	4	
5.	24MRT322	Image Processing and Computer Vision	Theory	PC	3	0	0	0	3	
6.		FCLF(Technical Stack)	Practical	OE	0	0	2	0	1	
7.		FCLF(Emerging Stack)	Practical	OE	0	0	2	0	1	

8.	24MR****	Professional Elective II	Theory	PE	3	0	0	0	3	
9.	24MR****	Professional Elective III	Theory	PE	3	0	0	0	3	
10.	24MR****	Indian Constitution	Theory	MC	2	0	0	0	-	
								Total Credits	22	
								Total Contact Hours/week	29	

Semester VII										
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**	**Pre-requisite**
1.	24MRT423	Engineering Economics and costing	Theory	HS	3	0	0	0	3	
2.	24MRE**	Professional electives IV	Theory	PE	3	0	0	0	3	
3.	24MRE***	Professional Elective V	Theory	PE	3	0	0	0	3	
4.	24MRE***	Professional Elective VI	Theory	PE	3	0	0	0	3	
5.	24MRE***	Professional Elective VII	Theory	PE	3	0	0	0	3	
6.	24MRJ424	Project phase 1	Project	PRJ	0	0	0	6	3	
								Total Credits	18	
								Total Contact Hours/week	21	

Semester VIII									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1.	24MRJ425	Project phase 2	Project	PRJ	0	0	0	24	12
								Total Credits	12
								Total Contact Hours/week	24
								Total Credits (1 to 8th sem)	**165**

Program Electives

Vertical 1: Applied Robotics									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24MRE001	Robots and Systems in Smart Manufacturing	Theory	PE	3	0	0	0	3
2	24MRE002	Agricultural Robotics and Automation	Theory	PE	3	0	0	0	3
3	24MRE003	Legged Robotics	Theory	PE	3	0	0	0	3
4	24MRE004	Healthcare Robotics	Theory	PE	3	0	0	0	3
5	24MRE005	Drone Technology	Theory	PE	3	0	0	0	3
6	24MRE006	Collaborative Robotics	Theory	PE	3	0	0	0	3
7	24MRE007	Micro & Nano robotics	Theory	PE	3	0	0	0	3
8	24MRE008	Motion simulation and virtual reality	Theory	PE	3	0	0	0	3
9	24MRE009	Marine Robotics	Theory	PE	3	0	0	0	3
Vertical 2: Industrial Automation									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24MRE010	Automation in production systems and Management	Theory	PE	3	0	0	0	3
2	24MRE011	Advanced SCADA, HMI and VFD	Theory	PE	3	0	0	0	3
3	24MRE012	Industrial Controller communications	Theory	PE	3	0	0	0	3
4	24MRE013	Virtual Instrumentation	Theory	PE	3	0	0	0	3
5	24MRE014	Digital Twin and Industry 5.0	Theory	PE	3	0	0	0	3
6	24MRE015	Robotic Process Automation	Theory	PE	3	0	0	0	3
7	24MRE016	Supply chain management in industry 4.0	Theory	PE	3	0	0	0	3
8	24MRE017	Condition Monitoring	Theory	PE	3	0	0	0	3
9	24MRE018	Micro Electromechanical Systems	Theory	PE	3	0	0	0	3
10	24MRE019	Medical Automation	Theory	PE	3	0	0	0	3
11	24MRE020	Operation Research	Theory	PE	3	0	0	0	3
Vertical 3: Intelligent system									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24MRE021	Applied Signal Processing	Theory	PE	3	0	0	0	3
2	24MRE022	Applied Image Processing	Theory	PE	3	0	0	0	3
3	24MRE023	Machine Learning for Intelligent Systems	Theory	PE	3	0	0	0	3
4	24MRE024	Computer Vision and Deep Learning	Theory	PE	3	0	0	0	3
5	24MRE025	Immersive Technologies and Haptics	Theory	PE	3	0	0	0	3
6	24MRE026	Embedded Based Industrial Control	Theory	PE	3	0	0	0	3

7	24MRE027	Cyber security	Theory	PE	3	0	0	0	3
8	24MRE028	Statistical foundations of biomedical informatics	Theory	PE	3	0	0	0	3
9	24MRE029	Database Management System	Theory	PE	3	0	0	0	3
10	24MRE030	Soft Computing	Theory	PE	3	0	0	0	3
Vertical 4: Design and Manufacturing									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24MRE031	Design for Sustainability	Theory	PE	3	0	0	0	3
2	24MRE032	Concepts of Engineering Design	Theory	PE	3	0	0	0	3
3	24MRE033	Mechatronics system design	Theory	PE	3	0	0	0	3
4	24MRE034	Design for New Product Development	Theory	PE	3	0	0	0	3
5	24MRE035	Design for additive manufacturing	Theory	PE	3	0	0	0	3
6	24MRE036	Mathematical modeling for design	Theory	PE	3	0	0	0	3
7	24MRE037	Computer Integrated Manufacturing	Theory	PE	3	0	0	0	3
8	24MRE038	Computer Aided Inspection and Testing	Theory	PE	3	0	0	0	3
9	24MRE039	Statistical Quality Control	Theory	PE	3	0	0	0	3
10	24MRE040	Composite and Smart Materials	Theory	PE	3	0	0	0	3
11	24MRE041	Finite Element Analysis	Theory	PE	3	0	0	0	3
12	24MRE042	Design of material handling systems	Theory	PE	3	0	0	0	3
13	24MRE043	Precision manufacturing	Theory	PE	3	0	0	0	3
14	24MRE044	Design for manufacturing and Assembly	Theory	PE	3	0	0	0	3
15	24MRE045	Maintenance Engineering	Theory	PE	3	0	0	0	3
Vertical 5: Electric and Hybrid Vehicles									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24MRE046	Automobile Engineering	Theory	PE	3	0	0	0	3
2	24MRE047	Modelling and Simulation of Automotive System	Theory	PE	3	0	0	0	3
3	24MRE048	Electric and Hybrid Vehicles	Theory	PE	3	0	0	0	3
4	24MRE049	Vehicle Dynamics and Controls	Theory	PE	3	0	0	0	3
5	24MRE050	Smart mobility and Intelligent Vehicles	Theory	PE	3	0	0	0	3
6	24MRE051	Advanced Driver Assistance Systems (ADAS)	Theory	PE	3	0	0	0	3
7	24MRE052	Aircraft Mechatronics	Theory	PE	3	0	0	0	3
Open Electives									
S. No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1.	24MRO001	Robotics for Engineers	Theory	OE	3	0	0	0	3
2.	24MRO002	Automation in Agriculture	Theory	OE	3	0	0	0	3
3.	24MRO003	Nature Inspired Optimization Techniques	Theory	OE	3	0	0	0	3
4.	24MRO004	Mechanics in Cricket	Theory	OE	3	0	0	0	3
5.	24MRO005	Low Cost Automation	Theory	OE	3	0	0	0	3
6.	24MRO006	Magics and Mechanics	Theory	OE	3	0	0	0	3
INDUSTRY OFFERING ELECTIVE									

1	24*******	Product Design and Development	Theory	PE	2	0	2	0	3
2	24*******	Product Lifecycle Management	Theory	PE	3	0	0	0	3
3	24*******	Introduction to HMI	Theory	PE	3	0	0	0	3
4.	24*******	Advanced HMI	Theory	PE	2	0	2	0	3
NPTEL COURSES as Additional Credits									
1	24*******	Surface Engineering of Nano materials	Theory	PE	2	0	0	0	2
2	24*******	Fundamentals of Automotive systems	Theory	PE	3	0	0	0	3
3	24*******	Structural Analysis of Nanomaterials	Theory	PE	1	0	0	0	1

MINOR SPECIALISATION CURRICULUM

Minor specialization in 3D Printing

S.No	Course code	Course Title	Course Mode	CT	L	T	P	J	C
1	24MRR001	Fundamentals of 3D printing	Embedded	ES	3	0	2	0	4
2	24MRR002	Additive manufacturing processes	Theory	ES	3	0	0	0	3
3	24MRR003	Mechatronics in 3D Printing	Embedded	ES	3	0	2	0	4
4	24MRR004	3D Printing laboratory	Laboratory	ES	0	0	2	0	2
5	24MRR005	Project	Project	PRJ	0	0	0	6	5
								Total Credits	**18**
								Total Contact Hours/week	**21**

Minor Specialization in Robotics

S.No	Course code	Course Title	Course Mode	CT	L	T	P	J	C
1	24MRR006	Fundamentals of Robotics	Embedded	MS	2	0	2	0	3
2	24MRR007	Introduction to single-board Microcontroller and Computer	Embedded	MS	2	0	2	0	3
3	24MRR008	Autonomous Mobile Robot	Embedded	MS	2	0	2	0	3
4	24MRR009	Industrial Robotics	Embedded	MS	2	0	2	0	3
5	24MRR010	Capstone Project	Project	PRJ	0	0	0	0	6
								Total Credits	18
								Total Contact Hours/week	16

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 games of Tamilnadu-explore the concept of thinai -to know the role of Tamils in Indian National movement.

Course Outcomes

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

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

Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	
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**	**3 Hours**

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamil	
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 Resources (Weblinks)

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)

SA I and SA II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE)

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

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	
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	Tutorial	Practical	Project	Total
Hours: 45	Hours: 0	Hours: 30	Hours: 0	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)

SA 1, SA 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. 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

24CYI101	ELECTRONIC MATERIALS CHEMISTRY (Common to EC, EE, EI and MR)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	7, 9, 12			

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

Course Objectives:

The purpose of taking this course is to:

1	Acquire knowledge of advanced electrochemical energy systems, organic materials, insulating, and high-resistivity materials in electronics to understand their role in modern electronic applications.
2	Develop skills to synthesize, analyze, and characterize various electronic materials such as conducting polymers, nanomaterials, and green electronic materials through theoretical and practical approaches.
3	Gain competency in evaluating the environmental impact of electronic materials and promote sustainable practices, including green chemistry principles, recycling, and e-waste management.
4	Apply advanced concepts of electronic materials to solve real-world engineering problems in the field of energy storage, flexible electronics, and nanoelectronics.
5	Enhance analytical and problem-solving abilities through hands-on laboratory experiments, bridging theoretical concepts with practical applications in the electronic materials domain.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Apply electrochemical principles to solve challenges in advanced battery and ybrid energy systems.	Ap
CO2	Analyse the properties and synthesis of conducting polymers to compare their applications in flexible electronics and OLEDs.	An
CO3	Analyse the applications in electronic components by integrating the properties of insulating and high-resistivity materials.	An
CO4	Apply the concepts of nanomaterials to demonstrate their significance in nanoelectronics and electronic sensing technologies.	Ap
CO5	Analyse the environmental impact of electronic materials to prioritize the adoption of green chemistry and sustainable electronic practices.	An
CO6	Evaluate and recommend innovative eco-friendly electronic materials and recycling strategies to address future environmental challenges.	E

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

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

Course Content

ADVANCED ELECTROCHEMICAL ENERGY SYSTEMS Introduction to electrochemistry for energy systems - Advanced battery technologies (Li-ion batteries, Sodium-ion batteries, Al – air Battery, Zn - air batteries) - Comparison of battery technologies and its challenges. Hybrid energy storage systems: Super-capacitors: Electric double-layer capacitors (EDLCs) - Pseudo capacitors - Hybrid supercapacitors Fuel cells: Principles and recent advancements of Proton exchange membrane fuel cells (PEMFCs) - Solid oxide fuel cells (SOFCs) - Microbial fuel cells - Regenerative fuel cells. **Practical Component:** • Compare the Conductivity of different electrolytes in battery systems. • Determination of electrical conductivity in electroplated metal coating on substrate. • Determination of electrode potentials of the cell and construct feasible cell. • Estimation of mixture of acids using strong base by Conductometric titrations.	**9 Hours** **12 Hours**
ORGANIC MATERIALS FOR ELECTRONIC APPLICATIONS Introduction to polymers - Classification - Functionality - Degree of Polymerization. Polymerization: Addition polymerization and its Mechanism (Free Radical, Cationic, and Anionic) - Condensation polymerization – Copolymerization Conducting materials: Small molecule conductors (Pentacenes and their derivatives) - Engineered Pentacenes and Reversible functionalization - Synthesis and doping of conducting polymers (Polyacetylene and Polythiophene) - Applications of conducting materials in devices (Organic light-emitting diodes (OLEDs), Organic photovoltaics, Flexible and printed electronics) **Practical Component:** • Determination of molecular weight of polymer using Viscometric method.	**9 Hours** **3 Hours**
INSULATING AND HIGH-RESISTIVITY MATERIALS IN ELECTRONICS Insulating materials in electronics: Introduction (Importance and Key properties) - Classification (Solid, liquid, and gas insulators) - Properties (Dielectric properties	

and breakdown) - Preparation, properties, and uses of Solid inorganic (Mica and Porcelain) and organic insulators (Bakelite and Rubber) - Liquid insulators (Epoxy resin and Transformer oil) – Gas Insulator (Sulfur hexafluoride) High Electrical resistivity materials: Factors influencing electrical resistivity - High resistivity materials (Composition, properties, and applications of Manganin and Molybdenum disilicide) - Nanocomposite insulators **Practical Component:** • Determination of pH and Conductivity in different Transformer Oils	**9 Hours** **3 Hours**
NANOMATERIALS AND NANOELECTRONICS Introduction to nano chemistry - Distinction between molecules, nanoparticles, and bulk materials - Size-dependent properties of nanomaterials - Quantum confinement effects - Carbon nanotubes and graphene (Preparation by Chemical Vapor Deposition and Laser Ablation, Properties and Applications in electronics) - Nanowires (Preparation by Electrochemical Deposition and Electrospinning, Properties and Applications in electronics) – Nanoparticles, nanoclusters, and nanorods (Preparation by Sol-gel, Solvothermal, Properties and Applications in electronics) - Nanotubes and nanowires in sensing applications. **Practical Component:** • Synthesis of Nanoparticle using Solvo-Thermal Method	**9 Hours** **3 Hours**
GREEN CHEMISTRY AND SUSTAINABLE ELECTRONICS Introduction to sustainable electronics (Importance and Environmental challenges in the electronics industry) - Environmental impact (Conductors, semiconductors, and polymers), Toxicity and persistence of electronic materials - Green chemistry principles in electronics manufacturing (12 principles of green chemistry applied to electronics and Eco-friendly materials and processes) - Life cycle assessment of electronic products - Recycling and e-waste management strategies (Recovery, Challenges and innovations in electronics recycling) - Future trends in eco-friendly electronic materials. **Practical Component:** • Determination of Copper from electronic waste by Complexometric method. • Estimation of copper ion by spectrophotometry. • Estimation of strength of sulphuric acid in spent Battery Electrolytes by pH metry	**9 Hours** **9 Hours**

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

Learning Resources

References:

1. Singh, G. (2019). Advanced battery technology for energy storage applications (1st ed.). New Age International Publishers.
2. Beguin, F., & Frackowiak, E. (2013). Supercapacitors: Materials, systems, and applications (1st ed.). Wiley-VCH.
3. Kumar, V., & Kumar, A. (2015). Conducting polymers: Synthesis, properties, and applications (1st ed.). Narosa Publishing House.
4. Chandrasekhar, S. (2014). Organic electronics: Concepts and applications (1st ed.). Springer.

5. Sharma, R. K. (2022). Electrochemistry for energy systems (1st ed.). Narosa Publishing House.
6. Hironis, N. P., & Pal, M. (2004). Electrical insulating materials (1st ed.). S. Chand & Company Ltd.
7. Kulkarni, S. K. (2014). Nanotechnology: Principles and practices (3rd ed.). Capital Publishing Company.
8. Ahluwalia, V. K. (2009). Green chemistry: Environmentally benign reactions (1st ed.). Ane Books Pvt. Ltd.
9. Shina, S. G. (2008). Green electronics design and manufacturing (1st ed.). McGraw-Hill.

Online Resources (Weblinks)

1. https://www.coursera.org/learn/lithium-based-batteries
2. https://www.youtube.com/watch?v=Gbltx4IXLzQ&list=PLbMVogVj5nJT0slH3tuas5BIp1DG8ZpMj&index=2
3. https://www.coursera.org/learn/applied-sustainability-engineering
4. https://www.youtube.com/watch?v=nSAvyQajVzE

Assessment (Embedded course)

SA 1, SA 2 , 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 from Industry	Expert 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 K Rathidevi, Dr. K Sampath, Dr S Jyothi, Dr R Ashokkumar, Department of Chemistry

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	
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 structures.	**9 Hours**
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

10. 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.
11. .James L. Meriam, L. G. Kraige, J. N. Bolton: Engineering Mechanics Statics , 9th edition, Wiley student edition, 2020.
12. James L. Meriam, L. G. Kraige, J. N. Bolton: Engineering Mechanics: Dynamics, 9th edition, Wiley student edition, 2020.
13. P. Boresi & J. Schmidt, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
14. Irving H. Shames, G. Krishna Mohana Rao, Engineering Mechanics - Statics and Dynamics, Fourth Edition – PHI / Pearson Education Asia Pvt. Ltd., 2006.

<table>
<tr><td colspan="4">15. Rajasekaran S and Sankarasubramanian G, “Engineering Mechanics-Statics and Dynamics”, Vikas Publishing House Pvt. Ltd., New Delhi, 2006</td></tr>
<tr><td colspan="4">Assessment (Theory course)</td></tr>
<tr><td colspan="4">SA 1, SA 2 , Activity and Learning Task(s), MCQ, End Semester Examination (ESE)</td></tr>
<tr><td colspan="4">Course Curated by</td></tr>
<tr><td>Expert(s) from Industry</td><td>Expert(s) from Higher Education Institution</td><td colspan="2">Internal Expert(s)</td></tr>
<tr><td>Mr. Babin. T,
Design Engineer Lead |Mechanical Product Design Engineer-III at SLB, Singapore.</td><td>Dr S Parimala Murugaveni
Associate Professor, Department of Mechanical Engineering, Government College of Technology, Coimbatore.</td><td colspan="2">Dr. N. Sangeetha,
Associate Professor,
Department of Mechanics,</td></tr>
<tr><td>Recommended by BoS on</td><td colspan="3">17.08.2024</td></tr>
<tr><td>Academic Council Approval</td><td>No: 27</td><td>Date</td><td>24.08.2024</td></tr>
</table>

24MRT100	BASICS OF MECHATRONICS SYSTEM	L	T	P	J	C
		1	0	0	0	1
BS		SDG	9			

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

Course Objectives:

The purpose of taking this course is to:

1	Introduce the basic concepts and significance of Mechatronics, focusing on understanding the key elements and their roles in a system.
2	Impart students with knowledge of different types of sensors, transducers, actuators and controllers emphasizing their operating principles and applications
3	Develop students to apply mechatronics systems in robotics and automation, automotive systems, and medical devices.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Discuss the significance of Mechatronics systems and assess the roles of electrical, electronic, and mechanical components in their design and operation.	U
CO 2	Outline the working principles of various sensors, transducers, actuators and controllers applied in Mechatronics systems.	U
CO 3	Demonstrate the application of Mechatronics systems in robotics, automation, automotive technologies, and medical devices.	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	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3					1	1				2	3	2
2	3					1	1	1			2	3	3
3	3	2	2	1	1	1	1	2	2	2	2	3	3

Course Content

INTRODUCTION TO MECHATRONICS Definition of mechatronics – Need of Mechatronics- Elements of Mechatronics system- Overview of mechanical components: Links, gears and cams	**3 Hours**
SENSORS AND TRANSDUCERS	**3 Hours**

Definition - sensors and Transducers, Differences – Passive and Active Sensors- Principle of operation – Resistive, Capacitive, Inductive, Piezo electric and electromagnetic type sensors	
CONTROLLERS AND SIGNAL CONDITIONING Introduction - Open loop and closed loop systems - controllers: Role of controllers in mechatronics systems - Microcontrollers and PLCs. Signal conditioning: Amplification – filtering - analog-to-digital conversion.	**3 Hours**
ACTUATORS Introduction to actuators: linear and rotary actuators - Electrical, hydraulic, and pneumatic systems. - applications of actuators in mechatronics systems.	**3 Hours**
CASE STUDIES OF MECHATRONICS SYSTEMS Mechatronics Design Process - Case studies on robotics and automation, automotive systems, and medical devices	**3 Hours**

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

Learning Resources

Textbooks

1. Bolton, W. (2018). Mechatronics: Electronic control systems in mechanical and electrical engineering (7th ed.). Pearson Education.Shetty, D., & Kolk, R. A. (2012). Mechatronics system design (2nd ed.). Cengage India

Reference books

1. Bolton, W. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering. Pearson, London (2021).
2. Smaili, A., & Mrad, F. Mechatronics: Integrated Technologies for Intelligent Machines. Oxford University Press, New York (2018).
3. Mahalik, N. P. Mechatronics: Principles, Concepts and Applications. Tata McGraw-Hill Education, New Delhi (2022).
4. Histand, M. B., & Alciatore, D. G. Introduction to Mechatronics and Measurement Systems. McGraw-Hill, New York (2022).
5. Bishop, R. H. The Mechatronics Handbook. CRC Press, Boca Raton (2021).

Online Resources (Web Links)

1. https://engineering.purdue.edu/ME588/lecture_notes.html
2. https://www.coursera.org/learn/cps-design-for-mechatronics-healthcare-ev--robotics
3. https://onlinecourses.nptel.ac.in/noc24_me120/preview
4. https://multimechatronics.com/
5. https://www.udemy.com/course/robotics-and-mechatronics-a-basic-guide-to-begin-with/?couponCode=IND21PM

Assessment (Theory course)

SA 1, SA 2 , One-minute paper, exit tickets/exit slips, Low-stakes quizzes, Diagnostic questions, Open-ended questions, Homework tasks, MCQ, End Semester Examination (ESE).

Course Curated by

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

Mr. Kannan VenkatachalaM, Tata Technologies Ltd., Mr. S. Ananth Kumar, Mathworks	Dr. N. Rajam Ramaswamy, Coimbatore Institute of Technology, Dr. P. Karthikeyan, MIT Dr. P. Mangaiyarkarasi, GCT		Dr. M. Saravana Mohan, Department of Mechatronics Engineering
Recommended by BoS on	14.08.2024		
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 skhing, 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 skhes 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	
1	2	2			2									
2		2		2						2				
3		2	2				2							

4	2		2		2								
5	2				2					2			
6	2				2					2			

Course Content

PLANE CURVES, PROJECTION OF POINTS, LINES AND PLANES • Importance of graphics in design process, visualization, communication, documentation and drafting tools, Construction of curves - ellipse, parabola, and hyperbola by eccentricity method only. Orthographic projection of points. • 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** **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 SKHING AND INTRODUCTION TO AUTOCAD • Free hand skhing techniques, skhing of orthographic views from given pictorial views of objects, including free-hand dimensioning. Free hand skhing 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 Precision. Annotation and dimensions, Object properties.	**6 Hours** **6 Hours**
DRAWING ORGANIZATION AND HOUSE PROJECT AutoCAD - Skhing – 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:	Tutorial Hours:	Practical Hours:	Project Hours:	Total Hours:
30	0	30	0	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):

6. https://www.khanacademy.org/math/differential-calculus
7. https://nptel.ac.in/courses/106105171
8. https://swayam.gov.in/nd1_noc19_cs42/preview

Assessment (Embedded course)

SA 1, SA 2 , Activity and Learning Task(s), 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

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	
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	**6 Hours**

Transdisciplinary systems to accelerate innovation - Manu'Futuring: Technology in hardware manufacturing and manufacturing of hardware technologies - Future scopes with product case studies.	
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	Tutorial	Practical	Project	Total
Hours: 0	Hours: 0	Hours: 30	Hours: 0	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

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 Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	
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,	**8 Hours**

Regulations, Governance, and ESG. The evolution and future of AI - The AI Ladder - The Journey for Adopting AI Successfully - Hotbeds of AI Innovation.	
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)

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. Sangeetha, Associate Professor Department of AI&DS

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 work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	
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:	**14 Hours**

• 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.	
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
    a. ., 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

SEMESTER II

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 behaviour 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	
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) **Practical Component** • Evaluating gradient, divergence and curl. • Evaluating line integrals and work done. • Verifying Green's theorem in the plane.	**9 Hours** **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. **Practical Component** • Solving of second and higher order ordinary differential equations.	**9 Hours** **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. **Practical Component** • Evaluating Laplace transforms and inverse Laplace transforms of functions. • Applying the technique of Laplace transform to solve differential equations.	**9 Hours** **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 **Practical Component** • Verifying the analyticity of a function. • Construction of analytic functions by Milne Thomson method.	**9 Hours** **6 Hours**
COMPLEX INTEGRATION	**9 Hours**

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. **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)

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

Assessment

8. SA 1,SA 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. Ramesh V.S., STEPS Knowledge Services Private Limited, Coimbatore. Mr. Jayakumar Venkatesan, Valles Marineris International Private Limited- Chennai.	Dr. T. Govindan, Government College of Engineering, Srirangam, Trichy. Dr. C. Porkodi, PSG College of Technology, Coimbatore.	Dr. S.MeenaPriyadarshini Dr.K.Maheswari Ms. A.Shamugavadivu Department of Mathematics

Mr. Imran Khan, GE Transportation Company, Bangalore.	Dr. P. Paramanathan, Amrita Vishwa Vidyapeetham, Coimbatore.		
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	
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 were students identify the main idea of paragraphs or sections and debrief)	**6 Hours**
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 (Theory course)

SA I and SA II, Activity and Learning Task(s), 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	
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,	**6 Hours**

salutation, body, closing) - reading and responding to email communication – Networking Emails - Analyzing and interpreting technical texts (Loud Reading).	
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)

SA 1, SA 2 Activity and Learning Task(s), MCQ, End Semester Examination (ESE)

Course Curated by

Expert from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr.Vijayan Ramanathan ,	Dr. Aninditha Sahoo,	Dr. Arokia Lawrence Vijay Dr. Hema

Project manager, Toppan Merrill. Technologies, Coimbatore	IIT, Madras Dr.P.R.Sujatha Priyadharshini, Anna University, Chennai Dr. E. Justin Ruben, CIT, Coimbatore	Department of English		
Recommended by BoS on		16.08.2024		
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 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	**6 Hours** **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.	**10 Hours**

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.	**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)

SA 1, SA 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)
-	-	Dr. S. Kavitha, Department of Information Technology

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

24PHI102	APPLIED PHYSICS FOR CIRCUIT ENGINEERING (Common to EC, EE, EI an MR)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	9			

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

Course Objectives:

The purpose of taking this course is to:

1	Discover the fundamental concepts of light-matter interactions, including emission, absorption, and Einstein's theory's presentation of stimulated emission's quantum mechanical foundations.
2	Comprehend the principles of quantum mechanics, including wave-particle duality, the significance of the wave function, and quantum tunnelling.
3	Examine various sources of green energy, including solar, wind, and ocean energy, and assess their efficiency and practical applications.
4	Study the properties of semiconductors, magnetic materials, including carrier concentration, transport phenomena, and applications of the Hall effect in sensors.

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 applied optics to demonstrate the operation of laser systems and their applications.	Ap
CO 2	Apply quantum mechanical concepts to solve problems related to wave-particle duality and quantum tunnelling.	Ap
CO 3	Apply principles of green energy technologies to assess their efficiency and practical applications.	Ap
CO 4	0075nderstanding semiconductor physics concepts to analyze carrier transport phenomena and properties of semiconductor devices.	U
CO 5	Apply knowledge of magnetic materials to evaluate their properties and uses in modern applications like spintronics.	Ap
CO 6	Apply optics, quantum physics, green energy, and semiconductor physics methods to design practical solutions in experimental setups.	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	3	1												

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

Course Content

APPLIED OPTICS 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 - CO_2 laser - Applications – Laser Imaging, Holography and 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**
QUANTUM PHYSICS 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) - Particle in a box- Eigen values and Eigen function- Superposition Principle - Quantum mechanical tunnelling through a barrier **Practical Component** 1. Compound pendulum – Determination of acceleration due to gravity 2. Determination of Planck's constant–electroluminescence method.	**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) - 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 **2.** Melde's string – Determination of frequency of a tuning fork	**9 Hours** **6 hours**
SEMICONDUCTOR PHYSICS Semiconductors - Intrinsic and extrinsic semiconductors - Variation of carrier concentration with temperature and impurity concentration - Carrier transport in Semiconductors: Drift, mobility and diffusion – Hall Effect in Semiconductors – Applications of Hall Effect - Magnetic field sensor, current sensor, and position sensor - Ohmic contacts: concept and importance - Schottky diode – construction and working - energy band diagram, I-V characteristics. **Practical Component**	**9 Hours**

1. Determination of band gap of a semiconductor 2. Determination of thermal conductivity of a bad conductor – Lee's Disc method 3. Non-uniform bending – Determination of Young's modulus	**6 hours**
MAGNETIC MATERIALS Introduction – Bohr magnetron - types of magnetic material – Hysteresis behaviour – Energy product - Hard and soft magnetic materials - Magnetic Anisotropy- Spintronics and Magnetic Semiconductors- Applications – GMR - MRAM (Magneto resistive Random Access Memory) - Nanomagnetic Materials - Magnetocaloric Materials – Magnetic Materials in Renewable Energy – Magnetic levitation. **Practical Component** 1. Determination of magnetic susceptibility of a solid material – B-H curve apparatus	**9 Hours** **6 hours**

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

Learning Resources

Textbooks

1. Avadhanulu, M. N., Kshirsagar, P. G., & Arun Murthy, T. V. S., A Textbook of Engineering Physics, S. Chand Publications, New Delhi (2018).
2. Gaur, R. K., & Gupta, S. L., Engineering Physics, Dhanpat Rai Publishing Co Pvt Ltd, New Delhi (Year not provided).
3. Beiser, A., Mahajan, S., & Choudhury, S. R., Concepts of Modern Physics, McGraw Hill Education, New Delhi (2017).
4. Rajendran, V., Applied Physics, Tata McGraw Hill Publishing, New Delhi (2017).

Reference books

1. Lal, Brij, & Subrahmanyam, Properties of Matter, S. Chand & Co Ltd., New Delhi (2014).
2. Prakash, Satya, Quantum Mechanics, Pragati Prakashan Publishers (2015).
3. Thiagarajan, K., & Ghatak, Ajoy, Lasers: Fundamentals and Applications, Springer Science & Business Media (2010)
4. Hill, William Silfvast, Laser Fundamentals, Cambridge University Press, New York (2018).
5. Ultrasonics: Fundamentals, Technology, Applications, 2nd Edition, Marcel Dekker, New York (1988).
6. Sze, S. M., & Ng, K. K., Physics of Semiconductor Devices, Wiley (2020), ISBN: 978-1119090240.
7. Sellmyer, David J., & Skomski, Robert, Permanent Magnetic Materials and Devices,
8. Springer (2017), ISBN: 978-3319315828.

Online Resources (Weblinks)

1. National Institute of Standards and Technology (NIST) - Laser Fundamentals
2. Optics.org - Laser Applications
3. IEEE Xplore - Semiconductor Devices
4. Semiconductor Industry Association - Semiconductor Technology
5. Global Wind Energy Council (GWEC) - Wind Energy
6. Ocean Energy Europe
7. Magnetics - Magnetic Materials

Assessment (Embedded course)

SA 1, SA 2 , Mini project, Qualitative assignments (PrBL/Activity based), MCQ, End Semester Examination (ESE), Lab Workbook, Model exam and viva-voce			
Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
			Dr. R. Balamurugan Dr. K. Sugandhi Department of Physics
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24MRT101	ELECTRONIC DEVICES AND CIRCUITS	L	T	P	J	C
		3	0	0	0	3
PC		SDG		9		

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

Course Objectives:

The purpose of taking this course is to:

1	Provide foundational knowledge on network theorems and their application in solving complex electrical circuits.
2	Impart understanding of the behaviour and characteristics of semiconductor devices and their role in electronic circuits.
3	Develop the ability to design and analyze various amplifier and oscillator circuits used in electronic applications.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply network theorems to solve electrical circuit problems using nodal and mesh analysis.	Ap
CO 2	Apply the basics of PN junction Diode and Zener Diode to solve simple circuit problems.	Ap
CO 3	Analyze the operation and VI characteristics of BJT and MOSFET.	An
CO 4	Analyze the frequency response of amplifier circuits and its significance in designing small signal amplifiers.	An
CO 5	Apply operational amplifier circuits to design analog circuits like oscillators, integrators, and comparators.	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	3	3										2		
2	3	1	1									2		
3	3		2									3	3	
4	3	3	1									2		
5	3	1	2									3	3	

Course Content

CIRCUIT THEORY Network Theorems: Kirchhoff's laws – Thevenin's theorem - Norton's theorem - Superposition theorem – Maximum power transfer theorem – Nodal and Mesh Analysis.	**9 Hours**
DIODES AND ITS APPLICATIONS PN junction Diode - Zener Diode Structure, Operation and VI Characteristics - Applications of Diode: Clippers and Clampers - Half Wave & Full Wave Rectifiers – Zener voltage regulator - Regulator Design: Case Study - Schottky Diodes - LEDs and Photo diodes -Introduction to Memristors.	**9 Hours**
BJT AND MOSFET BJT - Transistor Currents - Transistor Characteristics - CE and CB configuration - Biasing of a transistor; fixed bias, self-bias. MOSFET - Enhancement and Depletion Modes - Regions of Operation- MOSFET Characteristics - BJT and MOSFET as a switch.	**9 Hours**
AMPLIFIERS AND OSCILLATORS Common Emitter configuration - h parameter model for low frequencies – Small signal amplifiers - cascading amplifiers, differential amplifier – Oscillators – Barkhausen stability criterion - Hartley oscillators and Colpitts oscillators.	**9 Hours**
OPERATIONAL AMPLIFIERS Ideal characteristics – Inverting, Non-inverting – summer – Comparator, Integrator, differentiator – Schmitt trigger – R.C. Phase shift oscillator, Wein Bridge Oscillator – Astable multivibrator.	**9 Hours**

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

Learning Resources

Textbooks:

1. Sudhakar, Shyammohan, and Shyammohan Palli. Circuits and Networks: Analysis & Synthesis, Tata McGraw Hill, New Delhi (2010).
2. Malvino, Albert, and J. Bates. Electronic Principles, Tata McGraw-Hill Pub. Company Ltd., New Delhi (2008).
3. Millman, Jacob, Christos C. Halkias, and Satyabrata Jit. Electronic Devices and Circuits, Tata McGraw-Hill, New Delhi (2008).

References:

1. Agarwal, A., & Lang, J. H. (2005). *Foundations of analog and digital electronic circuits* (1st ed.). Morgan Kaufmann.
2. Floyd, T. L. (2021). *Electronic devices (Conventional current version)* (10th ed.). Pearson Education.
3. Hayt, W. H., Kemmerly, J. E., & Durbin, S. M. (2023). *Engineering circuit analysis* (10th ed.). McGraw-Hill Education.
4. Salivahanan, S., Suresh Kumar, N., & Vallavaraj, A. (2022). *Electronic devices and circuits* (5th ed.). McGraw-Hill Education India.
5. Chowdhury, D. R., & Jain, S. B. (2011). *Linear integrated circuits* (4th ed.). New Age International.
6. IEEE Xplore for journal articles related to Kirchhoff's laws, Thevenin's theorem, and other network theorems: https://ieeexplore.ieee.org/
7. All About Circuits for detailed explanations of circuit theory: https://www.allaboutcircuits.com/

Online Resources (Weblinks)

1. https://nptel.ac.in/courses/108102097
2. https://nptel.ac.in/courses/108108112
3. https://nptel.ac.in/courses/108108111

Assessment			
SA 1, SA 2 , 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. Kannan Venkatachalam Tata Technologies Ltd	Dr. P. Mangaiyarkarasi, Government College of Technology	Dr. B. Sabitha, Department of Mechatronics Engineering	
Recommended by BoS on	14.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

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

Introduction to basic electronic components (resistors, capacitors, transistors, .), 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	
SOFTWARE PROTOTYPING AND TOOLS Benefits of rapid prototyping in product development, Iterative design and testing, Wireframing tools (Balsamiq, Figma), UI design tools (Skh, Figma), Programming languages (Python, JavaScript), Testing frameworks (Selenium), No-code platforms (Bubble, Adalo, Wix, AppGyver), Building functional prototypes without extensive coding	**6 Hours**
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	-	Dr. Samuel Ratna Kumar P S Assistant Professor – III

Director - Innovation Practicum Associate VP - Forge. Innovation		Department Mechanical Engineering	
Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

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	
1	2		2				3	2	2		2			
2	2		2				3	2	2		2			
	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, எஃகு - 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

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

Assessment (Theory course)

SA 1, SA 2 , Activity and Learning Task(s), MCQ, End Semester Examination (ESE)

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

• Cognitive-behavioural strategies for managing stress and anxiety. • Hands-on activity: Developing and practicing a resilience toolkit.	
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: • 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.	**6 Hours**
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

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	
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	**6 Hours**

non-participation or lack of reflection-Overview of the Design Thinking process and its importance.	
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. Kelley, T. (2016). The Art Of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm. United Kingdom: Profile.
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 III

24HSP005 Practical	MASTERING CONVERSATIONS	L	T	P	J	C
		0	0	2	0	1
		SDG		8		

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

Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes:

After successful completion of this course, the students shall be able to		Bloom's Taxonomy Level (BTL)
CO 1	Empathize with and understand people in both professional and personal contexts, reflecting on situations from multiple perspectives and participating in activities that mirror career-related scenarios	K3
CO 2	Analyze and converse critically on complex subjects, demonstrating the ability to approach and deal with various social contexts effectively	K4
CO 3	Exhibit skills in role-playing and enacting given situations to navigate diverse social interactions and career-related contexts.	K6

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	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						3			3	2	3			
2									1	2				
3									3	2				

Course Content

Practical Component / Roleplays Dynamics Introduction to Role play - Benefits of role plays - Importance of gesture, tone and modulation-Skill development through role play activities - Types of role plays - Conversation Building through communicative functions-Initiating a dialogue- Framing questions- Receiving feedback .	**6 Hours**
Practical Component /Roleplays on Social Skill Social Interactions: - (Ordering food at a restaurant- Making a reservation at a hotel-- Shopping at a store-- Attending a party or social gathering).Travel and Tourism:(Asking for directions- Booking a flight or hotel-- Exploring a new city- Interacting with local people).Community and Volunteering:(Participating in a charity event- Volunteering at a local organization- Discussing community issues- Organizing a community project)	**6 Hours**
Practical Component / Roleplays on Education and Technology Education and Personal Growth:(Setting goals-(Short term & Long term)- Creating a study plan- Participating in a workshop- Reflecting on personal growth) Technology and Online Interactions:(Participating in an online meeting- Creating a social media post- Writing an email or text message- Making an online purchase). Technology and Science:(Explaining a scientific concept- Discussing emerging technologies- participating in Hackathons- Presenting a research paper)	**6 Hours**
Practical Component / Roleplays on Strategic Insights Critical Thinking :(Evaluating a news article-solving a moral dilemma-Decision with incomplete information-Assessing a historical event).Problem-Solving:(Resolving a conflict- Negotiating a deal - Making a complaint- Apologizing for a mistake).Business and Entrepreneurship:(Pitching an idea- Negotiating a contract- Conducting a market Research- Presenting a product launch)	**6 Hours**
Practical Component / Roleplays on Cultural Exchange Cultural Exchange:(Sharing customs and traditions- Discussing cultural differences- Exploring historical events- Participating in a cultural festival) Media and Entertainment:(Event planning- Creating an advertisement-Digital Marketing- Conducting interviews- Creating news broadcast- Writing and Performing a script- Enacting one act plays). Arts and Culture:(Visiting an art gallery - Attending/ organizing a concert or play - Discussing literature- Creating a piece of art)	**6 Hours**
Theory Hours: Tutorial Hours: Practical Hours: 30 Project Hours: Total Hours: 30	

Learning Resources

Textbooks
Reference books/ Web Links

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

Online Resources (Weblinks)

https://www.niu.edu/citl/resources/guides/instructional-guide
https://positivepsychology.com/role-playing-scripts/

Assessment

Formative	Summative
Assignments / Mini project), Quiz, Lab	Quizzes and written assignments, Participation in group activities

Course Curated By

Expert(s) from Industry	Expert(s) from Higher Education Institutions	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. Tissaa Tony

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

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

Course Objectives:

The purpose of taking this course is to:

1	Apply analytical methods to solve selected PDEs, including suitable method of characteristics.
2	Construct Fourier series expansions for functions defined on a finite interval.
3	Develop the ability to formulate and solve the one-dimensional wave equation and steady-state heat equation using analytical methods.
4	Introduce students to the mathematical formulation of the steady-state two-dimensional heat conduction equation in Cartesian coordinates.
5	Enable students to compute Fourier transforms of standard functions and understand their properties.
6	Apply the Z-transform technique to solve linear difference equations with constant coefficients.

Course Outcomes:

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

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

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

Course Content

PARTIAL DIFFERENTIAL EQUATIONS Solution of PDE by direct integration - solution of standard types of first order partial differential equations (excluding reducible to standard types) - Lagrange's linear equation – Linear homogeneous partial differential equations of second order with constant coefficients.	**9 + 3 Hours**
FOURIER SERIES Dirichlet's conditions – Fourier series – Odd and Even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic Analysis.	**9 + 3 Hours**
BOUNDARY VALUE PROBLEMS – ONE DIMENSIONAL EQUATIONS Classification of second order quasi linear partial differential equations – Solution of one-dimensional wave equation – Solution of one-dimensional heat equation (excluding insulated ends) – (Cartesian coordinates only).	**5 + 2 Hours**
BOUNDARY VALUE PROBLEMS – TWO DIMENSIONAL EQUATIONS Steady state solution of two-dimensional heat equation in infinite plate (Insulated edges excluded) – (Cartesian coordinates only)	**4 + 1 Hours**
FOURIER TRANSFORM Statement of Fourier integral theorem – Infinite Fourier transforms – Sine and Cosine Transforms – Properties (Proofs excluded)– Transforms of simple functions – Convolution theorem – Parseval's identity.	**9 + 3 Hours**
Z –TRANSFORM Z-transform - Properties (Proofs excluded) – Convolution theorem- Inverse Z – transform (by using partial fractions, residues and convolution theorem) – Solution of difference equations using Z - transform.	**9 + 3 Hours**
Theory Hours: 45 **Tutorial Hours: 15** **Practical Hours:** **Project Hours:** **Total Hours: 60**	
Learning Resources	
Textbooks	

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

Reference books/ Web Links

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

Online Resources (Weblinks)

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

Assessment

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

Course Curated By

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

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

24INM201	Universal Human Values II: Understanding Harmony (Common to All Branches)	L	T	P	J	C
		1	0	0	0	1
HS		SDG	5,10,16			

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

Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes

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

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1	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	3	3	3	2	2		3			
2		2	2	3	3	3	3	2	2		3			
3		2	2	2	2	3	3	2	2		3			
4		2	2	2	2	3	3	2	2		3			
5		2	2	3	3	3	3	2	2		3			

Course Content

Introduction to Value Education Value Education- Self-exploration as the Process for Value Education- Basic Human Aspirations and their Fulfilment- Right Understanding, Relationship and Physical Facility- Happiness and Prosperity – Current Scenario- Method to Fulfil the Basic Human Aspirations.	**3 Hours**
Harmony in the Human Being Human Being as Co-existence of the Self and the Body- Distinguishing between the Needs of the Self and the Body- The Body as an Instrument of the Self- Understanding Harmony in the Self- Harmony of the Self with the Body- Programs to Ensure Self-regulation and Health.	**3 Hours**
Harmony in the Family and Society Harmony in the Family –The Basic Unit of Human Interaction-'Trust' – The Foundational Value in Relationship-Respect – As the Right Evaluation- Other Values in Human-to-Human Relationship- Understanding Harmony in the SocietyLecture Vision for the Universal Human Order.	**3 Hours**
Harmony in the Nature (Existence) Understanding Harmony in Nature- Interconnectedness, Self-regulation and Mutual Fulfilment among the Four Orders of Nature- Realizing Existence as Co-existence at All Levels- The Holistic Perception of Harmony in Existence.	**3 Hours**
Implications of the Holistic Understanding- A Look at Professional Ethics Basis for Universal Human Values-Definitiveness of (Ethical) Human Conduct - professional Ethics in the Light of Right Understanding-A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order-Holistic Technologies, Production Systems-and Management Models-Typical Case Studies Strategies for Transition towards Value-based Life and Profession	**3 Hours**

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

Learning Resources

Textbooks:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

References:

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

Online Resources (Weblinks)

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

Assessment (Theory course)

SA I and SA II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE)

Course Curated by

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

	Sh. Umesh Jadhav, NCCIP (National Co-oridnation Committee)-AICTE	Dr.S.Sivakumar, Associate Professor, SFS Dr.R.Prakasam, Assistant Professor, Department of Physics Mr.J.Sivaguru, Assistant Professor, Department of Mechatronics	
Recommended by BoS on	03-05-2025		
Academic Council Approval		**Date**	26-06-2025

24MRI202	ELECTRICAL MACHINES	L	T	P	J	C
		2	0	2	0	3
PC		SDG	7, 9, 13			

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

Course Objectives:

The purpose of taking this course is to:

1	Understand the fundamental principles of working and construction of electric motors.
2	Explore the operational behaviour of electric motors, their performance characteristics, and various speed control strategies.
3	Investigate the factors influencing motor selection for real-world applications

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Examine the construction, principle of operation and performance of DC motors.	An
CO 2	Analyze the construction, principle of operation and performance of Induction Machines	An
CO 3	Apply speed control techniques of electrical machines to solve real-world engineering problems	Ap
CO 4	Compare the construction and operation of PMDC and BLDC motors to evaluate their suitability for specific applications.	An
CO 5	Distinguish between the construction and working principles of different types of stepper and servo motors for precise control applications.	An
CO 6	Evaluate the factors influencing motor selection to recommend suitable motors for different industrial applications.	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	
1	3	2	1	1	1						2	2	2	
2	3	2	1	1	1						2	2	2	
3	3	3	3	2	2	2		3	2	1	2	2	2	
4	3	2	2	1	2			3	2	1	2	3	3	
5	3	2	2	1	2			2	2	2	1	3	3	

6	3	2	1	2		2	2	3	2	3		2	2	

Course Content

DC MACHINES Principle of working -Construction of DC generator - EMF equation - Methods of excitation – Self and separately excited Shunt generator - Principle of operation of DC Motor - Back emf, voltage equation, torque equation-Characteristics of DC motors - Speed control of DC series and Shunt motors -Armature and Field control. **Practical Component:** • Load test on DC series motor • Load test on DC Shunt motor • Speed control of DC shunt motor using Armature and Field Control • Open circuit characteristics of DC Generator	**10 Hours** **20 Hours**
AC MACHINES Three phase induction motor: Principle of working -construction - Torque-slip characteristics, torque equation - cogging – crawling - Speed control of three phase induction motor -Voltage Control-Voltage/frequency control-slip power recovery scheme. **Practical Component:** • Load Test on Three Phase Squirrel Cage Induction motor • Speed control of three phase slip ring induction motor • Study of starters	**10 Hours** **10 Hours**
SPECIAL MACHINES Permanent Magnet DC motor – Brushless DC motor - Stepper motor– Servo motor – Principle of working, Construction, Applications.	**5 Hours**
SELECTION OF A MOTOR Factors influencing the selection of a motor - power ratings and capabilities, load requirements, Energy efficiency of motors IE1 to IE4, Heat flow in a Motor. CASE STUDIES: Selection of a motor for automotive and robotics applications. AI-Based Fault Diagnosis and Condition Monitoring of Electrical Machines, Safety standards for electrical machine applications .	**5 Hours**

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

Learning Resources

Textbooks:

1. Theraja, B. L., & Theraja, A. K. (2025). A textbook of electrical technology: Volume II – AC and DC machines. S. Chand Publishing.
2. Kothari, D. P., & Nagrath, I. J. (2018). Electric machines (5th ed.). McGraw Hill Education.

References:

1. Pillai, S. K. (2023). A first course on electrical drives (4th ed.). New Age International.
2. Janardanan, E. G. (2014). Special electrical machines (1st ed.). PHI Learning.
3. Dubey, G. K. (2002). Fundamentals of electrical drives (2nd ed.). Narosa Publishing House.
4. Chapman, S. J. (2020). Electric machinery fundamentals (5th ed.). McGraw-Hill Education.
5. Henneberger, G. (2002). Electrical machines I: Basics, design, function, operation. Shaker Verlag.

Online Resources (Weblinks)

- DC Machines, AC Machines, Selection of a Motor: https://archive.nptel.ac.in/courses/108/105/108105155/
- Special Machines:https://www.coursera.org/learn/motors-circuits-design

Assessment (Embedded course)

SA I and SA II Activity and Learning Tasks, 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. Boopathy Sivakumar Current Electromech Pvt Ltd, Erode.	Dr. P. Mangaiyarkarasi, EIE,GCT.		Dr.K. Akila, MCE , KCT
Recommended by BoS on	03/05/2024		
Academic Council Approval	No.	**Date**	26-06-2025

24MRT203	DIGITAL ELECTRONICS AND MICROCONTROLLER	L	T	P	J	C
		3	0	0	0	3
PC		SDG	8, 9, 12			

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

Course Objectives:

The purpose of taking this course is to:

1	Understand and apply fundamental concepts of number systems, Boolean algebra, and digital logic
2	Design and implement combinational logic circuits and sequential circuits
3	Explain the architecture, instruction set, and programming of the 8051 microcontrollers

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Apply the basics of digital systems and simplify logic circuits using K-Map technique.	Ap
CO2	Design various combinational circuits and analyze their functionality.	An
CO3	Evaluate synchronous sequential circuits including flip-flops, shift registers, and counters.	E
CO4	Apply programmable devices for implementing combinational logic circuits.	Ap
CO5	Examine the architecture of the 8051 microcontroller to develop basic assembly language programs.	An

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

Course Content

DIGITAL FUNDAMENTALS Review of Number Systems: Binary, Octal, Hexadecimal, BCD, Gray code, Excess 3 code -Binary arithmetic: 1's complement, 2's complement, and Code conversions - Boolean algebra: Basic Postulates and theorems, Canonical forms, Logic gates-Simplification using K- maps and Implementation using logic gates.	**9 Hours**
COMBINATIONAL CIRCUITS Problem formulation and design of combinational circuits: adder, subtractor, Parallel adder / Subtractor, Carry look ahead adder, Magnitude Comparator, Code converters, Encoder, Decoder, Multiplexer, Demultiplexer. Function realization using decoders and multiplexers.	**9 Hours**
SYNCHRONOUS SEQUENTIAL CIRCUITS General model of sequential circuits: Latch, Flip Flops, Level triggering, Edge triggering, Master slave configuration - Realization of one flip flop using other flip flop- Shift Registers-Counters: Binary counters, Modulo–n counter, Decade, Counter, Ring counter and Johnson counter.	**9 Hours**
PROGRAMMABLE LOGIC DEVICES Introduction to Programmability Logic Devices: PROM – PLA –PAL-CPLD-FPGA, Implementation of combinational logic circuits using PROM, PLA. **Case Study:** Application of AI in Digital Logic Design.	**6 Hours**
INTRODUCTION TO MICROCONTROLLER Overview of microprocessors, comparison of microprocessors and microcontrollers - 8051 Microcontroller: Architecture, Memory organization, Timers and counters, Interrupts, Addressing modes, Instruction Set, Programming in assembly language.	**12 Hours**
Theory Hours: 45 **Tutorial Hours: 0** **Practical Hours: 0** **Project Hours: 0** **Total Hours:** 45	

Learning Resources

Textbooks:

1. Mano, M. M., & Ciletti, M. D. (2018). Digital design: With an introduction to the Verilog HDL (6th ed.). Pearson Education.
2. Ayala, K. J., & Gadre, D. V. (2009). The 8051 microcontroller & embedded systems using assembly and C (3rd ed.). Cengage Learning India.

References:

1. Floyd, T. L. (2025). Digital fundamentals (11th ed., Global ed.). Pearson Education.
2. Kumar, A. A. (2016). Fundamentals of digital circuits (4th ed.). PHI Learning Pvt. Ltd.
3. Leach, D. P., Malvino, A. P., & Saha, G. (2011). Digital principles and applications (7th ed., Special Indian ed.). Tata McGraw-Hill Education.
4. Salivahanan, S., & Arivazhagan, S. (2018). Digital circuits and design (5th ed.). Oxford University Press.
5. Mazidi, M. A., Mazidi, J. G., & McKinlay, R. D. (2005). The 8051 microcontroller and embedded systems: Using assembly and C (2nd ed.). Pearson Education.

Online Resources (Weblinks)

- Digital Fundamentals:https://onlinecourses.swayam2.ac.in/cec22_cs09/preview
- Combinational Circuits, Synchromous Sequential Circuits, Programmable Logic Devices: https://www.coursera.org/learn/digital-systems

Assessment (Theory course)

SA 1 SA 2, 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. Arun Balaji YOI Robotics, Coimbatore	Dr.R. Venkateswari, ECE, PSG Tech		Dr.K.Akila/MCE/KCT
Recommended by BoS on	03/ 05/ 2025		
Academic Council Approval	No.	**Date**	26-06-2025

24MRT204	MECHANICS OF SOLIDS	L	T	P	J	C
		2	1	0	0	3
PC		SDG	9,12			

Pre-requisite courses	24MET104	Data Book / Code book (If any)	NIL

Course Objectives:

The purpose of taking this course is to:

1	Explore the behaviour of engineering materials under different loading conditions, including axial loads.
2	Investigate the effects of thermal and principal stresses in structural elements.
3	Compare different beam configurations to understand the influence of geometry on shear force and bending moment distributions.
4	Examine buckling phenomena in columns using theoretical and empirical methods.
5	Estimate shaft dimensions to assess their load and torque transmitting performances under torsion.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Apply fundamental concepts of stress, strain, and material deformation to solve problems related to axial loading conditions.	Ap
CO2	Analyze principal stresses and thermal stresses.in materials to determine failure conditions under thermal and bi-axial loading scenarios.	An
CO3	Evaluate shear force and bending moment diagrams to assess bending and shear stresses in beams of different configurations.	E
CO4	Interpret buckling characteristics of columns to assess structural stability using analytical methods.	An
CO5	Design shafts using torsional analysis to ensure safe mechanical performance in engineering applications.	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
1	3	3	2	1	2		1		1		1	3	2
2	3	3	2	1	1				1	1	1	3	3
3	3	3	2	1	1				1		1	3	2
4	3	3	2	1	1	1			1		1	3	2

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

Course Content

ELASTIC RESPONSE OF MATERIALS Introduction to elastic response of materials– stresses (tensile, compressive, shear & bending) & strength – strain and deformation, stress-strain curve for steel. Stresses and deformation of simple and compound bars under axial loads - Elastic constants and their relations (problems only) - Ethical Aspects of Structural Design	**9 Hours**
BI-AXIAL STRESSES AND THERMAL STRESSES Principal stresses – Introduction, significance, calculation of principal stresses - Mohr's circle method to find principal stresses. Thermal stresses in bimetallic strips and circular bars.	**9 Hours**
STRESSES AND BENDING MOMENTS IN BEAMS Types of beams, supports and loads – Cantilever, simply supported and Overhanging beams - Shear force and bending moment diagrams. Stresses in beams – theory of simple bending's applicability for different sections, Bending stress distribution and flexural strength.	**9 Hours**
BUCKLING OF COLUMNS Columns: End conditions, equivalent length – Euler's equation and its limitations – slenderness ratio – Rankine's formula for columns	**9 Hours**
TORSION OF CIRCULAR SECTIONS Analysis of torsion of circular bars – shear stress distribution – twist and torsional stiffness – Bars of solid and hollow circular sections. Artificial Intelligence-Based Estimation of Mechanical Properties in Composite Materials	**9 Hours**

Theory Hours:	**30**	**Tutorial Hours:**	**15**	**Practical Hours:**	**-**	**Project Hours:**	**-**	**Total Hours:**	**45**

Learning Resources

Textbooks:

1. Beer, F. P., Johnston, E. R. Jr., & DeWolf, J. T. (2020).Mechanics of materials (8th ed.). McGraw-Hill Education.
2. Rajput, R. K. (2015).Strength of materials (6th ed.). S. Chand Publishers.

References:

1. Subramanian, R. (2024). Strength of materials (3rd ed.). Oxford University Press.
2. Hibbeler, R. C. (2022). Mechanics of materials (11th ed.). Pearson Education.
3. Bansal, R. K. (2024). A textbook of strength of materials (7th ed.). Laxmi Publications.
4. Jindal, U. C. (2007). A textbook on strength of materials (1st ed.). Asian Books Pvt. Ltd.

Online Resources (Weblinks)

1. Critical buckling load for columns : https://bit.ly/3YOIKCR
2. Principal Stresses, Principal Planes, and Shear Stress using Mohr's Circle: https://bit.ly/3YVu9gW
3. Angle of twist : https://bit.ly/3Sazmze
4. Shear Force and Bending Moment Diagram : https://bit.ly/3WOmNJo

Assessment (Theory course)

SA I and SA II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE)

Course Curated by

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

Mr. K.Chandrasekhar Director, Oxytech Corporation	Dr.M.Yuvaraja Dept. of Mechanical Engg PSG Tech, Coimbatore		Mr. R. Raffik, MCE, KCT
Recommended by BoS on	03/ 05/ 2025		
Academic Council Approval	No.	**Date**	26.6.25

24MRT205	Fluid Mechanics and Thermal Science	L	T	P	J	C
		3	1	0	0	4
ES		SDG	7, 9, 12, 13			

Pre-requisite courses	-	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 for understanding pressure measurement and fluid behaviour at rest.
2	Develop the ability to describe and analyze different types of fluid flow using principles of fluid kinematics and dynamics, including Bernoulli's equation and its applications.
3	Explain the mechanisms of fluid flow through pipes, including the causes of energy losses, and to apply relevant equations for analyzing flow in piping systems.
4	Summarize the basic thermodynamic concepts and apply the first law of thermodynamics to analyze energy transformations in various systems.
5	Understand the second law of thermodynamics and evaluate the performance of thermal systems like heat engines and refrigerators using ideal cycles.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the fundamental properties of fluids and laws of fluid statics to demonstrate pressure measurements and distinguish fluid behaviour in static conditions.	Ap
CO 2	Analyze the principles of fluid kinematics and dynamics to interpret flow behaviour and examine the application of Bernoulli's equation in engineering devices.	An
CO 3	Analyze the principles of internal flow through pipes to interpret energy losses and flow behaviour in series and parallel pipe systems.	An
CO 4	Apply the first law of thermodynamics and related properties to solve energy interaction problems in closed and open systems.	Ap
CO 5	Apply the second law of thermodynamics and Carnot cycle principles to demonstrate the performance of heat engines, refrigerators, and heat pumps.	Ap

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

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

Course Content

FLUID PROPERTIES AND FLUID STATICS Fluid-definition, distinction between solid and fluid-Units and dimensions–Properties of fluids density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapor pressure, capillary and surface tension. Fluid statics: Pascal law - Hydrostatic law - Pressure measurements using Manometers and pressure gauges.	**12 Hours**
FLUID KINEMATICS AND FLUID DYNAMICS Fluid Kinematics – Types of flow - velocity and acceleration - continuity equation. Fluid dynamics - equations of motion - Euler's equation along streamline - Bernoulli's equation – Applications – Venturi meter, Orifice meter, Pitot tube.	**12 Hours**
FLUID FLOW THROUGH PIPES Hagen Poiseuille Equation - Darcy Weisbach equation - Friction factor – Major and minor energy losses - Flow through pipes in series and in parallel. Case Studies: Hydraulic Circuit Design in Industrial Automation, Fire Fighting System Design for High-Rise Buildings, Irrigation System Efficiency in Agricultural Engineering	**12 Hours**
BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS Thermodynamic system, properties, process, cycle - Zeroth law and temperature measurement – internal energy, enthalpy, specific heat capacities. First law of thermodynamics – application to closed and open systems – Steady Flow Energy Equation – Simple problems.	**12 Hours**
SECOND LAW OF THERMODYANAMICS Second Law of thermodynamics – Kelvin Planck and Clausius Statements – Equivalents of Kelvin Planck and Clausius statements. Reversibility – Irreversibility, reversible cycle – Heat Engine, heat pump and refrigerator. Carnot cycle – Simple problems.	**12 Hours**

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

Learning Resources

Textbooks:

1. Cengel, Y. A., & Cimbala, J. M. (2024). Fluid mechanics: Fundamentals and applications (2024 release ed.). McGraw-Hill Education.
2. Nag, P. K. (2020). Engineering thermodynamics (6th ed.). McGraw-Hill Education.

References:

1. White, F. M., & Xue, H. (2022). Fluid mechanics (9th ed.). McGraw-Hill Education.
2. Modi, P. N., & Seth, S. M. (2019). Hydraulics and fluid mechanics including hydraulics machines (22nd ed.). Standard Book House.
3. Bansal, R. K. (2014). Fluid mechanics and hydraulic machines (11th ed.). Laxmi Publications.
4. Çengel, Y. A., & Boles, M. A. (2023). Thermodynamics: An engineering approach (9th ed.). McGraw-Hill Education.

Online Resources (Weblinks)

1. Fluid statics and dynamics: https://onlinecourses.nptel.ac.in/noc25_ce107/preview
2. First and Second law of thermodynamics: https://nptel.ac.in/courses/101104063

Assessment (Theory course)

SA I and SA II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr. K.MohanSenthil kumar Aqua Flow,Managing Partner, Coimbatore	Dr. R.Surendran ,Dept. of Mechanical Engg, GCT	Mr. T. Suresh, MCE, KCT

Recommended by BoS on	03/ 05/ 2025		
Academic Council Approval	No.	**Date**	26.6.25

24INP201	INNOVATION PRACTICUM - 3	L	T	P	J	C
		0	0	2	0	1
ES		SDG				

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

Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyse the various stages of innovation and their interdependencies	
CO 2	Create innovative solutions that address specific customer needs	
CO 3	Evaluate the potential impact and risks of different innovation concepts and present them clearly and persuasively.	

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														
2														
3														

Course Content

IDEA WORTH PROTOTYPING Discuss potential risks and challenges associated with innovative ideas, Learn to refine and validate the initial concept, Develop a plan outlining key milestones and timelines for advancing from idea to prototype.	**06 Hours**
FRAMING THE CHALLENGE Define the specific problem or opportunity that the innovation aims to address, understand customer needs and preferences, Identify the gaps in the market and potential obstacles to adoption, assess the potential market size, competition, and feasibility.	**04 Hours**
CRAFTING HIGH-VALUE SOLUTIONS	**06 Hours**

Generate Minimum Usable Prototype (MUP) concepts that address the identified challenge that provide high value, evaluate the potential of each solution concept based on criteria like feasibility, viability, and desirability	
OPTIMIZATION AND PLANNING PRACTICAL COMPONENT: Create Bill of Quantities (BOQ) and Bill of Materials (BOM) to estimate costs and resources, Develop a comprehensive innovation proposal outlining the innovation concept, goals, and benefits, Implement Lean principles to improve efficiency and reduce waste in the innovation process, Reflect on the activities to identify areas for improvement and learning.	**06 Hours**
PROJECT PRESENTATION Develop and deliver a compelling presentation of your minimum usable prototype (MUP) and innovation solution to effectively communicate its value and impact to a broader audience. Create a visually engaging presentation that clearly outlines the problem, the proposed solution, and the value of your minimum usable prototype. Utilise tools such as slides, infographics, and videos to enhance the visual appeal. Craft a compelling story around your innovation. Highlight the journey from problem identification to solution development, emphasising key insights and milestones.	**04 Hours**

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

Learning Resources

Textbooks:

References:

1.
2. https://formlabs.com/blog/ultimate-guide-to-prototyping-tools-for-hardware-and-product-desi gn/
3. https://docs.kicad-pcb.org/
4. https://www.tinkercad.com/learn/circuits
5. https://docs.github.com/en/free-pro- team@latest/actions/guides
6. Everything you need about value proposition:
7. https://blog.forgeforward.in/everything-you-need-to-know-about-value-proposition-7247493c9 40c
8. Test your Value Proposition:
9. http://businessmodelalchemist.com/2012/09/test-your-value-proposition-supercharge-lean-s tartup-and-custdev-principles.html
10. Valuation Risk versus Validation Risk in Product Innovations: https://blog.forgeforward.in/valuation-risk-versus-validation-risk-in-product-innovations-49f25 3ca8624
11. User Guide for Product Innovation Rubric:
12. https://blog.forgeforward.in/user-guide-for-product-innovation-rubric-857181b253dd
13. Innovation Risk Diagnostic — Product Innovation Rubric: https://blog.forgeforward.in/product-innovation-rubric-adf5ebdfd356
14. Evaluating Product Innovations — proof, potential, & progress:https://blog.forgeforward.in/evaluating-product-innovations-e8178e58b86e
15. Online Resources (Weblinks)

Assessment (Practical course)

Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
		Dr.B.L.Lakshmi Meera VP & CPO, Forge.Innovation & Ventures	
Recommended by BoS on	03/ 05/ 2025		
Academic Council Approval	No.	**Date**	26.6.25

24MRP207	Electronics Devices and Digital Electronics Laboratory	L	T	P	J	C
		0	0	2	0	1
PC		SDG	9 ,12			
Pre-requisite courses	-	Data Book / Code book (If any)	-			

Course Objectives:

The purpose of taking this course is to:

1	Develop hands-on skills in analyzing and designing basic electronic circuits.
2	Provide practical exposure to digital circuit design and logic implementation.
3	Introduce basic microcontroller programming and interfacing techniques.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Demonstrate the input-output characteristics and behaviour of electronic devices (BJT, JFET, rectifiers, and oscillators) through hands-on circuit design using breadboards and circuit simulation tools.	Ap
CO 2	Design and implement basic combinational and sequential digital circuits including adders, multiplexers, flip-flops, counters, and shift registers, and validate them through hardware realization.	Ap
CO 3	Develop simple assembly language programs for 8051 microprocessor and interface hardware components like stepper motors for control 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	3	2	3	2	3	1	2	1	2	2	1	2	3	
2	3	3	3	2	3	1	2	1	2	2	1	2	3	

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

Course Content

Practical Component: **30 Hours**

1. Design of clipper and clamper circuit.
2. Construction of half-wave and full-wave rectifiers with and without filters.
3. Design of a voltage regulator circuit using a Zener diode.
4. Experimental Investigation of BJT and JFET Characteristics.
5. Implementation of an astable multivibrator using an operational amplifier
6. Design and implementation of adder and subtractor circuits.
7. Design and implementation of code converter circuits.
8. Implementation of multiplexer and demultiplexer circuits.
9. Design and implementation of Synchronous Counter.
10. Basic Assembly Language Programming (ALP) programming using 8051
11. Motor control using the 8051 microcontroller.

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

Learning Resources

References:

1. Hayes, T. C., & Horowitz, P. (2025). Learning the art of electronics: A hands on lab course (2nd ed.). Cambridge University Press.
2. Tokheim, G. (2023). Digital electronics: Principles and applications (9th ed.). McGraw Hill.
3. Ahmed, S. N., & Spreadbury, D. (2024). Analogue and digital electronics for engineers (2nd ed.). Cambridge University Press.
4. Bolt Industries. (2025). PCB reference circuit books: DC fundamentals; LEDs, transistors & oscillators [Interactive PCB page manuals]. Bolt Industries.
5. Hafiz, F., Emon, M. J. H., Hossain, M. A., Mukta, M. S. H., & Islam, S. et al. (2025). Design of a microprocessors and microcontrollers laboratory course addressing complex engineering problems and activities. arXiv.

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.Arun Balaji YOI Robotics Coimbatore	Dr.R. Venkateswari, ECE, PSG Tech	Dr.B.Sabitha,MCE/KCT

SEMESTER IV

24HSP006	**Mastering Group Discussion and**	**L**	**T**	**P**	**J**	**C**
		0	**0**	**2**	**0**	**1**

Practical	Presentation Skills	SDG	8

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

Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes:

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

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

Course Content

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

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

Learning Resources*

Reference books/ Web Links

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

Online Resources

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

Assessment

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

Course Curated By

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

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

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

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

Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes

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

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

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

Course Content

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

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

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

Learning Resources

References:

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

Online Resources (Weblinks)

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

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

Assessment (Embedded course)

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

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

Course Objectives:

The purpose of taking 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	Critically analyse the performance of different numerical methods in terms of accuracy, stability, and computational efficiency for solving PDEs in practical engineering applications.
4	Apply probability theory to model and solve real-world problems involving uncertainty, risk analysis, and decision-making in engineering, business, and science.
5	Study and apply standard probability distributions, with emphasis on the Poisson and Normal distributions, including their properties, applications, andparameter interpretation.

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)
Dr. Muthuraja Perumal General Manager - Research & Development Rohith Industries, APIIC Industrial Park, Andhra Pradesh	Dr. Mathivanan Packiarajan University of Michigan Ann Arbor, MI USA Dr. Venkatakrishnan Professor, School of Chemical Sciences Indian Institute of Technology (Mandi) Himachal Pradesh India	Faculty Of Chemistry Department of Chemistry

Recommended by BoS on			
Academic Council Approval	No.	Date	

Course Outcomes

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

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

Course Content

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

Linear interpolation method-Newton's method –Solution of linear system in engineering field by Gaussian elimination, Gauss Jordan method - Iterative method: Gauss Seidel method – Inverse of a matrix by Gauss Jordan method.

Practical Component — **6 Hours**

- Gauss Elimination & Inverse by Gauss Jordan method
- Newton Raphson method.

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

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

Learning Resources

Textbooks

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

Reference books

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

Online Resources (Web Links)

1. Numerical Analysis: https://nptel.ac.in/courses/111106101
2. Probability and Statistics: https//nptel.ac.in/courses/111105041

Assessment

Formative	Summative

Assignments-Open Book Test/Quiz/Case Study Analysis/Group Presentation/Poster Preparation/Mathematical Models, .,	MCQ, SA- I,SA – II and End Semester Examination (ESE)

Course Curated by

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

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

24MRI208	SENSORS AND INSTRUMENTATION	L	T	P	J	C
		2	0	2	0	3
PC		SDG		9		

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

Course Objectives:

The purpose of taking this course is to:

1	Impart foundational knowledge on measurement systems, performance characteristics, and error analysis
2	Introduce various transducers and sensor technologies for non-electrical and biomedical signal measurement
3	Develop the ability to apply signal conditioning techniques and digital data acquisition systems

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Classify the transducers and instruments based on their working principles, characteristics and order of the system.	U
CO2	Describe the working principle and characteristics of non-electrical transducers (Displacement, Velocity, Temperature, Radiation Pyrometer, Humidity measurement)	Ap
CO3	Discuss brief about the Non-electrical transducers of another measurements (Force, strain gauge, Vacuum, Light ,Acoustics and Nuclear radiation measurement)	Ap
CO4	Discuss about the construction, working principles and characteristics of bio medical sensors.	An
CO5	Brief the signal conditioning parameters used in measurement system.	Ap
CO6	Illustrate the importance of data acquisition system	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	
CO1	3		2					1	2		2	2		
CO2	3	2	2		2			1	2	2	2	2	2	
CO3	3		2	2	2			1	2	2	2	2	2	
CO4	3		2	2	2			1	2	2	2	2	2	

CO5	2	2	2		2		3	1	2		2			
CO6	3		2		2	2	3	2	2		2	3		

Course Content

MEASUREMENT SYSTEMS Generalized Measurement System – Performance Characteristics: Static and Dynamic Characteristics – Errors in Measurements – statistical Analysis of errors - Calibration and Standards – Generalized Performance of Zero Order, First Order and Second Order Systems – Classifications of Transducers.	9 Hours
MEASUREMENT OF NON-ELECTRICAL PARAMETERS-1 Linear and angular displacement: Resistive, capacitive, inductive types and Optics (encoders), proximity sensors. **Velocity measurement:** tachometers, tacho generators and resolvers Temperature measurement: Contact type: Bimetallic, RTD, Thermocouple and Thermistor **Non- Contact type:** Radiation Pyrometer – Optical Pyrometer Humidity: Capacitive and resistive and hot and wet bulbs. Other sensors: Fire, smoke and metal detectors. **Practical Component:** • Temperature measurement using Thermocouple, Thermistor and RTD and comparing the characteristics interface with Embedded Board. • Displacement measurement using potentiometer and LVDT and plotting the characteristic curves and interface with Embedded Board • Speed measurement using proximity, magnetic& Stroboscope sensor	9 Hours 10 Hours
MEASUREMENT OF NON-ELECTRICAL PARAMETERS-2 **Force measurement:** Resistive type strain gauges: Bridge configurations, Temperature compensation, Load cells, Fiber optic strain gauge- Semiconductor strain gauges- Piezo electric transducers. **Vacuum Measurement:** McLeod Gauge, Thermal Conductivity Gauge – Ionization Gauge. **Airflow:** Anemometers **Light:** UV, IR, Light emitter and detector **Introduction to Acoustics and acoustic sensors:** Ultrasonic sensor- Types and working of Microphones and Hydrophones – Sound level meters- nuclear radiation sensors. **Practical Component:** • Comparative Study of Incremental and Absolute Encoders (Linear & Rotary) for Position and Speed Measurement • Measurement of air flow velocity using hot wire anemometer • Measurement of strain using resistive type strain gauges and force measurement using loadcell	9 Hours 10 Hours
MEASUREMENT OF BIO SIGNALS Basic transducer principal Types – source of bioelectric potentials - electrode – electrolyte interface, electrode potential, resting and action potential – electrodes for their measurement, ECG, EEG. AI/ML algorithms to: Detect anomalies or faults.	9 Hours
SIGNAL CONDITIONING AND DATA ACQUISITION Amplification, Filtering – Level conversion – Linearization - Buffering – Sample and Hold circuit – Quantization –Multiplexer / Demultiplexer – Analog to Digital converter – Digital to Analog converter- I/P and P/I converter - Instrumentation Amplifier-V/F and F/V converter- Data Acquisition -Data Logging– Data conversion – Introduction to Digital Transmission system. **Practical Component:**	9 Hours

• Design and testing of Voltage to frequency converter and frequency to voltage converter. • Design and testing of sample and hold circuit. • Measurement of temperature, strain, , acceleration using NI DAQ cards.	10 Hours

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

Learning Resources

Textbooks:

1. Morris, A. S., & Langari, R. (2020). Measurement and instrumentation: Theory and application (3rd ed.). Academic Press.
2. Sawhney, A. K., & Sawhney, P. (2017). A course in mechanical measurements and instrumentation & control (12th ed.). Dhanpat Rai & Co.
3. Fraden, J. (2016). Handbook of modern sensors: Physics, designs, and applications (2nd ed.). Springer.

References:

1. Alciatore, D. G., & Histand, M. B. (2018). Introduction to mechatronics and measurement systems (5th ed.). McGraw-Hill Education.
2. Murty, D. V. S (2012). Transducers and instrumentation (2nd ed.). PHI Learning Pvt. Ltd.
3. Webster, J. G. (Ed.). (2014). Measurement, instrumentation and sensors handbook (2nd ed.). CRC Press.
4. Doebelin, E. O., & Manik, D. N. (2011). Measurement systems: Application and design (6th ed.). McGraw-Hill.
5. Bentley, J. P. (2005). Principles of measurement systems (4th ed.). Pearson Education.
6. Patranabis, D. (2003). Sensors and transducers (2nd ed.). PHI Learning Pvt. Ltd.

Online Resources (Weblinks)

- Characteristics and Measurement of non electrical parameter: https://onlinecourses.nptel.ac.in/noc23_ee105/preview
- Sensor and calibration techniques: https://onlinecourses.nptel.ac.in/noc21_ee32/

Assessment (Embedded course)

SA 1and SA 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)
Ilamparithi Tamizhanangu Director at Fibonacci Series Pvt Ltd, Coimbatore	Dr. P. Karthikeyan Department of production Engineering, MIT, Chennai	Dr. B. Sabitha MCE, KCT

Recommended by BoS on	3.5.25		
Academic Council Approval	No.		**26.6.25**

24MRI209	INDUSTRIAL ELECTRONICS AND DRIVES	L	T	P	J	C
		2	0	2	0	3
PC		SDG	7,9,13			

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

Course Objectives:

The purpose of taking this course is to:

1	Understand the characteristics and operation of power semiconductor devices such as SCR, MOSFET, and IGBT used in power electronic circuits.
2	Analyze and design various power electronic converters, including AC to DC converters, inverters, and DC-DC converters, for different types of loads and applications.
3	Apply PWM techniques and practical implementations for motor control and power conditioning applications through hands-on simulation and hardware experiments.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Describe the working principles, characteristics, and switching behavior of SCRs, MOSFETs, and IGBTs used in power electronic circuits.	U
CO 2	Apply the concepts of single-phase and three-phase AC to DC converters with resistive and inductive loads.	Ap
CO 3	Design the operation of single-phase and three-phase voltage source inverters and their application in motor control.	Ap
CO 4	Apply PWM techniques for inverter control and analyze output voltage waveforms based on duty cycle variation.	Ap
CO 5	Examine the working of DC-DC converters including buck, boost, and buck-boost converters and their application in renewable energy systems.	An
CO 6	Demonstrate the practical implementation of gate drivers, snubber circuits, and converters through lab experiments and simulations.	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	
CO1	3				2			2	3		1	1	3	
CO2	3	2		2	3			2	3		1	1	3	
CO3	3	2	3	2	3			2	3		1	1	3	

CO4	3	2	3		3			2	3		1	2	3	
CO5	3	2	3		3	2	2	2	3		1	2	3	
CO6	3	2	3	2	3			2	3	2	2	2	3	

Course Content

POWER SEMICONDUCTOR DEVICES Thyristors – Volt-Ampere Characteristics – Switching Characteristics-Power MOSFET – Volt- Ampere Characteristics–witching Characteristics-PowerI GBT–Volt-Ampere Characteristics-– Switching Characteristics **Practical Component:** • VI Characteristics of SCR, MOSFET, and IGBT • Design and Testing of Gate Driver and Snubber Circuit	**9 Hours** **6 Hours**
AC to DC CONVERTERS Diode Rectifiers – Single phase Bridge – R, RL – Thyristor Converter – Single phase bridge – RL – Three phase fully controlled converter -R-RL Load. **Practical Component:** • Single-Phase Fully Controlled Converter with R and RL Load • Three-Phase Fully Controlled Converter	**9 Hours** **6 Hours**
INVERTERS Single-phase VSI – Half-bridge – Centre tapped inverter – Full bridge inverter -Three-phase VSI – Square-wave–Control of induction motor by voltage source inverter. **Practical Component:** • Speed control of PMDC motor using three phase fully controlled converter • DC Voltage control using DC – DC Converter	**9 Hours** **6 Hours**
PWM TECHNIQUES PWM Inverter – fundamental concepts of PWM – naturally sampled PWM - PWM analysis by duty cycle variation **Practical Component:** • Single-Phase Voltage Source Inverter with PWM Control • Three-Phase Inverter for UPS Application	**9 Hours** **6 Hours**
DC- DC CONVERTER DC Chopper - Step Down Converter – Step Up Converter -Buck Boost Converter – Introduction - Fly Back converter-speed control of PMDC motor. **Practical Component:** • MOSFET based step-down and step up converter • Simulation of DC-DC Converter for PV System	**9 Hours** **6 Hours**
Theory Hours: 45 **Tutorial Hours: 0** **Practical Hours: 30** **Project Hours: 0** **Total Hours: 75**	

Learning Resources

Textbooks:

1. Bimbhra, P. S. (2022). Power electronics (7th ed.). Khanna Publishers.
2. Rashid, M. H. (Ed.). (2023). Power electronics handbook (5th ed.). Butterworth Heinemann.

References:

1. Fitzgerald, A. E., Kingsley, C., & Umans, S. D. (2021). *Electric machinery* (8th ed.). McGraw-Hill Education.
2. Chapman, S. J. (2020). *Electric machinery fundamentals* (5th ed.). McGraw-Hill Education.
3. Holmes, D. G., & Lipo, T. A. (2003). *Pulse width modulation for power converters: Principles and practice*. John Wiley & Sons.
4. Bose, B. K. (2001). *Modern power electronics and AC drives* (1st intl. ed.). Prentice Hall PTR.

Online Resources (Weblinks)

1. Power Switches, Converter,Inverter: https://archive.nptel.ac.in/courses/108/102/108102145/
2. DC – DC Converter : https://nptel.ac.in/courses/108101038

Assessment (Embedded course)

SA 1 and SA 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.E.Kumaran,MD Raisan Automation ,Coimbatore	Dr. Swaroop Ramaswamy Pillai, Dept of EEE, Amity University, Dubai	Dr.B.Sabitha,AP III/MCE, KCT
Recommended by BoS on	03/ 05/ 2025	
Academic Council Approval	No.	**Date** 26.6.2025

24MRT210	Theory of Machines	L	T	P	J	C
		2	1	0	0	3
PC		SDG	09,12,13			

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

Course Objectives:

The purpose of taking this course is to:

1	To impart foundational knowledge of mechanism elements and develop the ability to analyze velocity and acceleration in four-bar and slider-crank mechanisms.
2	To enable understanding of gear systems and friction drives, and to cultivate the skill of evaluating and comparing various gear trains for mechanical applications.
3	To provide theoretical grounding in rigid body dynamics and build competency in performing static and dynamic force analysis in reciprocating machinery.
4	To develop design skills for balancing rotating and reciprocating masses in single and multiple planes, aiming to minimize mechanical vibrations.
5	To study and apply techniques for vibration analysis, isolation, and control in damped and undamped systems to improve the performance and reliability of mechanical structures.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the basic elements of mechanisms to analyze velocity and acceleration in four-bar and slider crank mechanisms.	AP
CO 2	Analyze the fundamentals of gear and friction drives to compare different gear trains and their applications.	An
CO 3	Evaluate the principles of rigid body dynamics to predict static and dynamic force analysis in reciprocating engines.	E
CO 4	Design solutions for balancing single and multiple masses in different planes to balance the systems.	AP
CO 5	Develop methods to control vibrations in undamped and damped systems for enhanced mechanical performance.	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	3	2	2		2			2	1		2	3	2	
2	3	3	3	1	1		2				2	2	2	
3	3	2	2	1	1							3		

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

ourse Content

ANALYSIS OF MECHANISMS Basic Elements of Mechanisms – Introduction to kinematic links, pairs, chain, machine and structure, degrees of freedom. Grashoff's law, Kutzback criterion. Kinematic inversions of four-bar and slider crank chain. Velocity and acceleration analysis for Four bar chain and single slider crank mechanism.	**10 Hours**
GEAR AND FRICTION DRIVES Gear and Friction drives - Fundamentals of toothed gearing, spur gear terminology. Involute gear tooth profile. Gear meshing, contact ratio. Gear trains, simple compound gear trains and epicyclic gear train, Belt drives – classification, Power.	**08 Hours**
FORCE ANALYSIS Rigid Body dynamics in general plane motion – Equations of motion.- Static force analysis –D'Alemberts principle –The principle of superposition – Inertia force and Inertia torque – Introduction to Dynamic Analysis in Reciprocating Engines.	**09 Hours**
BALANCING Introduction, static and dynamic. Balancing of single mass rotating in single plane. Balancing of several masses rotating in single plane. Balancing of several masses rotating in different planes.	**10 Hours**
VIBRATION Types of vibration, frequency of undamped and damped system. Response to periodic forcing – Harmonic Forcing - Forcing caused by unbalance-Support motion - Force transmissibility. Predictive Maintenance of Machine Elements using AI	**08 Hours**

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

Learning Resources

Textbooks:

1. Rattan, S. S. (2019). Theory of machines (5th ed.). Tata McGraw-Hill Education.
2. Malik, M. N. (2018). Theory of machines (2nd ed.). Pearson Education.

References:

1. Uicker, J. J., Pennock, G. R., & Shigley, J. E. (2023). Theory of machines and mechanisms (6th ed.). Cambridge University Press.
2. Norton, R. L. (2020). Design of machinery: An introduction to the synthesis and analysis of mechanisms and machines (6th ed.). McGraw-Hill Education.
3. Hannah, J., & Stephens, R. C. (2005). Mechanics of machines (4th ed.). Viva Books.
4. Wilson, C. E., & Sadler, J. P. (2003). Kinematics and dynamics of machinery (3rd ed.). Pearson Education.

Online Resources (Weblinks)

- Theory of machines: online materials: Kinematics of Mechanisms: https://nptel.ac.in/courses/112105268
- Dynamics: http://www.digimat.in/nptel/courses/video/112104114/L01.html

Assessment (Theory course)

SA I and SA II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution		Internal Expert(s)
Mr. KamamalaKannan, Team Lead Capegemini	Dr. R. Vishnu, Department of Mechanical Engineering CIT,Coimbatore		Mr.P.Murugesan, MCE/KCT J.Sivaguru/MCE/KCT
Recommended by BoS on	03/ 05/ 2025		
Academic Council Approval	No.	**Date**	26.6.2025

24MRI211	Fluid Power Systems	L	T	P	J	C
		2	0	2	0	3
PC		SDG	7,8,9			

Pre-requisite courses	24MRT206	Data Book / Code book (If any)	Nil

Course Objectives:

The purpose of taking this course is to:

1	Recognize the different types of fluid power systems, including hydraulic and pneumatic systems, and their applications across industries.
2	Study the different control methods used in fluid power systems, including manual, electrical, and electronic control.
3	Apply best practices for fluid power system maintenance, including preventive maintenance techniques and fault diagnosis.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the concept of fluid power to real-world scenarios by identifying its use in various industries.	Ap
CO 2	Assess the performance of a hydraulic system by evaluating the efficiency and operation of different pumps and actuators.	E
CO 3	Analyze the differences between the various hydraulic control valves and determine the most suitable valve for specific applications.	An
CO 4	Evaluate the integration of pneumatic actuators in various industrial applications and determine their suitability based on system requirements.	E
CO 5	Analyze fluid logic circuits and diagnose the common failure modes in fluid power systems.	An
CO 6	Design a simple fluid power system, considering the type of fluid, system components, and symbols for a specific application.	C

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

6	3	2	2		3	3	3	3	2		2	3	3	

Course Content	
FUNDAMENTALS OF FLUID POWER Introduction to fluid power, Advantages of fluid power, Application of fluid power system. Types of fluid power systems, Properties of hydraulic fluids – General types of fluids. Fluid power symbols.	**6 Hours**
HYDRAULIC PUMPS AND ACTUATORS Pumping theory – Pump classification – Gear pump, Vane Pump, piston pump, construction and working of pumps – pump performance – Variable displacement pumps. Linear hydraulic actuators – Types of hydraulic cylinders–Single acting, Double acting special cylinders like tandem, Rodless, Telescopic - Construction and application. Cushioning mechanism, Rotary actuators - Gear, Vane and Piston motors - Selection of Pumps and actuators. **Practical Component:** • Design of Hydraulic circuit to control the speed and direction of a hydraulic motor.	**10 Hours** **1 Hour**
HYDRAULIC VALVES, ACCUMULATORS AND CIRCUITS Directional control valve – 3/2-way valve – 4/2, 4/3 way valve – Shuttle valve – check valve. Pressure control valves, Flow control valve – Fixed and adjustable, electrical control solenoid valves. Types of accumulators, Accumulators circuits, Intensifier – Circuit and Application, Speed control circuits, synchronizing circuit and industrial application circuits – copying circuit and press circuit. **Practical Component:** • Design of Hydraulic circuit for sequential operation of two hydraulic cylinders using pressure sequence valve. • Study of the working of Counterbalance valve, Accumulator, Proportional control valve.	**10 Hours** **2 Hours**
PNEUMATIC SYSTEMS, COMPONENTS AND CIRCUITS Properties of air – Compressors – Filter, Regulator, and Lubricator Unit – Air control valves, Quick exhaust valves and pneumatic actuators. Pneumo hydraulic circuit, Sequential circuit design for simple applications using cascade method, Karnaugh – Veitch Mapping method. Practical Component: • Design of simple pneumatic circuit to control the direction and speed of single acting/double acting cylinder using push button DCV/lever operated DCV and flow control valve. • Design of Pneumatic circuit using shuttle valve (OR function) and dual pressure valve (AND function). • Design of Pneumatic circuit for automatic reciprocation of single pneumatic cylinder using pilot operated DCV and roller operated DCV. • Design of Pneumatic circuit for synchronization of multiple pneumatic cylinders. • Design of Pneumatic circuit for sequential operation of multiple pneumatic cylinders. • Design of Pneumatic circuit for sequential operation of multiple pneumatic cylinders using Cascade method.	**10 Hours** **7 Hours**
FLUID LOGIC CONTROL SYSTEMS AND MAINTENANCE Hydro Mechanical servo systems, Electro-hydraulic and Electro-pneumatic systems and proportional valves. Fluidic Logic and switching controls - PLC applications in	**9 Hours**

fluid power control, Maintenance - Failure and trouble shooting in fluid power systems. Practical Component: • Design of Electropneumatic circuit (Relay control) for automatic reciprocation of single pneumatic cylinder using solenoid operated DCV and magnetic sensors. • Design of Electropneumatic circuit (Relay control) for synchronization of multiple pneumatic cylinders. • Design of Electropneumatic circuit (Relay control) for sequential operation of multiple pneumatic cylinders. • Design of Electropneumatic circuit for sequential operation of multiple cylinders using PLC.	**5 Hours**

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

Learning Resources

Textbooks:

1. Hansen, A. H. (2023). *Fluid power systems: A lecture note in modelling, analysis and control*. Springer Cham
2. Klette, P. J. (2022). Fluid power systems (3rd ed.). American Technical Publishers.
3. Esposito, A. (2009). Fluid power with applications (7th ed.). Pearson Education.

References:

- Srinivasan, R. (2019). *Hydraulic and pneumatic controls* (3rd ed.). Vijay Nicole Imprints.

Online Resources (Weblinks)

- Fundamentals of Fluid Power: https://www.coursera.org/learn/fluid-power
- Hydraulic Pumps and Actuators: https://onlinecourses.nptel.ac.in/noc24_me69/preview

Assessment (Embedded course)

- 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)
G.Vengat, Senior Technical Engineer Janatics Gobal Solutions Pvt.Ltd, Coimbatore	Dr.T.Muthuramalingam Dept.of Mechatronics Engg SRM,Chennai	Mr.T.Suresh,MCE/KCT

Recommended by BoS on	03/ 05/ 2025		
Academic Council Approval	No.	**Date**	26.6.25

24MRP212	PYTHON FOR EDGE DEVICES	L	T	P	J	C
		0	0	2	0	1
PC		SDG	7, 9, 12			

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

Course Objectives:

The purpose of taking this course is to:

1	To introduce Python programming fundamentals with a focus on edge computing using edge devices.
2	To explore Object-Oriented Programming (OOP) concepts including classes, objects, inheritance, and polymorphism.
3	To develop skills in optimizing Python scripts for resource-constrained edge devices.
4	To enable students to interface sensors and acquire data effectively using Python and edge devices.
5	To provide insights into real-time data processing techniques suitable for edge computing environments.
6	To equip students to design and deploy IoT-based Python applications on edge devices.

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 Python programming and its application in edge computing with edge devices.	U
CO 2	Develop Python scripts optimized for edge devices.	Ap
CO 3	Implement sensor interfacing and data acquisition using Python and edge devices.	Ap
CO 4	Analyze real-time data processing methods suitable for edge computing environments.	An
CO 5	Design and deploy IoT-based applications utilizing Python on edge devices.	C
CO 6	Apply Object-Oriented Programming (OOP) principles including classes, objects, inheritance, and polymorphism in Python projects for edge computing.	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	3	2	1					1	1		2	2	2
2	3	2	2	1	3			1	2	1	2	3	3

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

Course Content

INTRODUCTION TO PYTHON AND EDGE DEVICES: **Practical Component:** • Installing Python and setting up edge devices • Writing and executing basic Python scripts on edge devices • Experiment 1: LED/blinker control using GPIO and Python. • Experiment 2: User input/output (reading button state, printing to console).	**03 Hours**
OBJECT-ORIENTED PROGRAMMING (OOP) CONCEPTS: **Practical Component:** • Creating classes and objects in Python • Implementing inheritance and polymorphism in Python scripts on edge devices • **Experiment 3:** Define a class for LED/device control (methods for on/off/blink). • **Experiment 4:** Use OOP to structure code for multiple actuators or devices. •	**03 Hours**
SENSOR INTERFACING WITH EDGE DEVICES: **Practical Component:** • Interfacing sensors with edge devices GPIO pins • Data acquisition and logging using Python on edge devices • **Experiment 5:** Interface a temperature sensor and display readings. • **Experiment 6:** Log sensor data to a file (CSV/txt) on the edge device. •	**03 Hours**
REAL-TIME DATA PROCESSING ON EDGE DEVICES: **Practical Component:** • Real-time data collection, processing, and visualization on edge devices • Implementing data preprocessing and filtering techniques on edge devices • **Experiment 7:** Read logged sensor data, compute average/min/max. • **Experiment 8:** Plot sensor data using matplotlib/plotly (if display available), or send summary to console.	**03 Hours**
IOT APPLICATION DEPLOYMENT ON EDGE DEVICES: **Practical Component:** • Introduction to MQTT/HTTP protocols in Python. • Sending sensor data to the cloud/server. • **Experiment 9:** Publish live sensor readings to a test MQTT broker/cloud dashboard. • **Experiment 10:** Trigger an alert (e.g., LED or buzzer) when threshold is crossed and log event. •	**03 Hours**

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

Learning Resources

References:

1. Matthes, E. (2019). Python crash course: A hands-on, project-based introduction to programming (2nd ed.). No Starch Press.
2. Tollervey, N. H. (2017). Programming with MicroPython: Embedded programming with microcontrollers and Python. O'Reilly Media.
3. Norris, D. (2016). Python for microcontrollers: Getting started with MicroPython. McGraw-Hill Education.
4. Waher, P. (2020). IoT and edge computing for architects (2nd ed.). Packt Publishing.

5. Lee, K., & Man, K. L. (Eds.). (2022). Edge computing for Internet of Things. MDPI Books. https://doi.org/10.3390/books978-3-0365-4275-1

Online Resources (Weblinks)

Introduction to Python and Edge Devices ,Object- oriented Programming (OOP)Concepts, Sensor Interfacing with edge devices, Real Time Data Processing on Edge Devices ,IOT Application Deployment on Edge Devices: https://onlinecourses.nptel.ac.in/noc22_cs53/preview

Assessment

Project

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Arun Balaji, CEO, YOI Robotics Laboratory	Prakash J , Department of computer science and engineering, PSG college of Technology, Coimbatore 9500378146	Dr. A.Ramkumar,MCE,KCT

Recommended by BoS on	03/ 05/ 2025		
Academic Council Approval	No.	**Date**	26.6.25

24INP202	INNOVATION PRACTICUM - 4	L	T	P	J	C
		0	0	2	0	1
ES		SDG				

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

Course Objectives:

The purpose of taking this course is to:

1	Learn and apply the Forge Innovation Handbook (FIH) to problem-solving.
2	Develop a minimum usable prototype (MUP) through iterative design, development, and testing.
3	Effectively demonstrate the developed MUP.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Proficiency in using the FIH to identify and solve problems.	
CO 2	Experience in designing, building, and demonstrating a MUP.	
CO 3	Improved ability to communicate and present project outcomes effectively.	

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

Course Content

Innovation Fundamentals

Master Class 1: Explore the core concepts of product design and development.
Master Class 2: Introduction to the Forge Innovation Handbook (FIH) and its applications.
Workshop 1: Utilize the FIH Canvas to identify challenges, validate problems, understand user needs, and define pain points, gains, and value propositions.

Advanced Prototyping Techniques

Master Class 3: Rapid Prototyping Techniques - 1.
Master Class 4: Rapid Prototyping Techniques - 2.
Hack Time 1: Engage in hands-on experimentation to test core assumptions, refine the Proof of Concept (PoC). Incorporate rapid prototyping techniques and iterate on the design to enhance functionality.

Intellectual Property and Proof of Concept

Master Class 5: Gain insights into intellectual property (IP) and prior art search.

Hack Time 2: Develop and refine a working prototype. Build a Minimum Usable Prototype (MUP) based on feedback and iteration.	
Build the Minimum Usable Prototype (MUP) Hack Time 3: Enhance the prototype through iterative improvements. Utilise feedback from mentoring sessions to make targeted adjustments and refinements, optimising the prototype's functionality and design based on practical insights. Hack Time 4: Develop the Minimum Usable Prototype (MUP). Build the final version of the MUP incorporating all iterative refinements. Ensure that it meets the defined criteria and is ready for comprehensive testing and presentation.	
Perfect Pitch and Product Showcase Hack Time 5: Conduct a final demonstration and technical testing of the prototype. Create a compelling pitch to articulate the value proposition and potential impact of the innovation, aimed at securing support or funding. Pitch Presentation and MUP Demonstration: Students showcase their completed prototype through a comprehensive demonstration, highlighting its key features and functionalities to Industry experts, incubators and investors. They deliver a compelling pitch that clearly communicates the innovation's impact, market potential, and benefits. This presentation aims to effectively convey the value of the prototype, engage potential stakeholders, and secure support or funding opportunities.	

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

Learning Resources

Textbooks:

1. Rapid Prototyping And Engineering Applications: A Toolbox For Prototype Development - Frank W.Liou, 2007
2. Rapid Prototyping Technology: Selection And Application - COOPER K. G, 2001

References:

1. Jazz Factory - All about Presentations and http://blog.jazzfactory.in/
2. Pretotyping Methodology - https://www.pretotyping.org/methodology.html
3. How to give a killer presentation - https://hbr.org/2013/06/how-to-give-a-killer-presentation
4. Evaluating Product Innovations — proof, potential, & progress:https://blog.forgeforward.in/evaluating-product-innovations-e8178e58b86e

Online Resources (Weblinks)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
		Dr.B.L.Lakshmi Meera VP & CPO, Forge.Innovation & Ventures

24INM102	**Indian knowledge Systems in Science and Engineering (Common to All branches)**	**L**	**T**	**P**	**J**	**C**
		1	0	0	0	1
HS		SDG	5,16			

Pre-requisite courses	24INM001 Introduction to Indian Knowledge systems(IKS)	**Data Book / Codes / Standards (If any)**	

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

Course Outcomes	**After successful completion of this course, the students shall be able to**	**Bloom's Taxonomy Level (BTL)**
CO 1	Understanding Indigenous Knowledge Systems (IKS) in Science and Technology	U
CO 2	Apply Traditional Design Principles in Civil Engineering	Ap
CO 3	Explore of Ancient Aerospace Technologies for Aeronautical Engineering	E
CO 4	Know the sustainable traditional textile practices for ecofriendly atmosphere	R
CO 5	Gain knowledge of Ancient Medical Practices for Biotechnologists	U

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

Course Content

IKS in Basic Sciences Study of ancient Indian concepts such as atomism (paramāṇu)- the five elements	**3**

(Panchabhūta)- Exploration of alchemical practices, metallurgy-development of zero, decimal systems, algebra, and trigonometry - works by scholars such as Brahmagupta and Aryabhata- detailing planetary motions and timekeeping systems.	
IKS in Civil Engineering Evolution from rock-cut caves to grand temples like Madurai Meenakshi and Brihadeeswarar.- Vastu Shastra- The Concept of "Mandala- Courtyard Design- Sacred Geometry- Panchabhuta- Chhatri- dome-shaped canopy- Prana Vayu- Shilpa Shastra- Sthapatya Veda- Kaalchakra- Brahmasthan.	**3**
IKS in Mechanical Engineering Exploration of ancient metallurgical techniques-including ore extraction-alloying, furnace design-Vimana (Flying Machines) - Shakti (Energy Source) -Aerospace materials- Vimana Shapes -Ancient Navigation- Vedic Astronomy- Flight Principles in Nature- Matrika Systems- Indian shipbuilding techniques and navigation methods.	**3**
IKS in Textile technology Introduction to Ancient Indian Textiles- Cultural and Historical Context -Traditional Dyeing Techniques-Weaving Techniques and Patterns-Khadi- -Natural Fibers and Materials- Cotton,Silk,Wool and Jute-Sustainable Practices and Eco-Friendly Technologies-Organic Cotton Farming-Recycling and Repurposing.	**3**
IKS in medicine Ayurveda- Siddha Medicine- Rasa Shastra- Herbal Medicine- Nadi Pariksha-Chikitsa- Yoga and Pranayama- Surgical Techniques -Charaka Samhita - Sushruta Samhita— Panchagavya usage-Medicinal Plants and Herbal Remedies-Agricultural Practices and Crop Diversity-Sacred and Ritual Plants.	**3**
Theory Hours: 15 **Tutorial Hours:** **Practical Hours:** **Project Hours:** **Total Hours: 15**	

Learning Resources*

Textbooks

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

Reference books/ Web Links

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

Online Resources

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

Assessment

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

	-

Course Curated By

Expert(s) from Industry	Expert(s) from Higher Education Institutions	Internal Expert(s)	
	Dr K Sangeetha, Professor and Head-Textile Department, IKS-Nodal officer, Bharathiar University, Coimbatore-46.	1 Dr.R. Prakasam, Assistant Professor, Department of Physics. Capt-A.R.Arul, Assistant Professor, Department of Physics	
Recommended by BoS on	25-04-2025		
Academic Council Approval		**Date**	26-06-2025