KUMARAGURU COLLEGE OF TECHNOLOGY

An Autonomous Institution Affiliated to Anna University, Chennai

COIMBATORE – 641 049

B.E. ELECTRONICS & INSTRUMENTATION ENGINEERING

REGULATIONS 2024

I - & V SEMESTER Syllabus

2024 Batch onwards

Department of

Electronics & Instrumentation Engineering

BOS Chair

VISION

The Department of Electronics & Instrumentation Engineering (E&I) envisions a holistic education that transforms the learners into responsible engineers, enabling them to identify significant problems in industry and society to arrive at creative and sustainable solutions through collaborative team efforts.

MISSION

The Department of Electronics & Instrumentation Engineering (E&I) aims to

- Implement a modern pedagogical approach in academics, innovative research initiatives, and collaborative projects that ethically address societal needs.
- Develop knowledge and skills required to excel in manufacturing, automation and allied industries on a global platform.
- Expand the knowledge for higher studies and get inspired for lifelong learning.

PROGRAMME EDUCATIONAL OBJECTIVES

After a few years of graduation, Graduates of B.E. (Electronics & Instrumentation Engineering) will

PEO 1: Excel in a technical and professional career with core competence in automation.

PEO 2: Possess the passion for professional development by continuous learning in allied Engineering and Management fields.

PEO 3: Engage in resolving industrial and social issues using contemporary tools.

PEO 4: Exhibit professionalism and ethical attitude towards resolving automation issues to society at large.

PROGRAMME SPECIFIC OUTCOMES

Graduates of B.E. (Electronics & Instrumentation Engineering) will be able to:

PSO 1: Develop, analyse and calibrate Instruments and electronic systems for various real-world applications, adhering to ISA ethical codes.

PSO 2 : Integrate programmable logic controllers (PLC), distributed control systems (DCS) for manufacturing and processing systems and gain proficiency in relevant software tools.



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PROGRAMME OUTCOMES

Graduates of B.E. (Electronics & Instrumentation Engineering) will be able 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)



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KNOWLEDGE AND ATTITUDE PROFILE (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.



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KUMARAGURU COLLEGE OF TECHNOLOGY
DEPARTMENT OF ELECTRONICS & INSTRUMENTATION ENGINEERING
REGULATION 2024
B.E. Electronics & Instrumentation Engineering – Curriculum

SEMESTER - I

S. No.	Course Code	Course Title	Course Mode	Course Category	L	T	P	J	C
1	24HST101	Heritage of Tamil	Theory	HS	1	0	0	0	1
2	24MAI113	Linear Algebra and Multivariate Calculus	Embedded	BS	3	0	2	0	4
3	24CYI101	Electronic Materials Chemistry	Embedded	BS	3	0	2	0	4
4	24MEI103	Computer-Aided Engineering Graphics	Embedded	ES	2	0	2	0	3
5	24MET105	Basics of Engineering Mechanics	Theory	ES	3	0	0	0	3
6	24ADP001	Basics of Artificial Intelligence	Practical	ES	0	0	2	0	1
7	24INP102	Innovation Practicum - 1	Practical	ES	0	0	2	0	1
8	24HSP111	Holistic Wellness - 1	Practical	HS	0	0	2	0	1
9	24INP101	Design Thinking	Practical	ES	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		**28**

SEMESTER - II

S. No.	Course Code	Course Title	Course Mode	Course Category	L	T	P	J	C
1	24HST102	Tamils and Technology	Theory	HS	1	0	0	0	1
2	24HST103/ 24HST104	Effective Communication / Professional Communication	Theory	HS	2	0	0	0	2
3	24MAI123	Computational Differential Equations	Embedded	BS	3	0	2	0	4
4	24PHI102	Applied Physics for Circuit Engineering	Embedded	BS	3	0	2	0	4
5	24CSI101	Logical Thinking and Problem Solving	Embedded	ES	3	0	2	0	4
6	24BTT001	Biology for Engineers	Theory	BS	1	0	0	0	1
7	24EII101	Semiconductor Devices and Applications	Embedded	PC	3	0	2	0	4
8	24INP103	Innovative Practicum - 2	Practical	ES	0	0	2	0	1
9	24HSP112	Holistic Wellness - 2	Practical	HS	0	0	2	0	1
10	24INO1---	FCLF General Stack - 2	Practical	OE	0	0	2	0	1
							Total Credits		**23**
							Total Contact Hours/Week		**30**

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SEMESTER - III									
S. No.	**Course Code**	**Course Title**	**Course Mode**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1	24HSP005	Mastering Conversations	Theory	HS	0	0	2	0	1
2	24MAI233	Probability and Applied Statistics	Embedded	BS	3	0	2	0	4
3	24MET205	Thermodynamics & Fluid Mechanics	Theory	ES	3	0	0	0	3
4	24EII201	Electronic Circuit Design	Embedded	PC	3	0	2	0	4
5	24EII202	Sensors and Transducers	Embedded	PC	3	0	2	0	4
6	24EII203	Electrical Machines and Measurement Systems	Embedded	ES	2	0	2	0	3
7	24INP201	Innovation Practicum -3	Practical	ES	0	0	2	0	1
8	24INO---	FCLF – General Stack - 3	Practical	OE	0	0	2	0	1
9	24INM201	Universal Human Values – II Understanding Harmony	Theory	HS	1	0	0	0	1
10	24EIJ204	Internship- I	Project	PRJ	0	0	0	0	1
Total Credits									**23**
Total Contact Hours/Week									**27**

SEMESTER - IV									
S. No.	**Course Code**	**Course Title**	**Course Mode**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1	24HSP006	Mastering Group Discussion and Presentation Skills	Theory	HS	0	0	2	0	1
2	24ECI203	Linear Integrated Circuits	Embedded	PC	3	0	2	0	4
3	24EEI203	Digital System Design	Embedded	PC	3	0	2	0	4
4	24EII204	Signal Processing Techniques	Embedded	PC	3	0	2	0	4
5	24EII205	Control panel Design and Relay logic System	Embedded	PC	2	0	2	0	3
6	24INO---	FCLF – Tech. Stack - 1	Practical	OE	0	0	2	0	1
7	24INO---	FCLF – Emerging Tech Stack - 1	Practical	OE	0	0	2	0	1
8	24INP202	Innovation Practicum - 4	Practical	ES	0	0	2	0	1
9	24INM202	Environmental Science & Sustainability	Theory	BS	1	0	2	0	2
10	24INM102	Indian Knowledge System	Theory	HS	1	0	0	0	1
Total Credits									**22**
Total Contact Hours/Week									**31**

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SEMESTER - V									
S. No.	**Course Code**	**Course Title**	**Course Mode**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1	24HSP007	Building Professional Readiness	Theory	HS	0	0	2	0	1
2	24EII301	Field Instrumentation	Embedded	PC	3	0	2	0	4
3	24EII302	Embedded Systems Design and Development	Embedded	PC	2	0	2	2	4
4	24EII303	Control Engineering	Embedded	PC	3	0	2	0	4
5	24EII304	Data Structures & Algorithms for Intelligent Systems	Embedded	PC	2	0	2	0	3
6	24INO---	FCLF – Tech. Stack - 2	Practical	OE	0	0	2	0	1
7	24INO---	FCLF – Emerging Tech Stack - 2	Practical	OE	0	0	2	0	1
8	24EIE---	Professional Elective - 1	Theory	PE	3	0	0	0	3
9	24EIJ305	Internships/Mini Projects - 2	Project	PRJ	0	0	0	4	2
Total Credits									**23**
Total Contact Hours/Week									**32**

SEMESTER - VI									
S. No.	**Course Code**	**Course Title**	**Course Mode**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1	24EII306	Industrial Automation	Embedded	PC	3	0	2	0	4
2	24EII307	VLSI Design	Embedded	PC	2	0	2	0	3
3	24EII308	Process Dynamics and Control	Embedded	PC	3	0	2	0	4
4	24EIT310	Industrial Communication & Networking	Theory	HS	3	0	0	0	3
5	24EIE---	Professional Elective - 2	Theory	PC	3	0	0	0	3
6	24EIE---	Professional Elective - 3	Theory	PC	3	0	0	0	3
7	24INO---	FCLF – Tech Stack - 3	Practical	OE	0	0	2	0	1
8	24INO---	FCLF – Emerging Tech Stack - 3	Practical	OE	0	0	2	0	1
9	24HS----	Indian Constitution	Theory	HS	2	0	0	0	0
10	24HS----	Indian/Foreign Languages	Theory	HS	2	0	0	0	2
Total Credits									**24**
Total Contact Hours/Week									**29**

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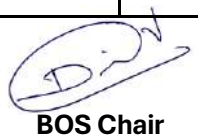
SEMESTER - VII									
S. No.	**Course Code**	**Course Title**	**Course Mode**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1	24EII401	Advanced Control Systems	Embedded	PC	3	0	2	0	4
2	24HS----	Project Management and Finance	Theory	HS	3	0	0	0	3
3	24EIE---	Professional Elective - 4	Theory	PE	3	0	0	0	3
4	24EIE---	Professional Elective - 5	Theory	PE	3	0	0	0	3
5	24EIE---	Professional Elective - 6	Theory	PE	3	0	0	0	3
6	24EIJ401	Capstone Project Phase -1/ Industrial Internship	Project	PJ	0	0	0	6	3
Total Credits									**19**
Total Contact Hours/Week									**23**

SEMESTER - VIII									
S. No.	**Course Code**	**Course Title**	**Course Mode**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1	24EIJ402	Capstone Project Phase -2/ Industrial Internship	Project	PJ	0	0	0	24	12
Total Credits									**12**
Total Contact Hours/Week									**24**

Semester	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
Credits/Semester	20	23	22	22	23	24	19	12
Total Credits								**165**

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PROFESSIONAL ELECTIVE									
ROBOTICS AND AUTOMATION									
S. No.	**Course Code**	**Course Title**	**Course Mode**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1	24EIE001	Basics of Robotics and Mechanisms	Theory	PE	3	0	0	0	3
2	24EIE002	Powertronics	Theory	PE	3	0	0	0	3
3	24EIE003	Fluid Power Systems	Theory	PE	3	0	0	0	3
4	24EIE004	Robotics and Flexible Automation	Theory	PE	3	0	0	0	3
5	24EIE005	Machine Vision and Image Processing for Robotics	Theory	PE	3	0	0	0	3
6	24EIE006	Mobile Robotics	Theory	PE	3	0	0	0	3
7	24EIE007	Autonomous Systems and Path Planning	Theory	PE	3	0	0	0	3
8	24EIE008	Collaborative Robots (Cobots)	Theory	PE	3	0	0	0	3
INDUSTRIAL AUTOMATION									
S. No.	**Course Code**	**Course Title**	**Course Mode**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1	24EIE011	Human–Machine Interface Design	Theory	PE	3	0	0	0	3
2	24EIE012	Industrial Safety and Hazardous Systems	Theory	PE	3	0	0	0	3
3	24EIE013	Distributed Control Systems and SCADA	Theory	PE	3	0	0	0	3
4	24EIE014	Building Automation	Theory	PE	3	0	0	0	3
5	24EIE015	Digital Manufacturing Technologies	Theory	PE	3	0	0	0	3
6	24EIE016	Hybrid and Electric Vehicle Technology	Theory	PE	3	0	0	0	3
7	24EIE017	Industry 5.0	Theory	PE	3	0	0	0	3
8	24EIE018	Smart Farming and Precision Agriculture	Theory	PE	3	0	0	0	3



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HEALTH CARE INSTRUMENTATION									
S. No.	**Course Code**	**Course Title**	**Course Mode**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1	24EIE021	Bio Sensors and Medical Instrumentation	Theory	PE	3	0	0	0	3
2	24EIE022	Bio Signal Processing	Theory	PE	3	0	0	0	3
3	24EIE023	Clinical Support and Laboratory Equipment	Theory	PE	3	0	0	0	3
4	24EIE024	Medical Device Calibration	Theory	PE	3	0	0	0	3
5	24EIE025	Bio-MEMS and Lab-on-Chip Systems	Theory	PE	3	0	0	0	3
6	24EIE026	Smart Biomedical Imaging Analytics	Theory	PE	3	0	0	0	3
7	24EIE027	AI in Health care	Theory	PE	3	0	0	0	3
8	24EIE028	Smart Healthcare Systems and Telemedicine	Theory	PE	3	0	0	0	3
9	24EIE029	Robotics for Surgery and Rehabilitation	Theory	PE	3	0	0	0	3
ADVANCED CONTROL AND INDUSTRIAL INSTRUMENTATION									
S. No.	**Course Code**	**Course Title**	**Course Mode**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1	24EIE031	Analytical Instrumentation	Theory	PE	3	0	0	0	3
2	24EIE032	Fibre Optics Instrumentation	Theory	PE	3	0	0	0	3
3	24EIE033	System Identification, Modelling and Simulation	Theory	PE	3	0	0	0	3
4	24EIE034	Adaptive Control	Theory	PE	3	0	0	0	3
5	24EIE035	Optimal and Robust Control	Theory	PE	3	0	0	0	3
6	24EIE036	Advanced Intelligent Controllers	Theory	PE	3	0	0	0	3
7	24EIE037	Fault Detection and Diagnosis	Theory	PE	3	0	0	0	3
8	24EIE038	Machine Monitoring Systems	Theory	PE	3	0	0	0	3
9	24EIE039	Aircraft Instrumentation	Theory	PE	3	0	0	0	3
10	24EIE040	Automotive Instrumentation	Theory	PE	3	0	0	0	3
ELECTRONICS AND EMBEDDED SYSTEMS									
S. No.	**Course Code**	**Course Title**	**Course Mode**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1	24EIE041	Powertronics	Theory	PE	3	0	0	0	3
2	24EIE042	MEMS and Sensor Design	Theory	PE	3	0	0	0	3
3	24EIE043	Real Time Operating Systems	Theory	PE	2	0	2	0	3
4	24EIE044	Industrial Electronic Drives	Theory	PE	3	0	0	0	3

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5	24EIE045	Wireless Sensor Measurement Systems	Theory	PE	3	0	0	0	3
6	24EIE046	Flexible and Wearable Electronics	Theory	PE	3	0	0	0	3
7	24EIE047	Sensors and Data Fusion	Theory	PE	3	0	0	0	3
8	24EIE048	Electronic Product Design and Development	Theory	PE	3	0	0	0	3

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FIRST SEMESTER



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

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

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

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
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

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	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 Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3	
1							3	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

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நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள். **FOLK AND MARTIAL ARTS** Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Ciabatta, Valari, Tiger dance - Sports and Games of Tami	3 Hours
தமிழர்களின் திணைக்கோட்பாடுகள் தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பொடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறைமுகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் தமிழர்களின் வெற்றி. **THINAI CONCEPTS OF TAMIL** Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.	3 Hours
இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு. **CONTRIBUTIONS OF TAMIL TO INDIAN NATIONAL MOMENT AND INDIAN CULTURE** Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.	3 Hours

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

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7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies). 8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.) 9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Textbook and Educational Services Corporation, Tamil Nadu) 10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author) 11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu) 12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)
Online Educational Resources:
1. https://www.youtube.com/watch?v=IKPwEmsmuZc&list=PLMMrJE4pHZmc0iJZIE6lBpFoPK_9Y325e 2. https://www.youtube.com/watch?v=j6_ddjn_gLc&list=PLMMrJE4pHZmc0iJZIE6lBpFoPK_9Y325e&index=2 3. https://docs.google.com/presentation/d/1pf0jbyuDTNdvlcKMnOfoPjbqha7JqdOc/edit#slide=id.p1 4. https://www.youtube.com/watch?v=IKPwEmsmuZc&list=PLMMrJE4pHZmc0iJZIE6lBpFoPK_9Y325e&index=1

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

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



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24MAI113	LINEAR ALGEBRA AND MULTIVARIATE CALCULUS (Common to EC, EE, EI)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	7, 9			

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

Course Objectives:	
The purpose of taking this course is to:	
1	provide a solid foundation in linear algebra, focusing on eigenvalues, eigenvectors, matrix transformations, and quadratic forms for practical applications.
2	develop skills in multivariate calculus for solving optimization problems and computing derivatives, integrals, and volumes using double and triple integrals.
3	teach key concepts in vector calculus, including operations like gradient, divergence, curl, and the application of Green's, Gauss's, and Stokes' theorems.
4	introduce fundamental principles of complex analysis, covering analytic functions, Cauchy's theorems, and residue calculus for evaluating integrals through contour integration.
5	equip students with MATLAB proficiency to perform matrix operations, solve optimization problems, compute integrals and verify complex mathematical theorems.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO1	apply the concepts of eigenvalues, eigenvectors, and the Cayley-Hamilton theorem to diagonalize matrices and perform orthogonal transformations of symmetric matrices using matrix operations and eigenvalue computations.	Ap
CO2	apply orthogonal transformations to reduce quadratic forms to their canonical forms and solve related matrix problems, leveraging to compute transformations and quadratic forms.	Ap
CO3	analyze 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 applications.	An
CO4	apply double and triple integrals in Cartesian coordinates by computing and using them to determine areas and volumes in engineering applications, including changing the order of integration.	Ap
CO5	apply vector calculus operations like gradient, divergence, curl, and directional derivatives to verify Green's theorem, Gauss's divergence theorem, and Stokes' theorem used for computational verification.	Ap
CO6	apply Cauchy-Riemann equations, Cauchy's integral theorem, and Cauchy's integral formula to solve complex analysis problems and	Ap



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	evaluate integrals using the residue theorem for performing contour integration.	

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

Course Content:	
MATRICES Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley Hamilton theorem (excluding proof) - Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation. **Practical Component** Introduction to MATLAB - Matrix Operations - Addition, Multiplication, Transpose, Inverse and eigenvalues and eigenvectors of higher order matrices. Characteristic equation of a Matrix and Cayley-Hamilton Theorem.	9 Hours 6 Hours
FUNCTIONS OF SEVERAL VARIABLES 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** Determining Maxima and Minima of a function of one variable. Determining Maxima and Minima of a function of two variables	9 Hours 6 Hours
MULTIPLE INTEGRALS Double integration in Cartesian coordinates – Change of order of integration - Triple integration in Cartesian coordinates – Applications: Area as double integral and Volume as triple integral. **Practical Component** Double Integral and Area as double integral Triple Integral and Volume as triple integral	9 Hours 6 Hours

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VECTOR CALCULUS Gradient, divergence and curl – Directional derivative – Irrotational and Solenoidal vector fields - Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proofs) – Verification of theorem and simple applications. **Practical Component** Evaluating gradient, divergence and curl. Verifying Green's theorem in the plane	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). **Practical Component** Check analyticity using Cauchy-Riemann equations	4 Hours 3 Hours
COMPLEX INTEGRATION Cauchy's integral theorem – Cauchy's integral formula –Singularities –Residues – Residue theorem –Application of residue theorem for evaluation of real integrals – Contour Integration (excluding poles on the real axis). **Practical Component** Perform contour integration around a circular contour	5 Hours 3 Hours

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

Learning Resources

Textbooks

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 45thEdition, 2020.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2018.
3. Kreyszig 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. Kandasamy P., Thilagavathy K., and Gunavathy K., "Engineering Mathematics", S. Chand & Co., New Delhi, (Reprint) 2014.
3. Venkataraman M.K., "Engineering Mathematics", The National Publising Co., Chennai, 2003.
4. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.

Online Resources (Web Links)

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1. Linear Algebra by MIT Open Courseware (Free)
   https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/
2. Multivariable Calculus by MIT Open Courseware (Free)
   https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/
3. Khan Academy: Multivariable Calculus (Free)
   https://www.khanacademy.org/math/multivariable-calculus
4. Coursera: Introduction to MATLAB Programming by Vanderbilt University
   https://www.coursera.org/learn/matlab

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

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
Mr. Ramesh V.S., STEPS Knowledge Services Private Limited, Coimbatore. Mr.Jayakumar Venkatesan, Valles Marineris International Private Limited- Chennai. Mr. Imran Khan, GE Transportation Company, Bangalore.	Dr.T.Govindan, Government College of Engineering, Srirangam, Trichy. Dr.C.Porkodi, PSG College of Technology, Coimbatore. Dr.P.Paramanathan, Amrita Vishwa Vidyapeetham, Coimbatore.	Dr. K.Maheswari Dr. J.Rajasingh Dr. K.Meena, Department of Mathematics	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

BOS Chair

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		RBT Levels
CO1	apply electrochemical principles to solve challenges in advanced battery and hybrid 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

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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	PSO-3
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)	9 Hours 3 Hours

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Practical Component: • Determination of molecular weight of polymer using Viscometric method.	
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		Tutorial		Practical		Project		Total	
Hours:	45	Hours:	0	Hours:	30	Hours:	0	Hours:	75

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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, 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	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

BOS Chair

24MEI103	COMPUTER AIDED – ENGINEERING GRAPHICS (Common to EE, EC, EI, BT)	L	T	P	J	C
		2	0	2	0	3
ES		SDG	4, 9, 12			

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 engineering graphics and their significance.
2	develop proficiency in freehand sketching, usage of drawing instruments, and lettering.
3	gain competency in using computer graphics technologies for graphical communication, including isometric views and various coordinate systems (absolute, relative, polar)

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO1	apply the principles of engineering graphics to create accurate orthographic and isometric projections	Ap
CO2	design free-hand sketches of orthographic views from pictorial representations to improve spatial understanding and communication of engineering concepts	C
CO3	apply CAD software tools to create, edit, and annotate technical drawings and analyse them using ISO and ANSI standards	Ap
CO4	analyse the parametric and non-parametric CAD models, producing detailed two-dimensional documentation, including sectional views and annotations.	An
CO5	apply geometric and topological concepts to design 3D models for additive manufacturing.	Ap
CO6	apply the principles of engineering graphics to create accurate orthographic and isometric projections	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	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2	2		2							2			
2		1	2								1			
3	2	3	2	2							2			

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

Course Content	
INTRODUCTION TO ENGINEERING DRAWING Principles of Engineering Graphics and their significance, Freehand sketching, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute.	6 Hours(T) 6 Hours(P)
ORTHOGRAPHIC AND ISOMETRIC PROJECTIONS Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes; Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.	6 Hours(T) 6 Hours(P)
OVERVIEW OF COMPUTER GRAPHICS Listing the computer technologies that impact on graphical communication, Isometric Views of lines, Planes, Simple and compound Solids, Coordinates system - Absolute Coordinates, Relative Coordinates, Polar Coordinates.	6 Hours(T) 6 Hours(P)
CUSTOMIZATION & CAD DRAWING Setting up modules and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Isometric Projections and Solids.	6 Hours(T) 6 Hours(P)
ANNOTATIONS, LAYERING & OTHER FUNCTIONS Layers to create drawings, create, edit and use customized layers; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and projecting the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Part editing and two-dimensional documentation of models, Shape extractions (Freeform modelling). Planar projection theory includes sketching of perspective, isometric, Multiview, auxiliary, and section views. Spatial visualization exercises – Transformation, Rendering and Lighting. Geometry and topology of engineered components: Introduction to Additive manufacturing (AM); Exporting the 3D model.	4 Hours(T) 8 Hours(P)

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

Learning Resources
Textbooks
1. Dhawan, R. K. A Textbook of Engineering Drawing. S. Chand Publishing (2019).

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2. Bhatt N.D., Panchal V.M. & Ingle P.R., Engineering Drawing, Charotar Publishing House (2014). 3. Shah, M.B. & Rana B.C. Engineering Drawing and Computer Graphics, Pearson Education (2008).
Reference books
1. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication 2. Narayana, K.L. & P Kannaiah (2008), Textbook on Engineering Drawing, Scitech Publishers.
Online Resources (Weblinks)
1. https://www.youtube.com/watch?v=8UKg928M4C0 2. https://www.youtube.com/watch?v=JvsJf1huMXQ 3. https://www.youtube.com/watch?v=8lHEizPf-wY
Assessment (Embedded course)
SA, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
Mr. G. Vergin Vino Design Engineer TANCAM, Chennai	Dr. V. Prabhuraja Professor, Department of Mechanical Engineering PSG College of Technology, Coimbatore	Dr. Samuel Ratna Kumaar Assistant Professor – III Department of Mechanical Engineering	
Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

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24MET105	BASICS ENGINEERING MECHANICS	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 the principles of statics to analyse mechanical systems in instrumentation:
2	calculate geometry-dependent properties relevant to electrical and instrumentation systems
3	understand the role of friction in mechanical and electromechanical systems
4	analyse kinematic and kinetic behaviour of rigid bodies in instrumentation systems

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	analyse the principles of transmissibility and moments to determine equilibrium conditions in rigid bodies.	Ap
CO 2	evaluate the geometry-dependent properties like centre 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	analyse and solve problems related to the kinematics of rigid bodies in plane motion	U
CO 5	apply Newton's laws and principles of kinetics to solve problems involving the motion of rigid bodies.	U

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

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Course Content	
STATICS OF RIGID BODIES Equivalent systems of forces acting on a rigid body in 2D space: Principle of transmissibility – Moment of force about a point– Moment of a couple – Equivalent couple –Moment of force about an axis – Resultant and equilibrium of forces – 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– Radius of gyration – Polar moment of inertia – Product of inertia - Mass moment of Inertia of simple solids.	9 Hours
FRICTION Laws of friction – coefficient of friction – Dry friction – wedge friction – ladder friction – rolling resistance. Applications of friction	9 Hours
KINEMATICS OF RIGID BODIES Kinematics of rigid bodies: Plane motion, translation and rotation: General plane motion: Absolute velocity, relative velocity, absolute acceleration, relative acceleration	9 Hours
KINETICS OF RIGID BODIES Dynamics of rotating systems in instrumentation Equations of motion of a rigid body - angular momentum devices kinetic energy of a rigid body - Vibration analysis: Types of vibrations, natural frequency, and damping	9 Hours

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

Learning Resources

Textbooks

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

Reference books

1. Beer, Ferdinand P., E. Russell Johnston, David Mazurek, Phillip Cornwell, and Brian Self. Vector Mechanics for Engineers: Statics and Dynamics. 2024 ed. New Delhi: Tata McGraw-Hill, 2024. ISBN 9781260710892.
2. .James L. Meriam, L. G. Kraige, J. N. Bolton: Engineering Mechanics Statics , 9th edition, Wiley student edition, 2020.
3. James L. Meriam, L. G. Kraige, J. N. Bolton: Engineering Mechanics: Dynamics, 9th edition, Wiley student edition, 2020.
4. P. Boresi & J. Schmidt, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage

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learning, 2008.

5. Irving H. Shames, G. Krishna Mohana Rao, Engineering Mechanics - Statics and Dynamics, Fourth Edition – PHI / Pearson Education Asia Pvt. Ltd., 2006.
10. Rajasekaran S and Sankarasubramanian G, "Engineering Mechanics-Statics and Dynamics", Vikas Publishing House Pvt. Ltd., New Delhi, 2006

Online Resources (Web Links)

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

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

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Recommended by BoS on	17.08.2024		
Academic Council Approval	27	Date	24.08.2024

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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		RBT Levels
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	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2						2							
2	2		2											
3					2					2				

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Course Content	
Introduction to Artificial Intelligence (AI) **Practical Component** Introduction to Artificial Intelligence (AI) - Generative AI Overview and Use Cases - Impact and Examples of AI - Application Domains for AI - Generative AI Applications. AI Concepts, Terminology - Cognitive Computing (Perception, Learning, Reasoning) - Terminology and Related Concepts of AI- Machine Learning Techniques and Training - Deep Learning - Neural Networks - Natural Language Processing, Speech, Computer Vision - Self Driving Cars. AI: Issues, Concerns and Ethical Considerations - AI Ethics, Regulations, Governance, and ESG. The evolution and future of AI - The AI Ladder - The Journey for Adopting AI Successfully - Hotbeds of AI Innovation.	8 Hours
Generative AI: Introduction and Applications **Practical Component** Introduction and Capabilities of Generative AI - Applications of Generative AI - Tools for Text Generation - Tools for Image Generation - Tools for Audio and Video Generation - Tools for Code Generation	6 Hours
Generative AI: Prompt Engineering Basics **Practical Component** Introduction to Prompt and Prompt Engineering - Best Practices for Prompt Creation - Common Prompt Engineering Tools - Hands on Lab: Getting to Know Our AI Prompting - Experimenting with Prompts - Naive Prompting and Persona Pattern. Prompt Engineering Techniques and Approaches - Text-to-Text Prompt Techniques - Interview Pattern Approach - Chain-of-Thought Approach - Tree-of-Thought Approach - Future of Human-Crafted Prompts - Text-to-Image Prompt Techniques - Hands-on Lab: Effective Text Prompts for Image Generation.	7 Hours
Project and Wrap Up Practical Component Graded Quiz Final Project: Generating Text, Images, and Code.	9 Hours

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

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

Assessment (Practical course)			
MCQ, Mini project and viva-voce			
Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
-	-		Dr. S. Sangeetha, Associate Professor Department of AI&DS
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

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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		RBT Levels
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	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1						2		1						
2						2								
3						1					3			
4						2					3			

Course Content	
INTRODUCTION TO HOLISTIC WELLNESS: • Overview of holistic wellness: physical, mental, emotional, and internal health. • The importance of balance in overall well-being.	4 Hour

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• Hands-on activity: Self-assessment of current wellness status.	
PHYSICAL WELLNESS: • Importance of physical activity and exercise. • Understanding nutrition and its role in health. • Sleep hygiene and its impact on well-being. • Hands-on activity: Designing a personalized fitness and nutrition plan.	14 Hours
MENTAL AND EMOTIONAL WELLNESS: • Stress management techniques. • The role of Yoga, mindfulness and meditation in mental health. • Emotional intelligence and its impact on relationships. • Hands-on activity: Practicing Yoga, mindfulness and emotional regulation exercises.	6 Hours
INTERNAL WELLNESS: • Exploring the concept of Internal wellness. • The role of purpose and meaning in life. • Introduction to meditation and reflective practices. • Hands-on activity: Developing a personal reflection, Yoga and meditation routine.	4 Hours
INTEGRATING WELLNESS PRACTICES: • Combining physical, mental, emotional, and Internal wellness practices into daily life. • Developing a balanced wellness plan. • Hands-on activity: Creating a comprehensive personal wellness plan.	2 Hours

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

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5. Kalderdon Adizes Ichak., What Matters in Life: Lessons I Learned from Opening My Heart WS Press, Newtown, PA (2023)
Online Resources (Weblinks)
1. Learning Suryanamskar 2. Yoga for well-being 3. Nutritional Educational contents 4. Introduction to Psychology 5. Guided Meditation 6. Simplified physical exercises instructions 7. Simplified Physical Exercises 8. Life skills and value education 9. James Allen Library

Assessment (Practical course)
Participation, Practical activities and assignments, personal wellness plan and reflection.

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

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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		RBT Levels
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	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	1		2			2		2			1			
2	1							2			1			
3	1		2			2		1			1			

Course Content	
INTRODUCTION TO PROBLEM SOLVING AND GROUND RULES	

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Introduction to problem-solving strategies without mentioning Design Thinking-Emphasize problem-solving attitudes, mindsets, and behaviours necessary for iterative problem solving (e.g., openness to failure, patience, empathy)-Set ground rules for the course, including incentives for creative risk-taking and penalties for non-participation or lack of reflection-Overview of the Design Thinking process and its importance.	6 Hours
EMPATHY AND PROBLEM DEFINITION Techniques for understanding user needs, including observation, interviews, surveys and focus groups-Importance of secondary research as a complement for the above-mentioned methods-Introduction to empathy cycles: involve students in two empathy cycles before and after problem definition-Finetuning problem definition based on user insights.	6 Hours
IDEATION AND CONCEPT MODELLING Brainstorming ideas and selecting feasible solution-Creating concept modelling to visualize ideas-Include an empathy cycle after students propose solutions, allowing them to revisit and reshape their solutions based on further insights from users.	6 Hours
PROTOTYPING AND TESTING WITH MODELS Building basic prototypes using simple materials (e.g., cardboard, clay)-Introduction to different prototyping methods (e.g., low-fidelity vs high-fidelity models) for different contexts: product design, space design, policy, and digital/e-commerce solutions-Conduct an empathy cycle after the prototype is developed to gather user feedback and refine the prototype.	6 Hours
ITERATION AND FINAL MODELLING PROJECT Students refine their prototypes based on feedback from the empathy cycle-Finalize prototypes for presentation based on consistent feedback loops.	6 Hours
PRESENTATION, REFLECTION, AND LEARNING SUMMARIES Students present their final projects and reflect on their learning journeys, including how their understanding of problem-solving and empathy evolved during the course- Learning Summary Activity: Each student presents their individual journey and learning outcomes from the empathy cycles and iterations-Peer review and group discussions.	6 Hours

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

Learning Resources
Textbooks:

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

Online Resources (Weblinks)	
1.	Survey and focus group design guides
2.	Guidance on Designing, Administering and Analyzing Focus Groups and Interviews
3.	Empathy mapping tools
4.	How to Make a Concept Model
5.	Brainstorming Techniques: 15 Creative Activities
6.	10 Brainstorming Techniques for Developing New Ideas
7.	Brainstorming templates
8.	5 Common Low-Fidelity Prototypes and Their Best Practices
9.	UX Prototypes: Low Fidelity vs. High Fidelity
10.	Low-fidelity vs. High-fidelity Design Prototypes (and when to use which)
	Case study 1: Iterative Design and Prototype Testing of the NN/g Homepage
	Case study 2: Using iterative design to optimise the user flow of a product
11.	Reflective practice toolkit

Assessment
Formative: Assignments, Mini project

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**	
		Dr. Padhmanand Sudhagar R Department of Bio-Tech Dr. Arul H Department of Physics	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

BOS Chair

SECOND SEMESTER



BOS Chair

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		RBT Levels
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.	Ap

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	know agriculture and irrigation technology. Understanding Scientific Tamil and Computer Tamil.	

	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	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2		2				3	2	2		2			
2	2		2				3	2	2		2			
3	2		2				3	2	2		2			

Course Content	
நெசவு மற்றும் பானைத் தொழில்நுட்பம்: சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள். Weaving Industry during Sangam Age - Ceramic technology - Black and Red Ware Potteries (BRW)-Graffiti on Potteries.	3 Hours
வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் ரூ சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் -சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை. Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.	3 Hours
உற்பத்தித் தொழில் நுட்பம்: கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க	3 Hours

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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.	
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		Tutorial		Practical		Project		Total	
Hours:	15	Hours:	0	Hours:	0	Hours:	0	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).

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8. The Contributions of the Tarnils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Textbook and Educational Services Corporation> Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation> Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) - Reference Book.

Online Resources

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

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

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

BOS Chair

24HST103	EFFECTIVE COMMUNICATION	L	T	P	J	C
		2	0	0	0	2
HS		SDG	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		RBT Levels
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	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1							2	2	3		3			

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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



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

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



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24HST104	PROFESSIONAL COMMUNICATION (Common to all Departments)	L	T	P	J	C
		2	0	0	0	2
HS		SDG		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		RBT Levels
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	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1						2	1	3	1		3			
2						2	3	3	2		3			
3						1	1	3	1		3			

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Course Content	
MASTERING PROFESSIONAL COMMUNICATION Industry-specific terminology (Business / Technical Register) - Crafting professional emails - Essential elements of an effective email (subject line, salutation, body, closing) - reading and responding to email communication – Networking Emails - Analyzing and interpreting technical texts (Loud Reading).	6 Hours
NAVIGATING DIGITAL MEDIA Introduction to Digital media and online communication tools (instant messaging, video conferencing, social media, blogs, forums) - Listening and analyzing advanced audio materials - Creative & Blog Writing (General & Technical).	6 Hours
TECHNICAL WRITING TECHNIQUES Writing Reflective Essays / Experience Sharing, Process writing, Transcoding graphics (interpreting technical texts), Writing Reviews (Research Articles & Books).	6 Hours
BUILDING A PROFESSIONAL DIGITAL PRESENCE Creating Digital Profile - Overview of different digital platforms (LinkedIn, GitHub, personal websites) - Setting Up a LinkedIn Profile – Crafting a Video Resume – Digital Etiquette and Professionalism - Cross-cultural communication and diversity awareness.	6 Hours
SOCIAL RESPONSIBILITY IN PRACTICE Environmental and social responsibilities - Case studies and real-world applications - Project Work - Writing Project reports.	6 Hours

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



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

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



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24MAI123	COMPUTATIONAL DIFFERENTIAL EQUATIONS (Common to EC, EE, EI)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	7, 9			

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

Course Objectives:	
The purpose of taking this course is to:	
1	understand the fundamental concepts and methods for solving linear ordinary differential equations (ODEs) of second and higher order, and apply them to real-world engineering problems such as electric circuits.
2	develop proficiency in using Laplace Transform techniques to solve ODEs, particularly in scenarios involving constant coefficients, and apply these methods to practical engineering systems.
3	gain expertise in the application of various numerical methods, including Taylor's series, Euler, Improved Euler, and Runge-Kutta methods, to solve initial value problems for ODEs with a focus on accuracy and efficiency.
4	master the methods of solving partial differential equations (PDEs), including separation of variables and standard techniques for first-order and higher-order PDEs, and understand their application in modeling physical phenomena.
5	apply and evaluate finite difference and other numerical techniques for solving complex engineering problems involving PDEs, such as two-dimensional Laplace's and Poisson's equations, as well as one-dimensional heat and wave equations.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	solve linear ordinary differential equations (ODEs) of second and higher order, including applications in electric circuits.	Ap
CO 2	apply Laplace Transform techniques to solve linear ODEs.	Ap
CO 3	apply numerical methods, including Taylor's series, Euler, Improved Euler, and Runge-Kutta methods, to solve initial value problems for ODEs.	Ap
CO 4	analyse and solve partial differential equations (PDEs) using separation of variables and standard methods for first-order PDEs and higher-order linear homogeneous PDEs.	An
CO 5	apply finite difference techniques to solve two-dimensional Laplace's and Poisson's equations and use numerical schemes to solve one-dimensional heat and wave equations.	Ap

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CO 6	analyze and solve complex real-world engineering problems using a variety of analytical and numerical methods for ordinary and partial differential equations.	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	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	2		2										
2	3				2									
3		2			2						2			
4		3		2										
5		2			3									
6	2	2			2						2			

Course Content	
ORDINARY DIFFERENTIAL EQUATIONS Linear equations of second and higher order with constant coefficients – Euler's and Legendre's linear equations – Method of variation of parameters – First order Simultaneous linear equations with constant coefficients – Applications: Electric Circuits. **Practical Component:** • Solving Second-Order Linear ODEs with Constant Coefficients • Solving First-Order Simultaneous Linear Equations	9 Hours 7 Hours
SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS USING LAPLACE TRANSFORMS: Laplace Transform – Properties – Inverse Laplace transforms – Properties – Solution of linear ordinary differential equations with constant coefficients. **Practical Component:** • Using Laplace Transforms to Solve Linear ODEs	9 Hours 4 Hours
NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS Initial value problems - Single step methods: Taylor's series method – Truncation error – Euler and Improved Euler methods – Fourth order Runge–Kutta method – Multistep method: Milne's predictor - corrector method. **Practical Component:** • Numerical Solution Using Taylor's Series Method • Numerical Solution Using Euler and Improved Euler Methods • Numerical Solution Using Fourth Order Runge-Kutta Method	9 Hours 9 Hours

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PARTIAL DIFFERENTIAL EQUATIONS: Solution of PDE by variable separable method - 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 and higher order with constant coefficients. **Practical Component:** • Solution of PDE by Variable Separable Method	9 Hours 4 Hours
NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS: Finite difference techniques for the solution of two-dimensional Laplace's and Poisson's equations on rectangular domain–Solution of one-dimensional heat equation using Bender Schmidt and Crank Nicholson difference schemes – Solution of one-dimensional wave equation by explicit scheme. **Practical Component:** • Numerical Solution of Two-Dimensional Laplace's and Poisson's Equations • Numerical Solution of Heat Equation Using Bender-Schmidt and Crank-Nicholson Methods.	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, 2021. 2. Sastry S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2015. 3. Thomas, G.B., Weir, M.D., Hass, J., "Thomas' Calculus", Pearson Education, 15th Edition, 2023.
References:
1. Kreyzig E., "Advanced Engineering Mathematics", 10th Edition, John Wiley and sons, 2023. 2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2018. 3. Zill, D.G., Wright, W.S., "Advanced Engineering Mathematics", Jones & Bartlett Learning, 7th Edition, 2020. 4. O'Neil, P.V., "Advanced Engineering Mathematics", Cengage Learning, 7th Edition, 2017. 5. "Numerical Methods for Engineers" by Steven C. Chapra and Raymond P. Canale,Mc Graw Hill, 8th Edition,2021.
Online Resources (Weblinks)
1. MIT OpenCourseWare: Differential Equations https://ocw.mit.edu/courses/mathematics/18-03-differential-equations-spring-2010 2. Khan Academy: Differential Equations https://www.khanacademy.org/math/differential-equations



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3. Paul's Online Math Notes: Differential Equations
   http://tutorial.math.lamar.edu/Classes/DE/DE.aspx
4. Coursera: Introduction to Differential Equations
   https://www.coursera.org/learn/differential-equations
5. Wolfram MathWorld: Differential Equations
   https://mathworld.wolfram.com/topics/DifferentialEquations.html

Assessment
SA, Activity and Learning Task(s), MCQ, Open Book Assignment, Worksheet assignment, End Semester Examination (ESE), Lab Workbook, Experimental Cycle tests, viva-voce.

Course Curated by			
Expert from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
Mr.Pradeep.C, Paerless Validation Software for Life Sciences Companies.	Dr. C. Porkodi, PSG College of Technology, Coimbatore. Dr. P. Paramanathan, Amrita Vishwa Vidyapeetham, Coimbatore.	Dr. K. Meena Dr. Vijeta Iyer Dr. R. Krishnamoorthy Department of Mathematics	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024



BOS Chair

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



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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	PSO-3
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 - CO2 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	9 Hours

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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	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** 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	9 Hours 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).

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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, 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



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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		RBT Levels
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



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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	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:	11 Hours

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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	10 Hours
ARRAYS AND STRUCTURES Collections: Arrays – 2D Arrays – String Manipulation. Structures and Unions: Definition - declaration - accessing members - differences between structures and unions - applications. **Practical Component** Programs on Arrays, Structures, Union,	10 Hours 6 Hours
POINTERS AND FUNCTIONS Pointers: Definition - declaration - pointer arithmetic - pointers and arrays. Functions: Definition - declaration - types of functions (user-defined, library functions) - parameter passing (by value, by reference) pointers and functions, recursion. **Practical Component** Pointers and Functions. Additional programs on Files to be discussed.	10 Hours 6 Hours

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

Learning Resources

Textbooks:

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

Reference

1. Cormen, Thomas H., Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. Introduction to Algorithms. MIT Press, Cambridge (2022).
2. Balagurusamy, E. Programming in ANSI C. McGraw Hill Education, New York (2021).
3. Kernighan, Brian W., and Dennis M. Ritchie. The C Programming Language. Prentice Hall, New York (2017).
4. Patterson, David A., and John L. Hennessy. Computer Organization and Design: The Hardware/Software Interface. Morgan Kaufmann, San Francisco (2017).

Online Resources (Weblinks)

1. https://nptel.ac.in/courses/106105214
2. https://www.coursera.org/learn/computer-fundamentals
3. https://www.khanacademy.org/computing/computer-science/algorithms

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4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/ 5. https://www.geeksforgeeks.org/c-programming-language/

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

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



BOS Chair

24BTT001	BIOLOGY FOR ENGINEERS	L	T	P	J	C
		1	0	0	0	1
BS		SDG	3, 9, 12			

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

Course Objectives:	
The purpose of taking this course is to:	
1	understand the fundamental biological concepts including the origin and evolution of life, biomolecules, genetics, and cellular processes, and their relevance to engineering principles.
2	apply biological knowledge to engineering solutions by integrating biological systems with technology in areas such as biotechnology, biomedical engineering, and materials science.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	conceptualize the relevance of biological principles to various engineering disciplines and describe the origin and evolution of life, emphasizing their implications for modern science and engineering.	Ap
CO 2	identify and explain the structure and function of major biomolecules and biological processes, connecting them to their engineering applications.	An
CO 3	design and understand the functionality of basic biosensors, wearable electronics, lab-on-chip devices, and biomaterials, applying biological knowledge to these engineering solutions.	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	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	3			2								2	
2	3	3	2	2										
3	2	2			2									

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Course Content	
THE INTERSECTION OF BIOLOGY AND ENGINEERING Why Should Engineers Know Biology? - Importance of biological knowledge in various engineering fields (biomedical, environmental, materials science). Instances of biological principles in engineering solutions. What is Life? How Did It Originate on Earth and Evolve? - Definitions and characteristics of life, Theories of the origin of life on Earth, Evolutionary processes and their relevance to modern engineering applications.	3 Hours
MOLECULAR AND CELLULAR FOUNDATIONS The Fundamental Molecules of Life - Overview of biomolecules: carbohydrates, lipids, proteins, nucleic acids. Structure and function of these molecules in living organisms. DNA Replication - The molecular mechanism of DNA replication. Importance of DNA replication in cell division and inheritance. Cell Replication - Processes of mitosis and meiosis, Techniques for quantifying cell replication (e.g., cell counting, flow cytometry). How Are Proteins Made in the Cell? – Transcription and Translation - The central dogma of molecular biology: from DNA to RNA to protein.	6 Hours
BIOTECHNOLOGY AND ENGINEERING APPLICATIONS Tools for manipulating DNA: PCR, DNA Sequencers (Bridge amplification) - Wearable Electronics and Biosensors (Glucose Biosensor Construction), Introduction to wearable electronics in healthcare, Principles and design of glucose biosensors, Hands-on activity: basic glucose biosensor construction; Lab-on-Chips and Microfluidics - Overview of lab-on-chip technology and its applications in diagnostics, Basics of microfluidic systems and their design considerations. Biomaterials: Metallic and Ceramic Implants - Introduction to biomaterials used in implants (metallic and ceramic), Properties of biomaterials and their interactions with biological tissues.	6 Hours

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

Learning Resources
Textbooks:
Biology for Engineers; Dr G K Suraishkumar, 2019 (Biology for Engineers (oup.com)
References:
Online Resources (Weblinks)
https://archive.nptel.ac.in/courses/121/106/121106008/

Assessment (Theory course)
Continuous assessments, Activity and Learning Task(s), Mini project, MCQ

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Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Dr. Harishankar BIOCON Biologics, Bangalore	Dr. Selvaraju Narayanasamy IIT Guwahati		Dr. Vinohar Stephen Rapheal Dr. Ram K Department of Biotechnology
Recommended by BoS on	14.08.2024		
Academic Council Approval	No:27	Date	24.08.2024

BOS Chair

24EII101	SEMICONDUCTOR DEVICES AND APPLICATIONS	L	T	P	J	C
		3	0	2	0	4
PC		SDG	9,12			

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

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the role and selection criteria for semiconductor materials in sustainable electronics, with a focus on environmental effect and electronic waste management.
2	Develop skills to design and analyse practical circuits using diodes, BJTs, and MOSFETs for energy-efficient and sustainable applications.
3	Apply the knowledge of semiconductor devices to solve real-world problems in analog and digital electronics with a focus on sustainability and high efficiency.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	analyse the role and impact of semiconductor materials in sustainable electronics and compare traditional and sustainable materials to select appropriate options for modern applications	Ap
CO 2	apply knowledge of diodes to design and analyse practical circuits for various electronic applications.	Ap
CO 3	apply the operation of Bipolar Junction Transistors (BJTs) and Field-Effect Transistors (FETs) in analog and digital circuits.	Ap
CO 4	analyse the performance and characteristics of power semiconductor devices in sustainable and high-efficiency systems	An
CO 5	analyse recent innovations in sustainable semiconductor technologies, including low-energy manufacturing processes and their potential impact on future device applications	An

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

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2		3											
3			2										
4				2									
5					2							2	

Course Content	
SEMICONDUCTOR MATERIALS FOR SUSTAINABLE ELECTRONICS Overview of Sustainable Electronics - Importance of Semiconductor Materials in Sustainability - Traditional vs. Sustainable Semiconductor Materials – Selection Criteria for Sustainable Semiconductor Materials - Case Studies: Current Trends in Sustainable Electronics- Global Electronic Waste Management and ethical sourcing of Materials -case study-Real-world project analysing a product lifecycle from raw material sourcing to disposal. **Practical Component:** • To compare the performance of traditional and sustainable semiconductor devices in a simple circuit • Design a practical circuit using sustainable semiconductor materials, such as a low-power LED driver or a solar-powered circuit • Real-world project analysing a product lifecycle (e.g., smartphone/ Laptop) from raw material sourcing to disposal.	7 Hours 4 Hours
DIODES AND APPLICATIONS Formation of the PN junction – V-I characteristics and analysis - Diode capacitance and switching times- Special diodes-Zener diodes: Characteristics and applications - Schottky diodes: Construction, operation, and applications - Light Emitting Diodes (LEDs) and Photodiodes-Diodes Application Rectifiers: Half-wave, full-wave, and bridge rectifiers -Clipping and clamping circuits - Voltage regulation using Zener diode **Practical Component:** • Design an envelope detector using PN Diode. • Design a Diode Crowbar Circuit using Zener diode. • Design a high-speed switching circuit using Schottky diode. • Design a circuit using LED to display the letter E.	10 Hours 12 Hours
INORGANIC SEMICONDUCTOR DEVICE BJT Structure and Operation:NPN and PNP transistors - BJT as a switch - Transistor configurations (CE, CB, CC)-BJT biasing methods: Fixed bias, voltage-divider bias, and emitter bias - Stability factors and thermal runaway. Field-effect transistor (JFET):Structure and operation of JFETs - Characteristics and transfer curve analysis - JFET biasing and applications- MOSFET structure: Enhancement and depletion types - MOSFET as a switch. Nano-electronics and global innovations in device miniaturization. **Practical Component:** • Design a Relay switch circuit using BJT	13 Hours

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• Verify NPN transistor datasheet using suitable circuit. • Demonstration of BJT biasing circuits • Verify the N-channel JFET Datasheet using suitable circuit. • Demonstration of JFET biasing methods • Demonstration of MOSFET as a switch	8 Hours
POWER SEMICONDUCTOR DEVICES Overview of Power Semiconductors - Power Diodes – Power Transistors: Power BJT, Power FET, Power MOSFET - Thyristors: SCR, DIAC, TRIAC – Sustainable Power Semiconductor: SiC, GaN devices for renewable energy **Practical Component:** • To evaluate the performance of power diodes in Battery charging circuits • To evaluate the performance of power transistors in UPS. • To evaluate the performance of SCR in the Heat control system.	8 Hours 6 Hours
INNOVATIONS IN SUSTAINABLE SEMICONDUCTOR MATERIALS Low-energy Manufacturing Processes - Recycling and Reuse of Semiconductor Materials - Biodegradable and Bio-based Semiconductor Materials - Sustainable Semiconductor Materials in Future Device Applications, Content Enhancements: Add global perspective on circular economy for semiconductor materials and recent innovations in bio-based semiconductors. **Practical Component:** • Develop a project utilizing sustainable semiconductor materials to enhance energy efficiency and reduce environmental impact in electronic systems.	7 Hours
Theory Hours: 45 Tutorial Hours: - Practical Hours: 30 Project Hours: - Total Hours: 75	

Learning Resources
Textbooks:
1. Salivahanan, S., and N. Suresh Kumar., Electronic Devices and Circuits., McGraw-Hill, New Delhi (2011) 2. Zhang, Qianfan., Sustainable Power Electronics: Efficient Power Conversion and Conservation for Electronics., Wiley, Chichester (2019
References:
1 Streetman, Ben G., and Sanjay Banerjee., Solid State Electronic Devices., 7th edition, Pearson, Upper Saddle River (2015). 2 Sze, Simon M., and Kwok K. Ng., Physics of Semiconductor Devices., 3rd edition, Wiley, Hoboken (2007). 3 Millman, Jacob, and Arvin Grabel., Microelectronics. 2nd edition, McGraw-Hill, New York (1992). 4 Pierret, Robert F., Semiconductor Device Fundamentals. Addison-Wesley, Boston (1996).



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5	Baliga, B. Jayant., Fundamentals of Power Semiconductor Devices. Springer, Boston (2008).
6	Neamen, Donald A., Semiconductor Physics and Devices: Basic Principles., 4th edition, McGraw-Hill, New York (2011).
7	Li, Xianjun., Sustainable Electronics Manufacturing. Wiley, Hoboken (2019).

Online Educational Resources:

1. https://onlinecourses.nptel.ac.in/noc20_bt17
2. https://onlinecourses.nptel.ac.in/noc22_mm11
3. https://www.mooc-list.com/tags/semiconductor-materials

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

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**	
Vijayeendra H S Co-Founder and Director at Avanijal Agri Automation Pvt. Ltd, Bangalore Dr. Parthasarathy Ramaswamy Senior Principal Engineer at Intel Corporation, Bangalore	Veena N. Hegde Professor, Dept. of E & I Engg. at B.M.S. College of Engineering, VTU, Bangalore Dr. M Mythily Assistant Professor at Dept. of Instrumentation Engg.MIT , Chennai	Umesh M V Associate professor at Dept. of E & I Engg, KCT Dr. Jeya Daisy I Assistant Professor -II at Dept. of E & I Engg, KCT	
Recommended by BoS on	10/08/2024		
Academic Council Approval	27	Date	10/08/2024

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

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

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

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
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
CO3	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	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	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	3 Hours

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design (KiCad, FreeCAD), software development (Python, Eclipse), and fabrication (Cura, LinuxCNC).	
ELECTRONICS FUNDAMENTALS AND TOOLS Introduction to basic electronic components (resistors, capacitors, transistors, etc.), Understanding of electronic circuits and their functions, Hands-on practice with CircuitJS and Falstad, Simulating and analysing electronic circuits, Introduction to Arduino and Raspberry Pi, exploring their capabilities and applications, Designing PCBs using KiCad and EasyEDA, Understanding PCB fabrication processes	6 Hours
SOFTWARE PROTOTYPING AND TOOLS Benefits of rapid prototyping in product development, Iterative design and testing, Wireframing tools (Balsamiq, Figma), UI design tools (Sketch, Figma), Programming languages (Python, JavaScript), Testing frameworks (Selenium), No-code platforms (Bubble, Adalo, Wix, AppGyver), Building functional prototypes without extensive coding	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, and a 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

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2. https://engservices-ece.sites.olt.ubc.ca/files/2020/01/SolidWorks-3D-Printing-Tutorial-R2.pdf

Assessment (Practical course)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert**
Dr. Mahesh Veezhinathan Director - Innovation Practicum Associate VP - Forge. Innovation	-		Dr. Samuel Ratna Kumar P S Assistant Professor – III Department Mechanical Engineering
Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

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4HSP112	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		RBT Levels
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	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	PSO-3
1						2		2						
2						2								
3						2					3			
4						2					3			

Course Content	
ADVANCED MINDFULLNESS AND MEDITATION: • Deepening mindfulness practices for enhanced mental clarity. • Exploring different forms of meditation (e.g., guided, transcendental, movement-based). • Hands-on activity: Daily meditation practice and journaling reflections.	6 Hours

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EMOTIONAL RESILIENCE AND MENTAL HEALTH: • Building emotional resilience through positive psychology practices. • Cognitive-behavioural strategies for managing stress and anxiety. • Hands-on activity: Developing and practicing a resilience toolkit.	6 Hours
SOCIAL AND ENVIRONMENTAL WELLNESS: • The impact of social connections and community on wellness. • Creating a supportive environment for personal growth. • Hands-on activity: Building a community wellness project or group activity.	6 Hours
INTERNAL GROWTH AND PURPOSE: • 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:	Tutorial Hours:	Practical Hours:	Project Hours:	Total Hours:
0	0	30		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

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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	16.08.2024		
Academic Council Approval	No: 27	Date	24.08.2024

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THIRD SEMESTER



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24HSP005	24HSP005-MASTERING CONVERSATIONS	L	T	P	J	C
		0	0	2	0	1
HS		SDG	4 & 8			

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

Course Objectives:	
The purpose of taking this course is to: (3 to 5)	
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		RBT Levels
CO 1	Empathize with and understand people in both professional and personal contexts, reflecting on situations from multiple perspectives and participating in activities that mirror career-related scenarios	Ap
CO 2	Analyze and converse critically on complex subjects, demonstrating the ability to approach and deal with various social contexts effectively	An
CO 3	Exhibit skills in role-playing and enacting given situations to navigate diverse social interactions and career-related contexts.	C

	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	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and	Life-Long Learning	PSO-1	PSO-2	PSO-3
1						3			3	2	3			
2									1	2				
3									3	2				

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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, Organising 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	



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

Approved by: BoS Chairman	
BoS Approval date:	16-8-2024



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24MAI233	PROBABILITY AND APPLIED STATISTICS (Common to EE, EI)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	7, 9			

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

Course Objectives:	
The purpose of taking this course is to:	
1	comprehend the basic principles of probability theory, including the axioms that govern probability spaces and the interpretation of probability values in different contexts.
2	analyze relationships between discrete variables using correlation and understand various distributions for modelling and analyzing random phenomena.
3	provide students with the knowledge and skills to perform statistical inference through hypothesis testing.
4	enable effective comparison of multiple treatments and control of variability in experimental data.
5	introduce the concept of statistical process control and to equip students with the skills to construct and interpret control charts for variables.

Course Outcomes:		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	apply the concept of probability and random variables.	Ap
CO 2	compute correlation between variables and construct probabilistic models for observed phenomena through distributions	Ap
CO 3	perform hypothesis testing and interpret the results.	An
CO 4	perform analysis of variance by understanding the principles of design of experiments	An
CO 5	sketch control charts and comment on the process control.	An
CO 6	apply the above concepts to solve problems using R Studio.	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	Conduct Investigations of	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative	Communication	Project Management and	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2	3							2	2				
2	3	3							2	2				
3	3	2							2	2				
4	3	3							2	2				

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5	3	3							2	2				
6	3								2	2				

Course Content	
PROBABILITY AND RANDOM VARIABLES Axioms of probability – Conditional probability – Total probability – Bayes' theorem Random variable – Distribution function – properties – Probability mass function Probability density function **PRACTICAL COMPONENT** • Introduction to R programming • Application of descriptive statistics – Mean, Median, Mode and standard deviation	9 Hours 6 Hours
CORRELATION AND STANDARD DISTRIBUTIONS Correlation (Discrete Data): Karl Pearson's Correlation coefficient - Regression lines (Discrete Data) - Binomial, Poisson and Normal distributions **PRACTICAL COMPONENT** • Applications of Correlation and Regression • Application of Normal distribution	9 Hours 6 Hours
TESTING OF HYPOTHESIS Testing of hypothesis for large samples (single mean, difference of means) – Small sample tests based on t and F distributions (single mean, difference of means, paired t- test and variance ratio test) – Chi-square test for independence of attributes and goodness of fit **PRACTICAL COMPONENT** • Application of Student – t test • Application of F test • Application of Chi-square test	9 Hours 6 Hours
DESIGN OF EXPERIMENTS Analysis of Variance (ANOVA) – Completely Randomized Design (CRD) – Randomized Block Design (RBD) – Latin Square Design (LSD). **PRACTICAL COMPONENT** • ANOVA – one way classification • ANOVA – two-way classification	9 Hours 6 Hours
STATISTICAL QUALITY CONTROL Concept of process control - Control charts for variables: Mean and Range charts – Control charts for attributes: p, np, c – charts. **PRACTICAL COMPONENT** • Control charts for variables (mean and range chart)	9 Hours 6 Hours

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

Learning Resources

Textbooks

1. Veerarajan T., Probability, Statistics and Random Processes, Tata McGraw Hill, third edition, 2017.

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2. Gupta S. P, Statistical Methods, Sultan Chand & Sons Publishers, 2021.
Reference books
1. Johnson R. A., Miller & Freund's Probability and Statistics for Engineers, ninth Edition, Pearson Education, Delhi, 2017. 2. Gupta. S.C and Kapoor. V.K, Fundamentals of Mathematical Statistics, Eleventh extensively revised edition, Sultan Chand & Sons, 2020. 3. Montgomery D. C., Design and analysis of experiments, tenth Edition, Wiley, 2019. 4. Gupta S.C, and Kapur V.K Fundamentals of Applied Statistics, Sultan Chand, New Delhi, fourth Edition, 2014. 5. Grant, E. L., & Leavenworth, R. S. Statistical quality control, Seventh edition, McGraw-Hill, 2017.
Online Resources (Web Links)
1. Probability and random variables: https://www.coursera.org/learn/foundations-of-probability-and-random-variables 2. Testing of Hypothesis https://archive.nptel.ac.in/courses/103/106/103106120/ 3. Design of Experiments: https://www.coursera.org/learn/anova-and-experimental-design 4. Control Charts: https://www.coursera.org/learn/stability-and-capability-in-quality-improvement#modules

Assessment	
Formative	Summative
Assignments / Group activities (like Group presentation, e-Poster Presentation), Quiz, Lab.	SA- I, SA – II and End Semester Examination (ESE)

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
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.	1. Dr. M. Sivakumar Assistant Professor Sr. Grade Vellore Institute of Technology, Vellore 2. Dr. Ramesh Babu Assistant Professor (SG) Amrita University Coimbatore, Tamil Nadu.	1. Dr. A. Ezhilarasi 2. Dr. R. Krishna Moorthy 3. Ms. S. Princy Flora Department of Mathematics

Recommended by BoS on	25.4.2025		
Academic Council Approval		Academic Council Approval	



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24MET205	THERMODYNAMICS AND FLUID MECHANICS	L	T	P	J	C
		3	0	0	0	3
ES		SDG	7 , 13			

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

Course Objectives:	
The purpose of taking this course is to:	
1	To provide fundamental knowledge of thermodynamics and its laws as applied to engineering systems
2	The power generation concepts in steam power plants
3	To study the fluid properties, Euler's, Bernoulli's equation Working principles of hydraulic turbines and pumps

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	Explain the basic concepts and laws of thermodynamics.	Ap
CO 2	Define and explain the fundamental modes of heat transfer: conduction, convection, and radiation.	Ap, An
CO 3	Explain the principles and operation of thermal systems such as turbines and boilers.	Ap. An
CO 4	Analyze and design basic flow measurement and heat transfer systems used in instrumentation	Ap, An
CO 5	Understand fluid properties and classify different types of fluid machines.	Ap, 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	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	2	-	-	-	-	-	-	-	-	2	3	-	-
2	3	2	-	-	-	-	-	2	2	-	-	2	-	-
3	3	3	-	2	1	-	-	3	3	-	-	2	-	-
4	3	2	-	2	-	-	-	3	3	-	2	2	-	-
5	3	3	2	2	-	1	-	3	3	-	2	2	-	-

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Course Content	
BASIC OF THERMODYNAMICS Thermodynamic systems – Types, Properties, State - process - Cycle – Equilibrium – Work and heat transfer – First law of thermodynamics for non-flow process (closed system) – First law applied to Flow process (open system) - SFEE (Steady flow energy equation) – Second law of thermodynamics – Heat engines – Refrigerators and heat pumps (Descriptive only).	10 Hours
BASIC OF HEAT TRANSFER Modes of Heat transfer- One dimensional Conduction heat transfer (Steady state) – composite walls, Convection heat transfer – Free and Forced convection- Cooling of electronic components: Thermoelectric cooling – Chip cooling (Descriptive only).	8 Hours
STEAM BOILERS AND TURBINES Formation of steam – properties of steam –working principle – Types of boilers- Mounting and accessories (Descriptive only). Steam power cycle (Rankine), Steam turbines: Impulse and reaction principle (Descriptive only).	9 Hours
FLUID PROPERTIES AND FLOW KINEMATICS Definitions of fluid - Properties of fluids – (Definition only)-Mass density – Specific weight – Specific volume – Specific gravity – Viscosity – Compressibility – Surface tension – Capillarity –Vapor pressure. – Fluid Pressure and Pressure Head – Types of Fluid Flow – Continuity Equation. Euler's equations – Bernoulli's Equation and Applications – Venturi meter and orifice meter.	9 Hours
FLUID MACHINES Definition and classifications- Centrifugal and Reciprocating Pumps: Working principles. Classification of hydraulic turbines, Pelton, Francis, and Kaplan turbines - working principles (Descriptive only)	9 Hours

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

Learning Resources
Textbooks:
1. Yunus A. Cengel, Michael A. Boles, "Thermodynamics: An Engineering Approach", McGraw-Hill. 2. R.K. Bansal, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications (P) Ltd, New Delhi (2006). 3. K.L. Kumar, "Engineering Fluid Mechanics", Eurasia publishing house, New Delhi,(2001).
References:
1. D. Patranabis, "Principles of Industrial Instrumentation", Tata McGraw-Hill. 2. P.N. Modi & S.M. Seth, "Hydraulics and fluid mechanics including hydraulic machines", Standard book house, New Delhi, (2005). 3. V.L. Streeter – "Fluid mechanics", McGraw-Hill, New York, (2002). 4. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, Chennai, (2003).

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5. Versteeg, H.K, and Malalasekera, W., "An Introduction to Computational Fluid Dynamics: The Finite Volume Method", Pearsons, United Kingdom, (2007).
Online Educational Resources:
1. http://nptel.ac.in/courses/105101082/ 2. http://bookboon.com/en/engineering-fluid-mechanics-ebook 3. http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv078 4. http://www.srividyaengg.ac.in/elearn1/coursematerial/Mech/114343. pdf 5. http://www.engineeringtoolbox.com/fluid-mechanics-t_21.html 4. https://www.youtube.com/watch?v=OGIkuJoQzok 5. https://www.youtube.com/watch?v=VZXVdPoy3zs 6. https://www.youtube.com/watch?v=3gxNrc_EEN8 7. https://www.youtube.com/watch?v=BaEHVpKc-1Q

Assessment (Embedded course)
SA, MCQ, Written Assignments , End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Mr. Balamurugan M Application Engineer-API Pumps Department : Techno-Commercial Operations M/s. Flowserve India Controls Pvt. Ltd., Coimbatore.	Dr. M Balasubramaniam Assistant Professor Department of Mechanical Engineering Anna University Regional Campus Coimbatore.		Mr. P.Pradeep Assistant Professor Department of Mechanical Engineering, Kumaraguru College of Technology, Coimbatore.
Recommended by BoS on	07/05/2025		
Academic Council Approval	No.	Date	XX/YY/2025

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24EII201	ELECTRONIC CIRCUIT DESIGN	L	T	P	J	C
		3	0	2	0	4
PC		SDG	9 and 3			

Pre-requisite courses	24EII101	Data Book / Code book (If any)	NIL

Course Objectives:	
The purpose of taking this course is to:	
1	To impart a solid foundation in basic circuit laws, network theorems, and simulation techniques for the analysis and design of electrical and analog networks, including sinusoidal steady-state AC behavior, resonance, and two-port systems.
2	To enable learners to model, analyze, and design small-signal and power amplifier circuits—including multistage, feedback, and MOSFET-based configurations—for use in analog front-ends, biomedical devices, and low-power wearable electronics.
3	To provide hands-on experience in the design and simulation of signal conditioning circuits, oscillators, and multivibrators for applications in timing, waveform generation, and frequency stability in embedded and communication systems.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	apply fundamental electrical laws and circuit analysis techniques to model, solve, and simulate linear electrical networks.	Ap
CO 2	analyse AC circuits in the sinusoidal steady state using phasor and impedance concepts, and evaluate resonance behaviour and frequency response.	An
CO 3	Design and analyse BJT-based single-stage and multistage amplifier circuits, evaluate their frequency response, feedback behaviour, differential operation, and power-stage performance for analog signal-processing chains.	An
CO 4	Design and analyse MOSFET amplifier circuits — biasing networks, common-source/gate/drain configurations, frequency response, and cascaded stages — appropriate to modern signal-conditioning systems.	An
CO 5	design and simulate stable oscillators and multivibrator circuits for waveform generation and timing applications in embedded and communication systems.	An



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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	Life-Long Learning	PSO-1	PSO-2
1	3	3	3	2	3	2	1	2			3	3	1
2	3	3	3	2	3	2	1	2			3	3	1
3	3	3	3	2	3	2	1	2			3	3	1
4	3	3	3	2	3	2	1	2			3	3	1
5	3	3	3	2	3	2	1	2			3	3	1
6	3	3	3	2	3	2	1	2			3	3	1

Course Content	
FUNDAMENTALS OF CIRCUIT ANALYSIS AND NETWORK Current and Voltage Laws (KCL, KVL)- Mesh and Nodal Analysis Techniques- Network Theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer Network Theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer - Practical Circuit Simulation using LTspice or Multisim **Practical Component:** • Verification of Kirchhoff's Laws using Simulation Tools (LTspice/Multisim) • Implementation and Analysis of Thevenin's and Norton's Theorems • Experimental Validation of the Maximum Power Transfer Theorem	9 Hours 6 Hours
AC SIGNAL ANALYSIS AND RESONANT NETWORKS Sinusoidal Steady State Analysis: Impedance, Phasor Concepts- Resonance in RLC Circuits (Series and Parallel)- Two-port Network Parameters and Interconnections - Application in Sensor Interfaces and Analog Filters for IoT **Practical Component:** • Impedance and Phasor Analysis in RLC Series and Parallel Circuits • Resonance Characteristics in Series and Parallel RLC Circuits • Characterization of Two-Port Network Parameters	9 Hours 6 Hours
BJT-BASED ANALOG DESIGN AND SIGNAL PROCESSING Small Signal Models: r,π Model- Frequency Response: Low, Mid, High Frequency- Miller Effect and Bandwidth Estimation- Multistage Amplifier- Negative Feedback age Amplifiers- Coupling Methods: RC Coupling, Transformer Coupling- Differential Amplifiers: Voltage Series, Voltage Shunt, Current Series, Current Shunt- Power Amplifiers: Class A, B, AB, and Class C Amplifiers- Efficiency and Distortion Analysis - Analog Front-End Design for Biomedical Applications **Practical Component:** • Frequency Response of a Single-Stage BJT Amplifier • Design and Analysis of Differential Amplifier • Performance Analysis of Power Amplifiers (Class A, B, AB)	9 Hours 6 Hours

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MOSFET AMPLIFIERS AND MODERN ANALOG DESIGN MOSFET Biasing: Fixed Bias, Voltage Divider Bias- Small Signal Analysis of CS, CG, CD Amplifiers-Frequency Response of MOSFET Amplifiers- Design Examples of MOSFET Amplifiers- Multistage Amplifiers: Cascading MOSFET Stages- Differential Amplifier- Case Study: Signal Conditioning for Wearable Health Monitors **Practical Component:** • MOSFET Biasing Techniques – Fixed and Voltage Divider Bias • Frequency Response of Common Source (CS) MOSFET Amplifier • Design and Analysis of Cascaded MOSFET Amplifier for Signal Conditioning	9Hours 6 Hours
OSCILLATORS, MULTIVIBRATORS, AND WAVEFORM GENERATORS Conditions for Sustained Oscillations (Barkhausen Criterion)- RC Oscillators: Phase Shift Oscillator, Wien Bridge Oscillator- LC Oscillators: Hartley Oscillator, Colpitts Oscillator- Crystal Oscillator (High-frequency Stability)- Multivibrators: Astable and Monostable using BJT circuits- Schmitt Trigger using BJT - Practical Implementation using Proteus/Multisim **Practical Component:** • Design and Simulation of Wien Bridge Oscillator • Design and Simulation of Astable and Monostable Multivibrators • Design and Simulation of Schmitt Trigger Circuits	9Hours 6 Hours

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

Learning Resources

Textbooks:

1. Boylestad, Robert L., and Nashelsky, Louis,Electronic Devices and Circuit Theory. Pearson Education, Noida (2021).
2. Salivahanan, S., and Suresh Kumar, N. Electronic Devices and Circuits. McGraw-Hill Education, New Delhi (2021).
3. Sedra, A. S., and Smith, K. C. Microelectronic Circuits. Oxford University Press, New York (2020).

References:

1. Millman, Jacob, and Halkias, Christos C. Integrated Electronics: Analog and Digital Circuits and Systems. McGraw-Hill Education, New York (2021).
2. Neamen, Donald A. Microelectronics: Circuit Analysis and Design. McGraw-Hill Education, New York (2021).
3. Rao, S. S., and Srinivasan, R. Network Analysis and Synthesis. Pearson Education, New Delhi (2021).
4. Kumar, A., and Sinha, P. Electronic Devices and Circuits. Dhanpat Rai Publishing Company, New Delhi (2020).
5. Muthusubramanian, R., and Salivahanan, S. Basic Electrical and Electronics Engineering. McGraw-Hill Education, New Delhi (2021).
6. Sarma, M. S., and Chatterjee, S. Analog Electronics. Cengage Learning, New Delhi (2021)



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7. Vasudevan, D., and Ranganathan, S. Electrical and Electronics Engineering. McGraw-Hill Education, New Delhi (2019).

Online Educational Resources:

1. https://www.khanacademy.org/math/differential-calculus
2. https://www.khanacademy.org/science/electrical-engineering
3. https://www.coursera.org/browse/engineering/electrical-engineering
4. https://www.edx.org/learn/electrical-engineering
5. https://www.allaboutcircuits.com
6. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/

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

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
[Name, Organisation]	[Name, Institution]	1. Dr. Jeya Daisy I, Assistant Professor-II, EIE 2. Dr. Mayurappriyan PS, Professor, EIE	
Recommended by BoS on	07/05/2025		
Academic Council Approval	No.28	Date	26/062025



BOS Chair

24EII202	SENSORS AND TRANSDUCERS	L	T	P	J	C
		3	0	2	0	4
PC		SDG	9 and 11			

Pre-requisite courses	24PHI102	Data Book / Code book (If any)	NIL

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the working principles and characteristics of various types of sensors and transducers.
2	Analyze the selection criteria and performance evaluation of sensors based on application requirements.
3	Develop skills to interface sensors with signal conditioning circuits and measurement systems.
4	Build competency to design and implement sensor-based measurement solutions in real-world applications.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	analyse the static and dynamic behaviour of first-order and zero-order transducers and evaluate the performance of measurement systems with respect to accuracy and uncertainty.	Ap
CO 2	apply the principles of resistive sensor technologies and design simple signal conditioning circuits for temperature, strain, and light measurements.	Ap
CO 3	analyze the working mechanisms of inductive and capacitive transducers and select appropriate sensors based on application-specific requirements.	Ap
CO 4	evaluate the operational effectiveness of thermoelectric, piezoelectric, and photovoltaic sensors and recommend suitable sensors for energy harvesting and dynamic measurement applications.	An
CO 5	examine the architecture of intelligent, MEMS, and fiber-optic sensors and design sensor integration strategies for smart measurement systems.	U
CO 6	integrate the knowledge of conventional, self-generating, and intelligent sensor technologies to design and evaluate complete sensor-based measurement solutions for industrial and scientific applications.	Ap

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

Course Content	
INTRODUCTION TO SENSOR BASED MEASUREMENT SYSTEM Classification of transducers – Selection of transducers. Static characteristics – Dynamic characteristics – Mathematical model of transducer – Zero, first order transducers – Response to impulse, step and ramp inputs. Units and Standards, Classification of errors, Limiting error and probable error – Error analysis – Statistical methods – Odds and uncertainty **Practical Component:** • Calibrate voltmeter / ammeter using Electrical calibration Test Bench • Calibrate RTD/Thermistor using Temperature Calibration Test Bench	9 Hours 4 Hours
RESISTIVE SENSORS Potentiometer, strain gauge, resistance thermometer, Thermistor, Hot-wire anemometer, Magnetoresistors, LDRs, Resistive bendy sensors and Resistive Hygrometers **Practical Component:** • Practical verification of Strain gauge sensor specifications with the signal conditioning circuits. • Practical verification of RTD and Thermistor sensor specifications with the signal conditioning circuits. • Practical verification of LDR specifications with the signal conditioning circuits.	9 Hours 6 Hours

REACTANCE VARIATION SENSORS Inductive transducers: LVDT, Induction potentiometer – Variable reluctance transducers – Synchros – Microsyn Capacitive transducers: Capacitive microphone, Capacitive level sensor, Capacitive pressure sensor, Capacitive humidity sensor, Proximity sensor	9 Hours

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Practical Component: • Practical verification of LVDT Sensors specifications with the signal conditioning circuits. • Practical verification of Capacitive level Sensors specifications with the signal conditioning circuits.	4 Hours
SELF-GENERATING SENSORS Thermocouples, Piezoelectric Sensors, Photovoltaic Sensors, Seismic Sensors, Pyroelectric sensors. Electromagnetic Flow Sensor **Practical Component:** • Practical verification of the Thermocouple Sensors specifications with the signal conditioning circuits. • Practical verification of Piezoelectric Sensors specifications with the signal conditioning circuits. • Practical verification of the Photo Voltaic Sensors specifications with the signal conditioning circuits	9 Hours 6Hours
DIGITAL, INTELLIGENT AND OTHER SENSORS Sensors Based on MOSFET Transistors, Charge-Coupled and CMOS Image Sensors, Fiber-Optic Sensors, Ultrasonic-Based Sensors, Position Encoders, Hall Effect sensor – Magneto elastic sensor –Introduction to MEMS **PRACTICAL COMPONENT:** • Practical verification of Hall effect Sensors specifications with the signal conditioning circuits. • Practical verification of Tachometer with the signal conditioning circuits. • Project – Design of a measurement system	9 Hours 10 Hous
Theory Hours: 45 Tutorial Hours: Practical Hours: 30 Project Hours: Total Hours: 75	

Learning Resources
Textbooks:
1. Fraden, Jacob., Handbook of Modern Sensors: Physics, Designs, and Applications, Springer, New York (2016). 2. John Turner, Martyn Hill., Instrumentation for Engineers and Scientists, Oxford University Press, Oxford (1999).
References:
Online Educational Resources:
1. https://onlinecourses.nptel.ac.in/noc21_ee32/preview 2. https://onlinecourses.nptel.ac.in/noc23_ee95/preview 3. https://www.coursera.org/learn/sensors-circuit-interface

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



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Course Curated by		
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**
Mr. S. Jeevanandham Senior Labview Developer Kg Invicta Pvt Ltd, Deputed at BOSCH Pvt. LTD , Coimbatore	Dr. Swetha R Kumar, Assistant Professor, Sr. Gr. VIT Chennai	Ms.V.Manimekalai, Assistant Professor II EIE
Recommended by BoS on	07/05/2025	



BOS Chair

24EII203	ELECTRICAL MACHINES AND MEASUREMENT SYSTEMS	L	T	P	J	C
		2	0	2	0	3
Professional Core		SDG		9,12,4		

Pre-requisite courses	24PHI102, 24MET105	Data Book / Code book (If any)	Nil

Course Objectives:	
The purpose of taking this course is to:	
1	To understand the construction, working principles, and performance characteristics of electrical machines including transformers, DC and AC motors.
2	To acquire knowledge on the principles and methods of measuring electrical quantities using analog and digital instruments.
3	To develop competency in selecting and applying appropriate machines and measurement systems for industrial, vehicular, and renewable energy applications.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO1	Explain the operating principles, construction, and characteristics of electrical machines and measurement instruments.	U
CO2	Analyze the performance and control strategies of DC and AC machines in industrial and energy applications.	An
CO3	Interpret the functional aspects of analog and digital instruments for measuring electrical quantities.	Ap
CO4	Evaluate the performance of single-phase and three-phase machines using equivalent circuit models and characteristics.	An
CO5	Conduct experiments on electrical machines and bridges to determine performance parameters and verify theoretical concepts.	An
CO6	Apply digital tools such as LabVIEW and DAQ systems for signal acquisition, calibration, and virtual instrumentation.	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	Problem Analysis	Design/Development	Conduct Investigations of	Engineering Tool	The Engineer	Ethics	Individual and Collaborati	Communic	Project Management and	Life-Long Learning	PSO-1	PSO-2
1	3	2	–	–	–	–	–	–	–	–	–	2	1
2	3	3	2	2	2	1	–	–	–	–	–	3	3
3	2	2	–	2	3	–	–	–	–	–	–	3	2
4	3	3	–	3	3	–	–	–	–	–	–	3	2
5	3	3	–	3	3	–	–	–	1	2	–	3	2
6	2	2	–	2	3	–	–	–	2	3	1	3	2

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COURSE CONTENT	
TRANSFORMERS AND THEIR APPLICATIONS IN POWER AND CONTROL SYSTEMS Review of Magnetic circuits- Construction and Operation of Ideal and Practical Transformers - Equivalent Circuit, Voltage Regulation, Efficiency. Autotransformers – Three-Phase Transformers. Instrument Transformers (CT and PT) – Working Principle, Applications in Metering and Protection. Transformer Rectifier Units (TRUs) – Structure and Industrial Applications. **PRACTICAL COMPONENT** 1. Performance Evaluation of Distribution Transformer for Rural Electrification	4 Hours 4Hours
DC MACHINES AND ELECTRIC DRIVE APPLICATIONS Construction and types: Shunt, series, compound - Working principle, EMF and torque equations - Armature reaction and commutation - Characteristics of DC generators and motors - Methods of speed control – Starting techniques and protection - Efficiency and testing methods - Applications in electric vehicles, elevators, and industrial drives - Servo motors and BLDC motors: Operation, applications. **PRACTICAL COMPONENT** 2. Load Test on DC Shunt Motor for E-Vehicle Application 3. Speed Control of DC Motor for Elevator Drive System	6 Hours 4 Hours
AC MACHINES – INDUCTION MOTORS AND APPLICATIONS Construction and working principle of three-phase and single-phase induction motors - Concept of rotating magnetic field and slip - Torque-speed characteristics and equivalent circuit models - Starting methods - Efficiency and power factor considerations - Applications in HVAC systems, renewable energy systems (e.g., wind turbines), and industrial drives. **PRACTICAL COMPONENT** 4. Performance Study of Single-Phase Induction Motor for Domestic HVAC Systems 5. Torque-Speed Characteristics of Three-Phase Induction Motor for Conveyor Belt Application	6 Hours 6 Hours
ANALOG AND DIGITAL MEASURING INSTRUMENTS Measurement System Fundamentals: Functional elements-classification of instruments; PMMC Instruments: Construction- working principle-torque equation-advantages and limitations; Electrodynamic Instruments: Principle-use in power measurement- construction- calibration: Digital Instruments: DMM-DVM- frequency counter sampling- error analysis; Measurement of Electrical Quantities: Voltage- current-power-and energy (single and three-phase) **PRACTICAL COMPONENT** 6. Measure power consumption in household appliances or laboratory devices using electrodynamic wattmeters and digital multimeters. 7. To determine and analyze power factor in residential and office electrical systems using voltmeter, ammeter, and wattmeter methods. 8. To perform calibration of digital voltmeters, multimeters, and wattmeters to ensure measurement accuracy in routine electrical testing and servicing.	7 Hours 6 Hours

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DC AND AC BRIDGES DC Bridge Measurements: Wheatstone, Kelvin Double Bridge, Megger – balancing conditions AC Bridge Measurements: Maxwell's Bridge (inductance), Schering Bridge (capacitance), Wien Bridge (frequency) **PRACTICAL COMPONENT** 9. To measure unknown resistance in sensor circuits or small electronic devices using the Wheatstone bridge and perform error analyses 10. To test low resistance in wires and connectors within control panels using the Kelvin double bridge method for maintenance purposes. 11. To evaluate the quality of capacitors by measuring capacitance and dielectric loss angle using the Schering bridge in power electronics and motor control systems. 12. To measure and verify inductance of coils or chokes used in power supplies and automation modules using Maxwell's bridge.	6 Hours 8 Hours
DATA ACQUISITION AND VIRTUAL INSTRUMENTATION LabVIEW fundamentals, DAQ cards, ADC/DAC, interfacing basics Virtual instrumentation concepts and LabVIEW basics **PRACTICAL COMPONENT** 13. DAQ with LabVIEW – Signal acquisition and logging from temperature or voltage sensor	2 Hours 2 Hours

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

LEARNING RESOURCES

TEXTBOOKS:

Electrical Machines:

1. I.J. Nagrath and D.P. Kothari - "Electric Machines",5th Edition, McGraw-Hill, 2017

Measurement Systems:

2. Helfrick, A. D., & Cooper, W. D. "Modern electronic instrumentation and measurement techniques" (1st ed.). Pearson Education.2002

REFERENCES:

1. Chapman, S. J. Electric machinery fundamentals (5th ed.). McGraw Hill Education. 2012
2. Sawhney, A. K. Electrical and electronic measurements and instrumentation (19th ed.). Dhanpat Rai & Co.,2015
3. Kalsi, H. S. Electronic instrumentation (3rd ed.). McGraw Hill Education.,2018

ONLINE EDUCATIONAL RESOURCES:

1. Fernandes, B. G. (n.d.). Power Electronics [Video lectures]. National Programme on Technology Enhanced Learning (NPTEL), IIT Bombay. Available via NPTEL https://www.youtube.com/watch?v=1Auay7ja2oY&list=PLA07ACBDE053A8229
2. Kastha, D. (n.d.). Electrical Machines – I [Video lectures]. NPTEL. https://nptel.ac.in/courses/108/105/108105017/
3. Vasudevan, K. (n.d.). Modeling and Analysis of Electric Machines [Video lectures]. NPTEL. https://nptel.ac.in/courses/108/106/108106023/

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4. Ravi Kumar. (2024). Mechanical Measurement Systems [Online course]. SWAYAM–NPTEL, IIT Roorkee. https://nptel.ac.in/courses/112107242

Virtual Labs & Simulation Platforms

1. Virtual Labs. (n.d.). Electrical Engineering Virtual Laboratory. Indian Institute of Technology (IIT) consortium. Retrieved from https://vlab.co.in

Software & Instrumentation Tutorials

1. National Instruments. (n.d.). LabVIEW tutorials and virtual instrumentation fundamentals. NI Learn Platform. Retrieved from https://learn.ni.com

Other platforms

1. Coursera. (n.d.). Electrical Machines, Instrumentation, and DAQ with LabVIEW. Retrieved from https://www.coursera.org
2. edX. (n.d.). Instrumentation, Machine Drives, and related courses. Retrieved from https://www.edx.org

Assessment (Embedded course)
CAT, Activity and Learning Task(s)* , Mini project, MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce • Electrical Machines: 50% (Quizzes, assignments, presentations) • Measurement Systems: 50% (Practical exercises, design problems)

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Moses Edison P Yageo Pulse Sr. Maintenance Er. Pulse System Electronics (India) Pvt. Ltd., Tiruchi	Dr. Sri Revathi B Professor Gr. 1 VIT, Chennai		1. Dr. Mayurappriyan M S Professor, EIE KCT 2. Ranganathan S Assistant Professor - EIE, KCT
Recommended by BoS on	07/05/2025		
Academic Council Approval	No.28	Date	26/062025

BOS Chair

24INP201	INNOVATION PRACTICUM - III	L	T	P	J	C
		0	0	2	0	1
ES		SDG	4, 9			

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

Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes

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

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

Course Content

IDEA WORTH PROTOTYPING Discuss potential risks and challenges associated with innovative ideas - Learn to refine and validate the initial concept - Develop a plan outlining key milestones and timelines for advancing from idea to prototype.	3 Hours
FRAMING THE CHALLENGE Define the specific problem or opportunity that the innovation aims to address, understand customer needs and preferences - Identify the gaps in the market and potential obstacles to adoption, assess the potential market size, competition, and feasibility.	6 Hours

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CRAFTING HIGH-VALUE SOLUTIONS Generate Minimum Usable Prototype (MUP) concepts that address the identified challenge that provide high value, evaluate the potential of each solution concept based on criteria like feasibility, viability, and desirability.	6 Hours
OPTIMIZATION AND PLANNING Create Bill of Quantities (BOQ) and Bill of Materials (BOM) to estimate costs and resources - Develop a comprehensive innovation proposal outlining the innovation concept, goals, and benefits - Implement Lean principles to improve efficiency and reduce waste in the innovation process - Reflect on the activities to identify areas for improvement and learning.	7 Hours
PROJECT PRESENTATION Develop and deliver a compelling presentation of your minimum usable prototype (MUP) and innovation solution to effectively communicate its value and impact to a broader audience - Create a visually engaging presentation that clearly outlines the problem, the proposed solution, and the value of your minimum usable prototype - Utilise tools such as slides, infographics, and videos to enhance the visual appeal - Craft a compelling story around your innovation - Highlight the journey from problem identification to solution development, emphasising key insights and milestones.	8 Hours

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

Learning Resources

References:

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



Online Resourse (Weblinks)
1. https://formlabs.com/blog/ultimate-guide-to-prototyping-tools-for-hardware-and-product-desi gn/ 2. https://docs.kicad-pcb.org/ 3. https://www.tinkercad.com/learn/circuits 4. https://docs.github.com/en/free-pro- team@latest/actions/guides
Assessment (Practical course)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
Dr. Mahesh Veezhinathan Director - Director Forge. Academy	-	Dr. Samuel Ratna Kumar P S Assistant Professor – III Department Mechanical Engineering	
Recommended by BoS on	07/05/2025		
Academic Council Approval	No: 28	Date	26/06/2025

BOS Chair

24INM201	UNIVERSAL HUMAN VALUES II: UNDERSTANDING HARMONY	L	T	P	J	C
		1	0	0	0	1
HS		SDG	5,10,16			

Pre-requisite courses	UHV-I(Students Induction Program)	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	Instil the importance of ethical behaviour in personal, professional, and social contexts.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
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	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)		
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of	4 Conduct Investigations of	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative	9 Communication	10 Project Management	11 Life-Long Learning	PSO-1	PSO-2	PSO-3
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			

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Course Content	
INTRODUCTION TO VALUE EDUCATION Value Education- Self-exploration as the Process for Value Education- Basic Human Aspirations and their Fulfilment- Right Understanding, Relationship and Physical Facility- Happiness and Prosperity – Current Scenario- Method to Fulfil the Basic Human Aspirations.	3 Hours
HARMONY IN THE HUMAN BEING Human Being as Co-existence of the Self and the Body- Distinguishing between the Needs of the Self and the Body- The Body as an Instrument of the Self- Understanding Harmony in the Self- Harmony of the Self with the Body- Programs to Ensure Self-regulation and Health.	3 Hours
HARMONY IN THE FAMILY AND SOCIETY Harmony in the Family –The Basic Unit of Human Interaction-'Trust' – The Foundational Value in Relationship-Respect – As the Right Evaluation- Other Values in Human-to-Human Relationship- Understanding Harmony in the Society . Lecture Vision for the Universal Human Order.	3 Hours
HARMONY IN 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

References:

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
4. Small is Beautiful - E. F Schumacher.
5. Economy of Permanence - J C Kumarappa
6. Bharat Mein Angrej Raj – Pandit Sunderlal



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7. Rediscovering India - by Dharampal 8. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi 9. India Wins Freedom - Maulana Abdul Kalam Azad 10. Vivekananda - Romain Rolland (English) 11. Gandhi - Romain Rolland (English)
Online Resources (Weblinks)
https://www.uhv.org.in/uhv-ii
Assessment (Theory course)
Presentatation,MCQ,Assignment,Case Study and E Chart.

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
		1.Dr.S.Sivakumar, Head/SFS/KCT 2.Dr.R.Prakasam,Assistant Professor,Department of Physics/KCT 3.Mr.J.Sivaguru,Assistant Professor,Department of Mechatronics/KCT	
Recommended by BoS on			
Academic Council Approval		Date	



BOS Chair

24EIJ204	INTERNSHIP-1	L	T	P	J	C
		0	0	0	2	1
PRJ		SDG	4,8,9			

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

Course Objectives:	
The purpose of taking this course is to:	
1	expose students to real industrial, research, start-up or innovation environments and professional work culture.
2	enable students to relate classroom learning with practical engineering systems, processes and technologies.
3	develop professional communication, teamwork, workplace ethics and lifelong learning competencies.
4	familiarize students with engineering standards, safety practices, sustainability principles and Industry 4.0 concepts.
5	encourage reflective learning through documentation, reporting and technical presentations.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	Explain the organizational structure, workflow and professional practices of the host organization.	U
CO 2	Apply fundamental engineering knowledge while performing assigned internship activities.	Ap
CO 3	Analyze industrial/research processes, technologies and engineering challenges encountered during the internship.	An
CO 4	Prepare professional documentation including internship diary, report and presentation	C
CO 5	Demonstrate ethical conduct, teamwork, communication skills and professional responsibility in workplace environments.	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	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	1	2		1		3	3	2	3	2	2	2	1

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

Course Content	
• Industry orientation • Industrial exposure • Professional practices • Internship report **DELIVERABLES** • Internship Completion Certificate • Internship Logbook • Internship Technical Report • Presentation and Viva Voce	40 Hours

Theory Hours:	Tutorial Hours:	Practical Hours:	Project Hours: 40	Total Hours: 40

Assessment (Internship/Project course)	
Internship Plan & Log Book	20%
Mid-Term Review	15%
Mentor Evaluation	20%
Internship Report	25%
Presentation & Viva	20%

Course Curated by			
Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)	
[Name, Organization]	[Name, Institution]	1. Dr. Dinesh Kumar V Associate Professor & Head, E&I, KCT 2. Umesh M V Associate Professor, E&I, KCT	
Recommended by BoS on	XX/YY/2024		
Academic Council Approval	No.	Date	XX/YY/2024



BOS Chair

FOURTH SEMESTER



BOS Chair

24HSP006	MASTERING DISCUSSION AND PRESENTATION SKILLS	L	T	P	J	C
		0	0	2	0	1
HS		SDG	4&8			

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

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

Course Outcomes:		
After successful completion of this course, the students shall be able to		RBT Levels
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	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative	Communication	Project Management and	Life-Long Learning	PSO-1	PSO-2	PSO-3
1		2			1	2		3	3		3			
2		2			1	2		3	3		3			
3		2			1	2		3	3		3			

BOS Chair

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. 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.	6 Hours
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 skill.	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



BOS Chair

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:	25.04.2025

BOS Chair

24ECI203	LINEAR INTEGRATED CIRCUITS (Common to ECE, EEE, E&I)	L	T	P	J	C
		3	0	2	0	4
PC		SDG	9			

Pre-requisite courses	24EII201, 24ECI102	Data Book / Code book (If any)	NA

Course Objectives:	
The purpose of taking this course is to:	
1	Introduce operational amplifiers, their structure, configurations, and characteristics.
2	Enable design and analysis of analog circuits using op-amps and special ICs.
3	Develop practical skills through hands-on experiments with linear integrated circuits.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	Describe op-amp structure, stages, and characteristics through basic experiments.	U
CO 2	Analyze and implement inverting, non-inverting, and differential amplifiers using op-amps.	An
CO 3	Analyze op-amp circuits such as adders, subtractors, integrators, differentiators, clippers, and clampers.	An
CO 4	Design and evaluate filters and waveform generators using op-amps and IC 555.	C
CO 5	Apply DAC and ADC techniques using R-2R, weighted resistor, flash, SAR, and dual-slope converters.	Ap
CO 6	Evaluate voltage regulator ICs through experiments and analyse the working of PLLs and VCOs in frequency control and modulation.	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	Conduct Investigations	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative	Communication	Project Management	Life-Long Learning	PSO-1	PSO-2
1	3	2										3	
2	3	3	2									3	
3	3	3	2	2								3	
4	3	2	3	2	2				1			3	1

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

Course Content	
BASICS OF OPERATIONAL AMPLIFIERS Basics of Operational Amplifiers – Ideal Operational Amplifier – General operational amplifier stages and internal circuit diagrams of IC 741, DC and AC performance characteristics, Open and closed loop configurations – Voltage follower, Inverting amplifier, Non-inverting amplifier, Differential amplifier. **PRACTICAL COMPONENT** • Inverting and non-inverting amplifiers	9 Hours 3 Hours
APPLICATIONS OF OPERATIONAL AMPLIFIERS Adder and subtractor, Instrumentation amplifiers, V-to-I and I-to-V converters, Differentiators and Integrators, Precision rectifiers, Wave shaping circuits (Clipper and Clampers), Log and Antilog amplifiers, Analog voltage multiplier circuit and its applications, Comparators, Schmitt trigger. **PRACTICAL COMPONENT** • Adder and subtractor • Integrator and differentiator • Clipper and clamper	9 Hours 9 Hours
FILTERS AND WAVEFORM GENERATORS Filters: Comparison between passive and active filters, Active filters: Low-pass, high-pass and band-pass filters – Waveform Generators: Sine, Square, Triangle, Sawtooth wave generators – IC 555 Timer: Monostable operation and its applications, Astable operation and its applications. **PRACTICAL COMPONENT** • Active filters • Waveform generation • Astable and Monostable multivibrators using IC 555 Timer	9 Hours 9 Hours
DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS D/A converter: Specifications, Weighted resistor type, R-2R ladder type – Sample and hold circuit – A/D Converter: Specifications, Flash type, Successive Approximation type, Dual Slope type, Sigma-delta converter. **PRACTICAL COMPONENT** • Digital to Analog conversion • Analog to Digital conversion	9 Hours 6 Hours
SPECIAL FUNCTION ICs IC Voltage regulators: Three terminal fixed and adjustable voltage regulators, IC 723 general purpose regulator, Monolithic switching regulator – Frequency to Voltage and Voltage to Frequency converters – PLL: Operation of PLL, Voltage Controlled Oscillator, PLL applications: AM and FM detection, FSK modulation and demodulation and frequency multiplier. **PRACTICAL COMPONENT** • IC Voltage regulator	9 Hours 3 Hours

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

Learning Resources
Textbooks
1. D. Roy Choudhry and Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 6th Edition (2021). 2. Ramakant A. Gayakwad and Rekha S., Op-Amps and Linear Integrated Circuits, Pearson Education, 4th Edition (Revised) (2021).
Reference books
1. Jacob Millman, Christos Halkias and Chetan Parikh, Integrated Electronics, McGraw Hill Education, 2nd Edition (2018). 2. Coughlin Robert F. and Driscoll Frederick F., Operational Amplifiers and Linear Integrated Circuits, PHI, 6th Edition (2011). 3. S Salivahanan and V. S. Kanchana Bhaskaran, Linear Integrated Circuits and Applications, McGraw Hill Education, 1st Edition (2018).
Online Educational Resources
1. https://onlinecourses.nptel.ac.in/noc24_ee73/preview 2. https://onlinecourses.nptel.ac.in/noc20_ee13/preview 3. https://training.ti.com/ti-precision-labs-op-amps 4. Falstad Circuit Simulator (Online Practical Tool): https://www.falstad.com/circuit/

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

Course Curated By			
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**		**Internal Expert(s)**
1. Mr. S. Chella Kumar, Staff CAD Engineer, Infinera India Pvt. Ltd., Bengaluru. 2. Ms. Candida John, Sembcorp Energy India Limited	1. Dr.V.P.Harigovindan, National Institute of Technology-Puducherry 2. Dr. Albert Alexander, VIT Vellore		1. Dr. P. Thirumoorthi, EEE 2. Dr. B. Gopinath, ECE 3. M. V. Umesh, E & I
Recommended by BoS on	07.05.2025		
Academic Council Approval	No: 28	Date	26.06.2025

BOS Chair

24EEI203	DIGITAL SYSTEM DESIGN (Common to ECE, EEE, E&I)	L	T	P	J	C
		3	0	2	0	4
PC		SDG	9			

Pre-requisite courses	24ECI102, 24EII201	Data Book / Codes / Standards (If any)	Nil

Course Objectives:	
The purpose of taking this course is to:	
1	Impart foundational knowledge of number systems, binary codes, Boolean algebra, and logic simplification techniques.
2	Develop analytical and practical skills in designing and implementing combinational and sequential circuits
3	Build competency in digital system design using state machine, programmable logic devices like FPGA and verilog HDL programming.

Course Outcomes:		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	Apply number systems and Boolean algebra to design basic digital circuits.	Ap
CO 2	Design and analyze the structure and functionality of various combinational circuits.	An
CO 3	Design and construct sequential circuits, including flip-flops, counters, and shift registers.	Ap
CO 4	Analyze synchronous sequential circuits using state diagrams and tables to examine state transitions and circuit behaviour.	An
CO 5	Apply Verilog HDL constructs with various modeling styles to simulate and test digital logic circuits.	Ap
CO 6	Develop, simulate and implement digital systems using logic gates and simulation tools	E

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of	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
CO1	3		1	1								2	1
CO2	3	2	1	1	2							2	2
CO3	3	3	1	2	2							2	2

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

Course Content

FUNDAMENTALS OF DIGITAL SYSTEMS Review of number systems, Logic gates, Binary codes and code converters - Boolean algebra and theorems - Sum of Product and Product of Sum simplification - Canonical forms - minterm and maxterm - Simplification of Boolean expressions - Karnaugh map (upto 4 variables). Basic IC Terminologies, Characteristics of Digital Logic families: TTL, ECL and CMOS logic. **PRACTICAL COMPONENT** • Implementation of Boolean Function using Gates. • Implementation of code converters using K-map.	9 Hours 6 Hours
DESIGN OF COMBINATIONAL LOGIC CIRCUITS Design of Combinational Circuits: Adders, Subtractors, Parallel Adder, Carry Look Ahead Adder, Digital Comparator, Parity Generator/Checker, Encoders, Decoders, Multiplexer, De-Multiplexer, Implementation of Boolean function using Multiplexer. **PRACTICAL COMPONENT** • Design and implementation of Adder / Subtractor circuits. • Design of combinational circuit using MUX/DEMUX.	9 Hours 6 Hours
SEQUENTIAL LOGIC CIRCUITS Latches and Flip Flops: SR, JK, T and D , Characteristic Equation, Excitation Table, Types of Triggering, Master Slave Flip Flop - Counters: Synchronous, Asynchronous Counter, Modulo-N Counter, Ring Counter - Shift Registers and its types. **PRACTICAL COMPONENT** • Design and implementation of Synchronous Counter. • Design and implementation of Asynchronous Counter.	9 Hours 6 Hours
STATE MACHINE DESIGN AND FPGA Classification of Sequential Circuits: Moore and Mealy Model, Design of Synchronous Sequential Circuit: State Diagram, State Table, State Reduction, State Assignment, Hazards in sequential circuits - Introduction to PLD and FPGA architectures. **PRACTICAL COMPONENT** • Design and implementation of synchronous sequential circuits	9 Hours 3 Hours
VERILOG HDL PROGRAMMING Overview of Digital Design with Verilog HDL- Basic concepts- Modules and Ports- Gate-Level Modeling- Dataflow Modeling- Behavioral Modeling-Verilog HDL programming examples: gates, multiplexer, encoders, adders, flip flops, counters. **PRACTICAL COMPONENT**	9 Hours

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• Simulation of Combinational Logic using Verilog HDL • Simulation of Sequential Logic using Verilog HDL • Realization of simple digital module in FPGA	9 Hours

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

Learning Resources*
Textbooks
1. M. Morris Mano, "Digital Logic and Computer Design", Pearson India Education Services Pvt. Ltd., New Delhi, 2018. 2. R. P. Jain, "Modern Digital Electronics", 4th Edition, Tata McGraw Hill Education Pvt Ltd., 2010. 3. A. Anand Kumar, "Fundamentals of Digital Circuits", 4th Edition, Prentice Hall India, 2016. 4. Samir Palnitkar, "Verilog HDL A guide to Digital Design and Synthesis" 2nd edition, Pearson, 2003.
Reference books/ Web Links
1. M. Morris Mano and Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog", Pearson India Education Services Pvt. Ltd., New Delhi, 2017. 2. Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson Education Limited, 2021. 3. Raj Kamal, "Digital Systems: Principles and Design", 3rd Edition, Pearson Education Limited, 2014. 4. John M. Yarbrough, "Digital Logic: Applications and Design", West Publishing Company, 2002. 5. David J. Comer, "Digital Logic & State Machine Design", Oxford University Press, 2012.
Online Resources
• https://onlinecourses.nptel.ac.in/noc21_ee39/preview • https://www.coursera.org/learn/digital-systems • https://www.allaboutcircuits.com/textbook/digital/chpt-9/combinational-logic-functions • https://youtube.com/playlist?list=PLBlnK6fEyqRiVhbXDGLXDk_OQAeuVcp2O • https://nptel.ac.in/courses/108106086
Free online tools
• https://www.tinkercad.com/circuits • https://www.falstad.com/circuit/ • https://circuitverse.org/simulator/ • https://www.dcode.fr/karnaugh-map-solver • https://www.edaplayground.com/ • https://hdlbits.01xz.net/wiki/Main_Page • https://www.xilinx.com/products/design-tools/vivado.html

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

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Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
Suganya M, Bosch Global Software Technologies PVT Ltd	Dr. Albert Alexander, Vellore Institute of Technology	Dr.. P.Thirumoorthi , EEE Dr. K.Paramasivam, EEE Dr. B. Gopinath, ECE Dr. I. Jeya Daisy, EIE
Recommended by BoS on	30.04.2025	
Academic Council Approval	No: 28	26.06.2025



BOS Chair

24EII204	SIGNAL PROCESSING TECHNIQUES Common EEE/EIE	L	T	P	J	C
		3	0	2	0	4
PC		SDG		9, 12		

Pre-requisite courses	24MAI113,24MAI233,24ECI102	Data Book / Code book (If any)	Nil

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the fundamentals of signals, systems, and transforms used in signal analysis and processing.
2	Develop practical skills to model, analyse, and simulate signals and systems using modern computational tools.
3	Build competency to design and evaluate signal processing solutions with a focus on performance and sustainability.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO1	Classify various signals and systems and formulate mathematical representation using differential and difference equations.	U
CO2	Analyze signal behaviour in time and frequency domains using the Fourier series, Fourier transforms and Z-transform.	An
CO3	Apply convolution and transformation techniques to model and simulate the response of continuous-time and discrete-time systems.	Ap
CO4	Apply DFT and FFT algorithms to perform frequency-domain analysis of discrete-time signals.	Ap
CO5	Design digital filters using appropriate techniques for performance and stability improvement.	An
CO6	Demonstrate signal processing methods by analysing their characteristics using analytical and simulation tools	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	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
CO1	3	2			1						1	3	1
CO2	3	3			2						1	3	2
CO3	2	3	2		1			2				3	3

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

COURSE CONTENT	
SIGNAL AND SYSTEMS Definition of Signals- Classification of Signals -Elementary Signals and Basic Operations –Introduction to Systems- Classification of Systems - Properties of Systems- Impulse Response Characterisation and Convolution (CT-LTI and DT-LTI)-System Representation Using Differential and Difference Equations – Applications: Smart home audio control systems. **PRACTICAL COMPONENTS:** • Standard signals, Mathematical operations on signals. • Convolution for CT and DT LTI systems and interpret outputs. • Simulation /modelling of LTI system using difference equations	9 Hours 6 Hours
FOURIER ANALYSIS CT Fourier Series and CT Fourier Transform (CTFT)- Properties of CTFT and Frequency Response - DT Fourier Series and Discrete-Time Fourier Transform (DTFT) - Properties and Applications of DTFT **PRACTICAL COMPONENTS:** • Computation of CTFT and Fourier series synthesis • Fourier Series Representation of Musical Tones • Fault detection and Vibration analysis in Rotating Machines - Simulation	9 Hours 6 Hours
Z-TRANSFORM Discrete-Time Complex Exponentials and Z-Transform - Region of Convergence and Properties - Inverse Z-Transform -Relationship between Z-Transform and Fourier Transform - Application to Solving Difference Equations **PRACTICAL COMPONENTS:** • Z-transform and inverse Z-transform computation • System analysis using Z-transform.	5 Hours 4 Hours
DISCRETE FOURIER TRANSFORM Introduction to DFT and its Properties, and limitations- FFT Algorithms for Efficient Computation - Radix-2 FFT: DIT and DIF Algorithms - Butterfly Diagrams – Applications: FFT in speech recognition systems **PRACTICAL COMPONENTS:** • Power Quality analysis using FFT • FFT in speech recognition systems • ECG Heartbeat Frequency Detection -Simulation	10 Hours 6 Hours
DESIGN OF DIGITAL FILTERS FIR Filter Design: Linear Phase and Windowing (Hamming, Hanning) - IIR Filter Design: Butterworth, Chebyshev - Impulse Invariant and Bilinear Transformation - FIR and IIR Structures: Direct Form I & II, Cascade, Parallel - Finite Precision Effects- Applications: Radar Signal Processing for Object Detection– Introduction to wavelet Transform.	12 Hours

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PRACTICAL COMPONENTS:	
• FIR filter Design • IIR filter design • Radar Signal Processing for Object Detection -Simulation • Precision effects on filter stability and response	8 Hours

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

LEARNING RESOURCES
TEXTBOOKS:
1. Alan V. Oppenheim, Alan S. Willsky, Signals and Systems, 2nd Edition, Pearson Education,2015 2. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing: Principles, Algorithms, and Applications, 5th Edition, Pearson Education,2021
REFERENCES:
1. Simon Haykin & Barry Van Veen, Signals and Systems, Wiley, 2nd Edition, Wiley India, 2007. 2. Sanjit K. Mitra, Digital Signal Processing: A Computer-Based Approach, 4th Edition, McGraw-Hill Education, 2013 3. P. Ramesh Babu & R. Anandanatarajan, Signals and Systems, Vijay Nicole, 2022 4. P. Ramesh Babu, Digital Signal Processing, 7th Edition, Vijay Nicole, 2011
ONLINE EDUCATIONAL RESOURCES:
SIGNALS AND SYSTEMS • NPTEL: Signals and Systems by Prof. Nagendra Krishnapura (IIT Madras) (https://nptel.ac.in/courses/117106084) • YouTube: Signals & Systems - EC Academy • Interactive Tool: Desmos Signal Explorer (for plotting signals) **FOURIER ANALYSIS OF CT AND DT SIGNALS** • NPTEL: Fourier Series and Transforms - IIT Kharagpur (https://nptel.ac.in/courses/117105144) • YouTube: Fourier Series – MathTheBeautiful • Simulation Tool: PhET Fourier: Making Waves **Z-TRANSFORM** • MIT OCW: Z-Transform Concepts (Video) (https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-003-signals-and-systems-fall-2011/) • YouTube: Z-Transform Tutorials by Dr. Saeed Roosta • Tool: Symbolab Z-Transform Calculator **DFT and FFT** • Khan Academy: Fourier Transform Intuition • YouTube: Understanding FFT - Steve Brunton • Online Tool: FFT Visualizer - Academo.org **DIGITAL FILTER DESIGN** • Coursera: Digital Signal Processing by EPFL

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- NPTEL: Digital Signal Processing – Prof. T. K. Basu (IIT KGP) (https://nptel.ac.in/courses/117105130)
- Online Tool: T-filter (FIR Design Tool)
- MATLAB Resource: Filter Design Using FDAtool (Official MATLAB Guide)

GENERAL TOOLS AND PLATFORMS

- MATLAB Online: https://matlab.mathworks.com
- Google Colab (Python + SciPy): https://colab.research.google.com
- GNU Octave (Free MATLAB alternative): https://www.gnu.org/software/octave/
- Scilab: https://www.scilab.org/

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

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
Vinayaka Hegde Director Software Development, Visteon	Dr Suyampu Lingam A Assistant Professor (Sr. Gr.), Amrita Viswa Vidyapeetham	Umesh M V Associate Professor E& I Dr. Kavitha R Associate Professor EEE Dr. Kandasamy V Associate Professor EEE	
Recommended by BoS on	29.11.2025		
Academic Council Approval	No 29	Date	24.12.2025

BOS Chair

24EII205	CONTROL PANEL DESIGN & RELAY LOGIC SYSTEMS	L	T	P	J	C
		2	0	2	0	3
PC		SDG	7, 9, 12			

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

Course Objectives:	
This aims the students to:	
1	Understand the functions, standards, and operating principles of industrial control panel components, wiring methods, motor control circuits, power distribution systems, and fluid power systems.
2	Develop skills in wiring control panels, implementing relay logic, designing motor starters, selecting LV power distribution components, and integrating pneumatic and hydraulic circuits
3	Apply multidisciplinary knowledge to design, implement, troubleshoot, and integrate electrical, motor control, and fluid power systems in industrial automation applications.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	Identify the functions of essential control panel and wiring standards.	U
CO 2	Implement relay logic circuits including latching, interlocking, timing, and counting operations.	Ap
CO 3	Construct, analyze and troubleshoot motor control circuits	An
CO 4	Analyze control panel layouts for safety, protection, thermal performance, and compliance with industrial standards.	An
CO 5	Develop pneumatic and electro-pneumatic control circuits integrated with relay logic for basic automation tasks	Ap
CO 6	Assemble a fully functional industrial control panel, demonstrating professional wiring, testing, documentation, and safety practices.	Ap



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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 [illegible]	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	2	1	1	1	1	2	–	–	1	–	3	
2	2	2	3	2	2	–	–	–	–	2	–	2	
3	2	2	3	3	2	–	–	–	–	3	1	2	3
4	2	3	2	3	2	2	3	2	–	2	1	3	
5	1	1	2	2	2	–	–	–	1	2	–	3	3
6	2	2	3	3	3	2	2	2	3	3	2	3	3

Course Content	
CONTROL PANEL COMPONENTS Introduction to control panels in automation – Types of Control panels: Power panels, MCC, PCC, Relay Logic panels - Wiring Standards: IEC/IS, cable types, ferruling conventions - Working principle of circuit breakers, relays, contactors, timers, counters, OLR - – LOTO (Lockout–Tagout) fundamentals for safe isolation before maintenance and troubleshooting – Introduction to VFD, power thyristor-based heater control **PRACTICAL COMPONENT:** • Identification, testing, and wiring of industrial control components (relays, contactors, timers, counters, OLR, pushbuttons, tower lamps). • Construction of a basic industrial Start–Stop control circuit with tower lamp status indication. • Heater load control using power-thyristor firing circuit with thermal overload demonstration.	4 Hours 6 Hours
RELAY LOGIC DESIGN & SEQUENTIAL CONTROL SYSTEMS Relay logic design principles - Latching, interlocking, seal-in circuits - Sequential machine operations (2-step, 3-step sequences) - Timer-based sequencing - Counter-based operations Industrial safety interlocks (door switch, OLR, E-stop) - Electrical diagrams - Mandatory LOTO application before modifying or testing relay logic circuits to prevent accidental energization. **PRACTICAL COMPONENT:** • Relay-based motor Start–Stop control with seal-in logic, OLR protection, and tower lamp alarm indication.	7 Hours 6 Hours

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• Timer-driven sequential industrial process control (Motor → Heater → Alarm) using relay–timer logic. • Industrial counting system using electromechanical counter and limit switch for part/bottle counting.	
MODULE 3: MOTOR CONTROL CIRCUITS & PROTECTION DOL starter construction & control - Forward–Reverse motor control (reversing logic) - Star–Delta starter control (timer-based) - Interlocking & protection - VFD overview – wiring external control terminals - Stepper motor basics & driver interface - Motor braking (DC injection / mechanical overview) - Load protection, fuses, OLR, surge suppressors- safe electrical maintenance. **PRACTICAL COMPONENT:** • Construction and testing of a complete DOL starter with MCB–Contactor–OLR–Motor and relay-based control. • Forward–reverse motor control using electrical/mechanical interlocking with tower lamp status indication. • Industrial control of AC motor via VFD external terminals and stepper motor using driver-based relay logic.	7 Hours 6 Hours
MODULE 4: CONTROL PANEL DESIGN, SAFETY AND THERMAL MANAGEMENT GA layout design, component placement and proper cable routing with power–control segregation. Electrical safety covering IP ratings, shock protection and isolation, safe shutdown during panel assembly, maintenance, and testing, safe earthing and grounding practices, arc-flash basics, short-circuit calculation overview, and over-temperature protection methods. Identification of heat sources, techniques for heat dissipation including ventilation, louvers, forced cooling, and heat sinks, basic thermal calculations for derating and airflow, and guidelines for infrared (IR) thermal inspection of control panels. **PRACTICAL COMPONENT** • Design of control panel GA layout and internal wiring routing using Automation Studio with industrial component placement. • Assembly and wiring of a complete industrial control panel (DOL, tower lamp, timer circuit) with proper cable management and safety practices. • Thermal and safety inspection of a control panel with load testing and implementation of ventilation or heat-sink solutions.	7 Hours 6 Hours
MODULE 5: ELECTRO-PNEUMATIC & HYDRAULIC SYSTEMS Pneumatic and hydraulic component basics - Actuators, valves, air preparation units - Electro-pneumatic solenoid valves - Relay-based control of cylinders - Safety in pneumatic systems hydraulic/pneumatic isolation to prevent stored-energy hazards. Application of timer-based sequencing for efficient and reliable industrial motion control systems. reduced leakage, and optimized air usage to minimize compressor energy consumption **PRACTICAL COMPONENT:**	5 Hours 6 Hours



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• Operation of single-acting and double-acting pneumatic cylinders using pushbutton-controlled circuits. • Electro-pneumatic cylinder extend–retract control using relay logic with solenoid valve interlocking. • Relay- and timer-based sequential electro-pneumatic system for pick-and-place operation	

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

Learning Resources

Textbooks:

1. McMillan, G. K., & Considine, D. M. (2019). Process/Industrial instruments and controls handbook (6th ed.). McGraw-Hill Education.
2. Fink, D. G., & Beaty, H. W. (2007). Standard handbook for electrical engineers (15th ed.). McGraw-Hill Education.

a. (Used as an authoritative source for control panel wiring, protection, and motor control.)

3. Schneider Electric. (2022). The essential guide to control panels (Latest ed.). Schneider Electric Publishing.

References:

1. Bureau of Indian Standards. (2023). National Electrical Code of India (NEC): IS SP 30 (Latest Revision). BIS Publications.
2. Chapman, S. J. (2012). Electric machinery fundamentals (5th ed.). McGraw-Hill Education.

a. (For motor control theory, starters, and protection systems.)

3. Esposito, A. (2021). Fluid power: Hydraulics and pneumatics (4th ed.). Pearson Education.
4. Coursera. (n.d.). Motor circuits and design. https://www.coursera.org/learn/motors-circuits-design

Assessment (Embedded course)

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

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr. Babukumar. S, Manager, Automation / Central Engineering, Apollo Tyres, Oragadam	[Name, Institution]	Mr. S. Ranganathan Assistant Professor Department of E&I

Recommended by BoS on	29.11.2025		
Academic Council Approval	No 29	Date	24.12.2025

BOS Chair

NM202	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		RBT Levels
CO1	apply the concept of natural resource conservation to demonstrate sustainability 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	Conduct Investigations	Engineering Tool	The Engineer and The	Ethics	Individual and Collaborative Team work	Communication	Project Managemen	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2	–	–	–	–	2	3	–	1	–	–	2	–	–

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

Course Content	
NATURAL RESOURCES Introduction to Natural resources: Types, significance, and conservation strategies Water resources: Utilization, management practices, and conservation strategies - rainwater harvesting methods.– Water distribution system audit Food resources: Challenges of food security in India - impact of modern agriculture, and environmental concerns related to fertilizers and pesticides. **Practical Component:** • Parameter Testing : Water / Effluent / Soil/Fertiliser • Simulation Experiments • Online Course	3 Hours 10 Hours
ECOSYSTEM AND BIODIVERSITY Ecosystem: Structure and function of an ecosystem- ecosystem resilience and adaptive capacity Biodiversity: Values of biodiversity - Hot Spot of biodiversity (in the Himalayas, the Western Ghats, the Indo-Burma region, and the Gulf of Mannar) - Threats to biodiversity. Conservation Strategies: Emerging Issues in Biodiversity Conservation - Citizen science - In-situ and Ex-situ conservation of biodiversity. **Practical Component:** • Documentation of biodiversity in the campus	3 Hours 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	3 Hours 2 Hours

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

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

Learning Resources

References:

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

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

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

BOS Chair

24INM102	INDIAN KNOWLEDGE SYSTEMS IN SCIENCE AND ENGINEERING (COMMONTOALL BRANCHES)	L	T	P	J	C
		1	0	0	0	1
HS		SDG	5,16			

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

Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes

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

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

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

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

Learning Resources

Textbooks:

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

References:

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

Online Resources (Weblinks)

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

Assessment (Theory course)
Presentation, MCQ, Assignment, Case Study and E Chart.

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

BOS Chair

FIFTH SEMESTER



BOS Chair

24HSP007	BUILDING PROFESSIONAL READINESS	L	T	P	J	C
		0	0	2	0	1
Practical		SDG	4&8			

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

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

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

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

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

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

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Learning Resources*

Reference books/ Web Links

1. Amos, J. (2004). Handling Tough Job Interviews: Be Prepared, Perform Well, Get the Job. United Kingdom: How To Books.
2. Clark, A. (2019). Cracking the Behavioral Interview Code!!! How to Answer Behavioral Interview Questions and Answer with a Preparation Guide + 20 Most Popular Behavioral Interview Questions and Answers.. (n.p.): Amazon Digital Services LLC - KDP Print US.
3. Collins, A. (2015). HR Interview Secrets: How to Ace Your Next Human Resources Interview, Dazzle Your Interviewers and LAND the JOB YOU WANT!. United States: Success in HR Publishing.
4. Downes, C. (2008). Cambridge English for Job-hunting Student's Book with Audio CDs (2). Germany: Cambridge University Press.
5. Hatcher, S. (2015). Group Interview Preparation: Learn How to Use Group Discussion to Your Advantage and Be Comfortable, Confident, and Likeable While Standing Out in a Group Interview. (n.p.): CreateSpace Independent Publishing Platform.
6. McKay, D. R. (2013). The Everything Job Interview Question Book: The Best Answers to the Toughest Interview Questions. United States: Adams Media.
7. Ryan, R. (2016). 60 Seconds and You're Hired!: Revised Edition. United States: Penguin Publishing Group.
8. Winter, S. (2020). Job Interview Preparation and Conversation Skills 2-in-1 Book: Learn How to Crush Your Next Job Interview and Develop A Magnetic Charisma to Enhance Your Communication Skills. United States: Native Publish

Online Resources

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

Assessment

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

Course Curated By

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

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

BOS Chair

24EIT301	FIELD INSTRUMENTATION	L	T	P	J	C
		3	0	2	0	4
PC		SDG	9, 12			

Pre-requisite courses	Sensors and Transducers	Data Book / Code book (If any)	ISA Standards

Course Objectives:	
The purpose of taking this course is to:	
1	Acquire knowledge on modern industrial field instruments and smart transmitters used in sustainable industries.
2	Develop skills in installation, calibration, commissioning and troubleshooting of field devices.
3	Build competency to design safe, reliable and energy-efficient instrumentation systems.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO1	Read and draw P&ID diagrams using ISA-5.1 instrument symbols, identification codes, and loop numbering conventions.	Ap
CO2	Execute calibration and troubleshooting of industrial instruments (pressure, flow, level, temperature) using HART communicators.	Ap
CO3	Configure WirelessHART and smart field transmitters and integrate them into IIoT-enabled process monitoring systems.	Ap
CO4	Analyse and select instruments for process measurements based on process conditions, fluid properties, and safety requirements.	An
CO5	Apply functional safety (IEC 61511) and ISA ethical principles in instrumentation system design and commissioning.	Ap
CO6	Design basic field instrumentation loops integrating smart transmitters, safety interlocks, and IIoT analytics.	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	Conduct Investigations	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative	Communication	Project Management	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	-	2	1	-	2	-	1	-	3	1

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

Course Content	
FIELD INSTRUMENTATION FUNDAMENTALS AND P&ID Industrial measurement systems; smart transmitters; 4-20 mA current loop-Instrument datasheets: functional specifications, environmental ratings, SIL - Lifecycle engineering and sustainable instrumentation practices- P&ID fundamentals (ISA-5.1): instrument identification codes (TIC, FIC, LT, PT, etc.); function designators; process lines; signal types-P&ID drawing exercise: oil & gas separator P&ID; refinery distillation column P&ID-Instrument loop diagram: loop numbering; junction box; field wiring; control room termination-Instrument index / equipment list: tag number, description, spec, location-ISA-18.2 Alarm Management: alarm rationalization; alarm priority (high/medium/low); nuisance alarms; PSSR (Pre-Startup Safety Review) **Practical Component:** • Draw and interpret a complete P&ID for a heat exchanger loop (TIC with cascade to FIC) per ISA-5.1	9 Hours 5 Hours
PRESSURE - FLOW INSTRUMENTATION Pressure sensing technologies: gauge, absolute, differential; Bourdon tube, diaphragm, capacitive cell-DP transmitter (Rosemount 3051): installation, wet leg/dry leg, purge-ISO 5167 flow measurement: orifice plate, Venturi, flow nozzle-Coriolis flow meter: operating principle, density measurement, energy efficiency-Electromagnetic flow meter: Faraday law; grounding rings; liner selection-Ultrasonic flow meter: transit-time and Doppler types-Smart DP transmitter features: HART configuration (Device ID, tag, range, units); multivariable transmitter (dP + P + T)-Custody transfer metering: API MPMS standards; proving; uncertainty in fiscal measurement-Low-flow metering: Coriolis for pharma/bio applications; micro-Coriolis (Emerson CMF010) **Practical Component:** • Dead weight tester calibration of DP transmitter; • HART communicator field calibration exercise	9 Hours 5 Hours
LEVEL - TEMPERATURE INSTRUMENTATION Contact level: displacer, capacitive, resistive types- Non-contact: radar (FMCW and pulse), ultrasonic level measurement -Guided Wave Radar (GWR): principle, single/twin-rod probe, application in interface measurement (oil-water)-Radar level transmitter configuration: VEGAPULS 64; antenna selection; echo curve interpretation-Temperature transmitter- RTD and thermocouple fundamentals; cold-junction compensation: HART-enabled head-mount transmitter (Rosemount 644); sensor drift detection-Multipoint temperature measurement: thermocouple array; averaging; hot-spot detection in reactors- Analytical instrument calibration: two-point pH calibration; conductivity cell constant; temperature compensation	9 Hours

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Practical Component: Radar level transmitter setup and HART configuration; echo curve analysis for agitated vessel	5 Hours
INSTALLATION, COMMISSIONING, MAINTENANCE AND TROUBLESHOOTING Industrial instrument installation practices, impulse piping, wiring techniques, grounding and shielding methods, loop checking- calibration- commissioning procedures and documentation practices-Preventive and predictive maintenance concepts-troubleshooting of field instruments and control loop-identification of wiring and transmitter faults, and safety practices during maintenance and commissioning activities. **Practical Component:** • Installation and testing of pressure transmitter with impulse piping arrangement	9 Hours 5 Hours
ANALYTICAL INSTRUMENTS AND SAFETY INSTRUMENTATION pH, conductivity, density/viscosity, humidity sensors - Smart transmitter architecture: microprocessor, sensor, ADC, HART modem - Gas analyser technologies: paramagnetic O2 analyser; NDIR CO/CO2 analyser; flame ionisation detector (FID) for VOC- Chromatograph overview: process gas chromatograph (PGC); application in refinery off-gas analysis- Safety Instrumented System (SIS) basics: IEC 61511 process safety lifecycle; Safety Instrumented Function (SIF); SIL rating- Safety sensor selection: SIL-rated pressure transmitter (Emerson 3051S SIS); voting logic (1oo2, 2oo3)- Hazardous area instrumentation: ATEX/IECEx zones (Zone 0/1/2 gas; Zone 20/21 dust); intrinsic safety (Ex ia); flameproof (Ex d)- Instrument commissioning checklist: loop check; functional test; as-built documentation; handover to operations **Practical Component: Mini-project** • Complete instrumentation loop design for a heat exchanger (P&ID → instrument selection → datasheet → loop diagram → HART calibration)	9 Hours 10 Hours

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

Learning Resources

Textbooks:

1. Lipták, B. G., & Venczel, K. (Eds.). (2022). Instrument and automation engineers' handbook: Process measurement and analysis (5th ed., Vols. 1–2). CRC Press
2. Johnson, C. D. (2014). Process control instrumentation technology (8th ed.). Pearson Education.
3. Dunn, W. C. (2013). Introduction to instrumentation, sensors, and process control (2nd ed.). Artech House.

References:

1. Bentley, J. P. (2018). Principles of measurement systems (5th ed.). Pearson.
2. Bolton, W. (2015). Instrumentation and control systems (2nd ed.). Elsevier.
3. *Morris, A. S., & Langari, R. (2016)*. Measurement and instrumentation: Theory and application *(2nd ed.)*. *Academic Press*.

4. *Battikha, N. E. (2010)*. The condensed handbook of measurement and control *(3rd ed.)*. *ISA*.
Online Educational Resources:
1. Field Comm Group. (2024). *HART and FOUNDATION™ fieldbus technology resources*. https://www.fieldcommgroup.org 2. Instrumentation Tools. (2024). *Industrial instrumentation tutorials and technical articles*. https://instrumentationtools.com 3. International Society of Automation. (2024). *ISA standards, publications, and webinars*. https://www.isa.org

Assessment (Theory course)
SA, 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)**
[Name, Organization]	[Name, Institution]		Dr.M.Saravanabalaji E & I, KCT
Recommended by BoS on	XX/YY/2024		
Academic Council Approval	No.	Date	XX/YY/2024

BOS Chair

24EII302	EMBEDDED SYSTEMS DESIGN AND DEVELOPMENT	L	T	P	J	C
		2	0	2	2	4
PC		SDG	SDG No's. 9,12			

Pre-requisite courses	24EII201, 24EEI203	Data Book / Code book (If any)	ARM Cortex-M reference, MISRA C:2012

Course Objectives:	
The purpose of taking this course is to:	
1	Develop competency in designing and programming modern embedded systems using ARM Cortex-M microcontrollers and embedded development platforms.
2	Build practical skills in peripheral interfacing, wireless communication, IoT connectivity, and RTOS-based embedded application development.
3	Introduce safety, reliability, and Edge AI concepts for intelligent embedded-system design on resource-constrained platforms

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	Apply modern embedded-system architecture and development platforms for embedded application development.	Ap
CO 2	Develop embedded applications for interfacing and communication using microcontroller peripherals	Ap
CO 3	Analyze wireless communication and IoT-based embedded system applications.	An
CO 4	Apply real-time operating system concepts for multitasking embedded applications.	Ap
CO 5	Analyze safety, reliability, and coding practices in embedded-system design.	An
CO 6	Evaluate Edge AI and TinyML applications on resource-constrained embedded platforms.	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	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative	Communication	Project Management and	Life-Long Learning	PSO-1	PSO-2
1	3	2	2	1	3	-	-	-	1	-	-	3	
2	3	2	3	2	3	-	-	-	1	1	-	3	

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

Course Content	
MODERN EMBEDDED SYSTEM ARCHITECTURE AND ARM CORTEX PLATFORMS Introduction to Embedded Systems - Embedded Applications in Industry and IoT- Memory Hierarchy in Embedded Systems - CISC vs RISC Architecture - ARM Cortex-M0/M3/M4/M7 Architecture - Interrupt Structures and NVIC- CMSIS Framework - Vendor Ecosystems (STM32/Nordic/NXP)- Modern Embedded Toolchains (STM32CubeIDE/Keil MDK/GCC ARM Toolchain)- Introduction to RISC-V **Practical Component:** • STM32 GPIO Peripheral Programming • GPIO Interrupt Programming • Configuration of STM32 Clock system	6 Hours 12 Hours
PERIPHERAL DRIVERS AND EMBEDDED INTERFACING GPIO Driver Development - Timer and Counter Programming - PWM Signal Generation - ADC and DAC Interfacing - UART Communication - SPI and I2C Protocols - CAN Bus Architecture - Framing and Error Detection -Interrupt Service Routines - DMA-Based Peripheral Access - Introduction to HAL-based and Register-Level Embedded Programming. **Practical Component:** • Audio Sensor Interfacing using ADC • Design of Sensor Data Logger • UART/SPI/I2C/CAN Sensor Driver Development	6 Hours 12 Hours
IOT CONNECTIVITY AND WIRELESS EMBEDDED SYSTEMS BLE Fundamentals- Wi-Fi and ESP-IDF Awareness - MQTT Concepts for IIoT - Sensor-to-Cloud Architecture - Embedded Wireless Communication - Industrial IoT Concepts **Practical Component:** • BLE-Based Sensor Data Transmission to Smartphone • ESP32 Wi-Fi Connectivity Demonstration • Python Visualization Tools for Sensor Data using Matplotlib	6 Hours 12 Hours
RTOS for Embedded Systems RTOS concepts - Free RTOS - Scheduling - Queues - Semaphores - Mutexes - Priority inversion **Practical Component:** • Task Creation • Multitasking scheduling • simple queue communication	6 Hours 12 Hours

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• Synchronize tasks using semaphore • Protect shared resource using mutex	
SAFETY-CRITICAL EMBEDDED SYSTEMS AND EDGE AI Watchdog Timers- Power-On Self-Test (POST) - CRC and Data Integrity Techniques - MISRA-C:2012 Coding Standard - IEC 61508 SIL Concepts - Introduction to Edge AI - TensorFlow Lite Micro - Edge Impulse Workflow - Energy-Aware Machine Learning on MCUs **Practical Component:** • Watchdog timer implementation • Audio classification • Gesture recognition • Anomaly detection • TinyML mini project	6 Hours 12 Hours

Theory Hours: 30	Tutorial Hours:	Practical Hours: 60	Project Hours:	Total Hours: 90

Learning Resources

Textbooks:

1. Barry, Richard., Mastering the FreeRTOS Real-Time Kernel., Latest Edition, Real Time Engineers Ltd., United Kingdom (2021)
2. Amos, Brian., Hands-On RTOS with Microcontrollers: Building Real-Time Embedded Systems using FreeRTOS, STM32 MCUs, and SEGGER Debug Tools., Packt Publishing, Birmingham (2020)
3. Zhu, Yifeng., Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C., 4th Edition, E-Man Press LLC, California (2023)
4. Yiu, Joseph., The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors., 3rd Edition, Newnes, Oxford (2014)

References:

1. Valvano, Jonathan W., Embedded Systems: Real-Time Interfacing to ARM Cortex-M Microcontrollers., 3rd Edition, CreateSpace Independent Publishing, Texas (2021)
2. Noergaard, Tammy., Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers., 2nd Edition, Elsevier, Burlington (2012).
3. White, Elecia., Making Embedded Systems: Design Patterns for Great Software., 2nd Edition, O'Reilly Media, Sebastopol (2024)
4. Marwedel, Peter., Embedded System Design: Embedded Systems Foundations of Cyber-Physical Systems., 4th Edition, Springer, Dordrecht (2021).
5. Gbati, Israel., Bare-Metal Embedded C Programming: Develop High-Performance Embedded Systems with C for ARM Microcontrollers., Packt Publishing, Birmingham (2024).

Online Educational Resources:

1. https://onlinecourses.nptel.ac.in/noc25_cs32/preview

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2. https://www.st.com/content/st_com/en/support/learning/stm32-education/stm32-moocs.html 3. https://academy.nordicsemi.com/ 4. https://www.freertos.org/Documentation/RTOS_book.html 5. https://docs.edgeimpulse.com/ 6. https://www.tensorflow.org/lite/microcontrollers 7. https://docs.espressif.com/projects/esp-idf/en/latest/esp32/ 8. https://docs.zephyrproject.org/latest/

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

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
[Name, Organization]	[Name, Institution]	Dr. I. JEYA DAISY Electronics and Instrumentation Engineering	
Recommended by BoS on	XX/YY/2026		
Academic Council Approval	No.	**Date**	XX/YY/2024

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24EII303	Control Engineering	L	T	P	J	C
		3	0	2	0	4
PC		SDG	7, 9, 12			

Pre-requisite courses	24EII201, 24EII204	Data Book / Code book (If any)	--

Course Objectives:	
The purpose of taking this course is to:	
1	Acquire the fundamental principles of classical and modern control systems, including mathematical modelling of physical systems, block diagram and signal-flow graph representations, time- and frequency-domain analysis, stability concepts, and state-space methods.
2	Develop the ability to model, analyse, simplify, evaluate, and design control systems using classical and modern control techniques, supported by MATLAB-based simulation and performance assessment.
3	Demonstrate competency in designing and validating stable, efficient, and reliable control systems for real-world engineering applications by integrating modelling, analysis, controller design, and simulation tools.

Course Outcomes		
After successful completion of this course, the students shall be able to		
CO 1	Develop transfer-function models of mechanical, electrical, thermal and electromechanical systems and distinguish open-loop and closed-loop configurations.	Ap
CO 2	Determine the overall transfer function of interconnected systems using block-diagram reduction and signal-flowgraph (Mason's gain formula) techniques.	Ap
CO 3	Analyse the transient and steady-state response of first- and second-order systems and interpret time-domain specifications and error constants.	An
CO 4	Assess the absolute and relative stability of linear systems using the Routh–Hurwitz criterion and the root-locus technique.	An
CO 5	Analyse system stability and performance in the frequency domain using Bode and Nyquist methods and design lead, lag and lead-lag compensators.	An
CO 6	Develop state-space models of linear systems and evaluate the controllability and observability.	Ap

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Crse 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	Problem Analysis	Design/Development	Conduct Investigations of	Engineering Tool	The Engineer	Ethics	Individual and Collaborat	Communication	Project Management and	Life-Long Learning	PSO-1	PSO-2
1	3	2			2	1						3	
2	3	3		2	2							3	
3	3	3		2	3	2						3	
4	3	3	3	3	3	2					1	3	1
5	3	3	3	2	3						2	3	2
6	3	3	2	3	3	2	1	2	1	1	2	3	2

Course Content	
MATHEMATICAL MODELLING OF DYNAMIC SYSTEMS • Open loop and closed loop systems; • Modelling of mechanical, electrical, thermal, electromechancial systems; transfer functions **Practical Component:** • MATLAB simulation: Modelling of Electric Vehicle Cruise Control System. • Derivation and validation of transfer function for a spring-mass-damper system.	7 Hours 6 Hours
BLOCK DIAGRAM ALGEBRA AND SIGNAL FLOW GRAPHS • Block diagram reduction; signal flow graph (SFG); Mason's gain formula • Multi-loop systems; aircraft pitch control model **Practical Component:** • MATLAB simulation: Block diagram reduction and SFG analysis for an Aircraft Pitch Control System.	6 Hours 3 Hours
TIME DOMAIN ANALYSIS OF CONTROL SYSTEMS • Standard test signals; first and second order system response; time domain specifications • Steady-state errors and error constants; generalised error constants **Practical Component:** • MATLAB simulation: step(), impulse(), lsim() commands; stepinfo() for time response & time domain specifications	6 Hours 3 Hours
STABILITY ANALYSIS Concept of stability – Routh-Hurwitz stability criterion – Root locus technique – Rules for construction of root locus – Effect of addition of poles and zeros – Introduction to Maglev Train control.	8 Hours

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Practical Component: • MATLAB simulation: Root locus plot for Magnetic Levitation System. • Stability check of temperature regulation in a chemical reactor using Routh Array.	6 Hours
FREQUENCY DOMAIN ANALYSIS Bode plot construction and stability analysis – Polar plot and Nyquist stability criterion – Frequency response specifications and analysis. **Practical Component:** • MATLAB simulation: Stability Analysis using Bode Plot for Smart Grid Frequency Response. • Nyquist Stability Verification for Industrial Flow Control System.	8 Hours 6 Hours
COMPENSATOR DESIGN Lead, Lag, Lead-Lag compensator design using Bode Plot. **Practical Component:** • Design and Implementation of Control Systems for Engineering Applications	3 Hours 3 Hours
STATE SPACE ANALYSIS State space formulation-state model of linear system-state diagram-state space representation using physical variable-, phase variable, canonical variable-Solution of state equations using Laplace Transform-Concepts of controllability and observability **Practical Component:** • State-Space Analysis in Electronic Systems	7 Hours 3 Hours

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

Learning Resources
Textbooks:
1. N. S. Nise, *Control Systems Engineering*, 8th ed. New Delhi, India: Wiley India Pvt. Ltd., 2020. 2. K. Ogata, *Modern Control Engineering*, 5th ed. New Delhi, India: Pearson Education, 2010. 3. B. C. Kuo, *Automatic Control Systems*, 10th ed. New Delhi, India: McGraw Hill Education, 2017.
References:
1. M. Gopal, *Control Systems: Principles and Design*, 5th ed. New Delhi, India: McGraw Hill Education, 2023. 2. R. C. Dorf and R. H. Bishop, *Modern Control Systems*, 13th ed. New Delhi, India: Pearson Education, 2020. 3. K. J. Åström and R. M. Murray, *Feedback Systems: An Introduction for Scientists and Engineers*. Princeton, NJ, USA: Princeton University Press, 2021.
Online Educational Resources:
1. Massachusetts Institute of Technology, "Feedback Systems," MIT OpenCourseWare. [Online]. Available: 2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-302-feedback-systems-fall-2007/

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3. NPTEL, "Control Systems," IIT Kharagpur. [Online]. https://nptel.ac.in/courses/108/106/108106098/
4. MathWorks, "Control System Toolbox Documentation." [Online]. https://www.mathworks.com/help/control/
5. Electrical4U – Control Systems Concepts *(Quick conceptual explanations for revision)* https://www.electrical4u.com/control-system/

Interactive & Visual Learning Platforms

- YouTube – Brian Douglas (Control Systems Series) ***(Best conceptual explanations for control theory)*** https://www.youtube.com/c/BrianBDouglas
- YouTube – Neso Academy (Control Systems) ***(Structured lecture-style videos)*** https://www.youtube.com/c/NesoAcademy
- Khan Academy (Math Foundations for Control) ***(Strengthens prerequisite math concepts)*** https://www.khanacademy.org/math

Assessment (Embedded course)
SA, Activity and Learning Tasks, Mini project, MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle Tests, Viva-voce

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Mr. R. Suresh Senior Technical Lead– Research on Electric Vehicle, Bosch Global Software Technologies Private Limited	Prof. S. Rajendran Associate Teaching Professor Electrical Engineering IIT-Gandhinagar		Dr. P.S. Mayurappriyan Professor Department of E&I
Recommended by BoS on	/YY/2026		
Academic Council Approval	No.	**Date**	XX/YY/2026

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24EII304	DATA STRUCTURES & ALGORITHMS FOR INTELLIGENT SYSTEMS	L	T	P	J	C
		1	0	4	0	3
PC		SDG	9,4,12			

Pre-requisite courses	24CSI103	Data Book / Code book (If any)	• Standard Time and Space Complexity Tables (Big-O, Ω, Θ) • Sorting and searching complexity comparison charts

Course Objectives:	
The purpose of taking this course is to:	
1	understand data structures, algorithms, and OOP concepts for computational and instrumentation systems.
2	develop analytical and programming capabilities for structured and real-time data problems.
3	design efficient, scalable, and resource-aware engineering solutions.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	explain DS, algorithms, and OOP principles	U
CO 2	apply DS for structured and streaming data	Ap
CO 3	analyze algorithm efficiency and scalability	An
CO 4	design modular OOP-based systems	Ap
CO 5	analyze and compare data structures and algorithms for suitability in different problem contexts	An
CO 6	analyze problem requirements and select appropriate data structures and algorithms for efficient implementation	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	PSO1	PSO2
	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	2			2	2					2	2	1
2	3	3	2		3	2		2	2		2		2
3	3	3		2	2	3					2	3	2

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

Course Content	
COMPUTATIONAL THINKING & DATA HANDLING Algorithm fundamentals, ADT, asymptotic analysis (Big-O, Ω, Θ) - Growth of functions and scalability - Characteristics of real-time engineering data: sensor data, time series data, streaming data, time stamp and sampling rate handling, missing data and outlier concepts **Practical Component – Embedded Practice & Application** • Compare iterative and recursive implementations of factorial/Fibonacci and analyze their execution time. • Empirical complexity study: measure runtime against input size and compare with best / average / worst case predictions. **Mini Application Task:** Develop a C program to analyze a set of sensor readings and identify missing readings (values less than 0) and abnormal readings (values greater than 100) using predefined threshold limits.Display each reading with its status (Normal, Missing, or Abnormal) and print the total number of normal, missing, and abnormal readings	6 Hours 6 Hours
LINEAR DATA STRUCTURES **Arrays:** Traversal, Insertion, Deletion and Searching – Sliding Window Technique and Ring Buffer (Introduction) – **Linked Lists:** Singly, Doubly and Circular Linked Lists – Applications: Circular Buffer for Sensor Data Acquisition, Data Logging and Rolling Average Computation (Overview). **Practical Component – Embedded Practice & Application** • Perform array operations: traversal, insertion, deletion, and searching. • Fixed-size sliding-window statistics (rolling mean / min / max) over sensor data. **Mini Application Task:** Develop a simple continuous sensor data logging system using a circular buffer to store and display the latest sensor readings.	06 Hours 06 Hours
STACKS & QUEUES Stack, Queue and Circular Queue ADTs – Deque and Priority Queue (Introduction) – Applications of Stacks and Queues: Function Call Stack, Expression Evaluation, Circular Buffer, Data Buffering and Printer Queue (Overview). **Practical Component – Embedded Practice & Application** • Implement Stack using arrays and perform Push, Pop, Peek, and Display operations. • Write a C program to implement a Linear Queue using an array and perform Enqueue, Dequeue, and Display operations. **Mini Application Task:** Develop a simple Sensor Data Buffering System using a Circular Queue in C.	06 Hours 06 Hours
OBJECT-ORIENTED PROGRAMMING	03 Hours

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Classes, Encapsulation – Inheritance, Polymorphism, Abstraction – Modular System Design – Graph Representation – Breadth First Search (BFS) – Depth First Search (DFS) – Shortest Path Algorithm (Dijkstra) – Travelling Salesman Problem (Overview) – Applications of Graph Algorithms in Network Routing and Path Planning (Overview). **Practical Component – Embedded Practice & Application** • create a class for a Sensor using data members, a constructor, and member functions to display the sensor details. • Implement inheritance using a Sensor class and a Temperature Sensor class. Display the sensor details. **Mini Application Task:** Develop a simple Industrial Communication Network Simulation using graph representation (Adjacency Matrix) and display the communication links between devices.	12 Hours
SEARCHING, SORTING & OPTIMIZATION Searching: linear, binary - Sorting: merge, quick, selection - Greedy algorithms (intro) - Sliding window algorithms - Basic Algorithm Analysis (Time and Space Complexity) – Applications in Embedded and Instrumentation Systems (Overview) **Practical Component – Embedded Practice & Application** • Implement a simple Sliding Window technique for calculating the moving average of sensor readings. • Analyze sensor data by finding the minimum, maximum, average, and identifying readings beyond predefined threshold values. **Mini Application Task:** Develop a simple Temperature Monitoring System to monitor sensor readings and identify high-temperature alerts using a predefined threshold value.	03 Hours 06 Hours

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

Learning Resources

Textbooks:

1. Cormen, Thomas H., Leiserson, Charles E., Rivest, Ronald L., and Stein, Clifford., *Introduction to Algorithms.*, **4th ed.**, MIT Press, Cambridge, MA (2022).
2. Balagurusamy, E., *Object Oriented Programming with C++.*, **8th ed.**, McGraw Hill Education, New Delhi (2020).

References:

1. Weiss, Mark Allen., *Data Structures and Algorithm Analysis in C++.*, **4th ed.**, Pearson Education, Boston (2014). *(Latest widely used academic edition)*
2. Goodrich, Michael T., Tamassia, Roberto., and Goldwasser, Michael H., *Data Structures and Algorithms in Python.*, **2nd ed.**, Wiley, Hoboken (2023).
3. Stroustrup, Bjarne., *Programming: Principles and Practice Using C++.*, **3rd ed.**, Addison-Wesley, Boston (2021).
4. Stroustrup, Bjarne., "Classes and Objects.", *The C++ Programming Language.*, **4th ed.**, Addison-Wesley, Boston (2013): pp. 45–120.

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5. Mittal, Sparsh., “A Survey of Techniques for Improving Energy Efficiency in Embedded Computing Systems.”, Technical Report, Iowa State University, USA (2014).
6. Gubbi, Jayavardhana., Buyya, Rajkumar., Marusic, Slaven., and Palaniswami, Marimuthu., “Internet of Things (IoT): A Vision, Architectural Elements, and Future Directions.”, *Future Generation Computer Systems*, Vol. 29 No. 7 (2013): pp. 1645–1660. DOI: 10.1016/j.future.2013.01.010,
7. Dean, Jeffrey., and Ghemawat, Sanjay., “MapReduce: Simplified Data Processing on Large Clusters.”, Proceedings of the 6th Symposium on Operating Systems Design and Implementation (OSDI)., San Francisco, USA (2004): pp. 137–150. DOI: 10.1145/1327452.1327492

Online Educational Resources:

1. **NPTEL – Data Structures and Algorithms**
   Provides comprehensive lecture series covering data structures, algorithm analysis, and problem-solving techniques.
   https://nptel.ac.in/courses/106105085
2. **SWAYAM – Programming and Algorithm Courses**
   Offers curriculum-aligned courses on programming, data structures, and embedded systems
   https://swayam.gov.in
3. **GeeksforGeeks – Data Structures & Algorithms**
   Structured tutorials, explanations, and examples for all core topics including arrays, linked lists, stacks, queues, and sorting algorithms.
   https://www.geeksforgeeks.org
4. **Programiz – Programming & OOP Concepts**
   Beginner-friendly explanations for programming and object-oriented concepts.
   https://www.programiz.com
5. **LeetCode – Algorithmic Problem Solving**
   Collection of structured problems covering arrays, linked lists, stacks, queues, searching, and sorting.
   https://leetcode.com
6. **HackerRank – Coding Practice & Skill Development** Practice problems and structured tracks for data structures and algorithms.
   https://www.hackerrank.com
7. **VisuAlgo – Interactive Algorithm Visualization**
   Visual representation of data structures and algorithms such as sorting, searching, graphs, stacks, and queues.
   https://visualgo.net
8. **Python Tutor – Code Execution Visualization**
   Step-by-step visualization of code execution for better understanding of logic and memory usage
   https://pythontutor.com
9. **Abdul Bari – Data Structures & Algorithms**
   Concept-focused explanations of algorithms and complexity analysis.
   https://www.youtube.com/c/AbdulBari

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10. FreeCodeCamp – Full DSA Courses
Long-form tutorials covering complete data structures and programming concepts. https://www.youtube.com/c/Freecodecamp

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

, **Course Curated by**			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Dr. T. Rajesh, Innovate Engineering Products.	[Name, Institution]		Umesh M V Associate Professor, EIE , KCT
Recommended by BoS on	XX/YY/2026		
Academic Council Approval	No.	Date	XX/YY/2026

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PROFESSIONAL ELECTIVES



24EIE001	Basics of Robotics and Mechanisms	L	T	P	J	C
		3	0	0	0	3
PE		SDG	9			

Pre-requisite courses	Engineering Mechanics, Engineering Mathematics , Basic Electrical Engineering	Data Book / Code book (If any)	NA

Course Objectives:	
The purpose of taking this course is to:	
1	build the kinematic, dynamic and mechanism vocabulary required for robotic systems.
2	develop the analytical skills to compute forward and inverse kinematics of serial manipulators.
3	introduce robot actuators, sensors, and end-effector design with sustainability and lifecycle considerations.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	classify robot types and mechanisms by structure, kinematic chain and degrees of freedom.	U
CO 2	apply Denavit–Hartenberg parameters to derive forward kinematics for 3–6 DoF manipulators.	Ap
CO 3	solve inverse kinematics for planar and spatial manipulators using geometric and algebraic methods.	Ap
CO 4	analyse Jacobians, singularities and basic dynamics (Newton–Euler / Lagrangian) of serial robots.	An
CO 5	select actuators, sensors and end-effectors for a given robotic task with cost and energy constraints.	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	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
CO1	3	2	–	–	–	–	–	–	–	–	1	1	2
CO2	3	3	2	–	2	–	–	–	–	–	1	1	3
CO3	3	3	2	–	2	–	–	–	–	–	1	1	3
CO4	3	3	2	2	2	–	–	–	–	–	1	2	3
CO5	2	2	3	–	2	2	–	–	–	–	2	2	3

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Course Content	
MODULE 1: INTRODUCTION TO ROBOTICS AND MECHANISMS Robot anatomy — structural components and classification; Robot classification: serial, parallel, hybrid manipulators; Workspace analysis and reachable/dexterous workspace; Applications across manufacturing and service sectors; Modern taxonomy per ISO 8373:2021; Cobots (Collaborative Robots) and mobile manipulators as distinct classes; Sustainability framing — robots as enablers vs. embodiments of energy consumption **Case Study** Deployment of collaborative robots (cobots) in automotive assembly lines for human–robot collaboration, productivity improvement, and energy-efficient manufacturing.	**9 Hours**
MODULE 2: SPATIAL DESCRIPTIONS AND FORWARD KINEMATICS Rigid body transformations; position and orientation representation; Rotation matrices-properties, inverse, composition; Homogeneous transforms-translation + rotation; Denavit–Hartenberg parameter convention; Forward kinematics of 3–6 DoF arms(serial manipulators); Roboticists' workflow on modern toolchains: brief introduction to URDF and the concept (not depth) of ROS 2 transforms, Worked examples: 3-DoF planar arm, Stanford manipulator, PUMA 560 **Case Study** Kinematic modelling of a 6-DoF industrial robotic arm used in automated welding applications.	**9 Hours**
MODULE 3: INVERSE KINEMATICS AND VELOCITY ANALYSIS Inverse kinematics problem formulation — geometric and algebraic approaches ;Geometric IK for planar 2-DoF and 3-DoF arms; Pieper's solution for wrist-partitioned arms(6-DoF manipulators); Jacobian matrix — derivation and physical interpretation; manipulability measure and ellipsoid; singularities— types, detection and avoidance; Numerical IK (damped least-squares) concept-level introduction; awareness of how modern motion planners use the Jacobian **Case Study** Inverse kinematics and singularity analysis in robotic surgical manipulators for precision healthcare applications.	**9 Hours**
MODULE 4: DYNAMICS AND CONTROL BASICS Newton–Euler recursive dynamics— outward/inward recursion; Lagrangian formulation— kinetic and potential energy for 2–3 DoF; Equations of motion: $M(q)\ddot{q} + C(q,\dot{q})\dot{q} + G(q) = \tau$; joint-space PD control with gravity compensation; Brief introduction to torque-controlled robots; impedance and compliance control concepts **Case Study** Dynamics and impedance control in torque-controlled robotic manipulators used in collaborative manufacturing.	**9 Hours**
MODULE 5: ACTUATORS, SENSORS, END-EFFECTORS & SUSTAINABILITY ROBOT CONTROL AND INDUSTRIAL AUTOMATION DC, BLDC and servo motors— principles, torque-speed characteristics; harmonic drives— gear reduction, zero backlash, compliance; pneumatic actuators— cylinders, grippers, safety considerations; encoders— position and velocity sensing, force/torque sensors— 6-axis F/T sensing for compliant tasks; End-effectors:	**9 Hours**

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grippers (parallel, angular, vacuum), special tooling; Energy-efficient drives, regenerative braking in robotics; End-of-life and circularity (robots as e-waste vs. recoverable platforms); Soft actuators awareness— pneumatic artificial muscles, dielectric elastomers (awareness level) **Case Study** Sustainable robotic systems with regenerative braking and recyclable actuator platforms in warehouse automation.	

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

Learning Resources
Textbooks:
1. Groover, Mikell. Industrial Robotics: Technology, Programming and Applications, McGraw-Hill, New York 2015. 2. Craig, John J. Introduction to Robotics: Mechanics and Control, Pearson, Boston 2018. 3. Siciliano, Bruno. Robotics: Modelling, Planning and Control, Springer, Berlin 2016
References:
1. M. W. Spong, S. Hutchinson, and M. Vidyasagar, Robot Modeling and Control, 2nd ed. Hoboken, NJ, USA: Wiley, 2020. 2. S. B. Niku, Introduction to Robotics: Analysis, Control, Applications, 3rd ed. Hoboken, NJ, USA: Wiley, 2019. 3. K. S. Fu, R. C. Gonzalez, and C. S. G. Lee, Robotics: Control, Sensing, Vision and Intelligence. New York, NY, USA: McGraw-Hill, 2017.
Online Educational Resources:
1. NPTEL, “Introduction to Robotics,” Available: https://nptel.ac.in/courses/106105195 2. MIT OpenCourseWare, “Introduction to Robotics,” Available: https://ocw.mit.edu/courses/2-12-introduction-to-robotics-fall-2005/ 3. ROS Documentation, “ROS 2 Documentation,” Available: https://docs.ros.org/en/rolling/index.html 4. IEEE Robotics and Automation Society, Available: https://www.ieee-ras.org/ 5. Modern Robotics, Northwestern University, Available: https://modernrobotics.northwestern.edu/

Assessment (Theory course)
Sa, Activity and Learning Task(s) - Think–Pair–Share, Case Study, Concept Mapping , Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
[Name, Organization]	[Name, Institution]		E. Muthuramalingam
Recommended by BoS on	XX/YY/2026		
Academic Council Approval	No.	**Date**	XX/YY/2026



BOS Chair

24EIE012	INDUSTRIAL SAFETY AND HAZARDOUS SYSTEMS	L	T	P	J	C
		3	0	0	0	3
PE		SDG	7, 9, 11			

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

Course Objectives:	
The purpose of taking this course is to:	
1	Acquire the fundamental concepts of industrial safety, hazardous systems, safety standards, risk assessment and functional safety used in process industries.
2	Develop the ability to analyse industrial hazards, hazardous systems, occupational health risks and safety practices for ensuring safe plant operation.
3	Demonstrate competency in applying safety engineering principles, safety instrumented systems and risk management techniques in industrial environments.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT
CO 1	Explain industrial safety principles, hazards, safety standards and Safety Instrumented Systems (SIS).	Un
CO 2	Analyze hazardous systems and apply risk assessment techniques including FTA, ETA, FMEA and HAZOP.	An
CO 3	Analyze safety requirements in process control and instrumentation systems for functional safety.	An
CO 4	Apply industrial safety practices to fire protection, occupational health and hazardous system management.	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	Conduct Investigations of Complex	Engineering Tool Usage	The Engineer and The	Ethics	Individual and	Communication	Project Management	Life-Long	PSO-1	PSO-2
1	3	2			2		1					3	2
2	3	3		2	2		1					3	3
3	3	3	2	2	3		3					3	3
4	3	3	3		3		2			1	1	3	1

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Course Content	
INTRODUCTION TO INDUSTRIAL SAFETY Overview of Industrial Safety and its Importance – Types of Industrial Hazards (Mechanical, Electrical, Chemical, etc.) – Safety Standards and Regulations (OSHA, ISO) – Risk Assessment and Management Techniques – Safety Instrumented Systems (SIS) and Safety Integrity Levels (SIL).	**9 Hours**
HAZARDOUS SYSTEMS AND RISK MANAGEMENT Types of Hazardous Systems in Industries – Fault Tree Analysis (FTA) and Event Tree Analysis (ETA) – Failure Modes and Effects Analysis (FMEA) – Risk Matrix and Hazard and Operability Study (HAZOP) – Emergency Planning and Response.	**9 Hours**
SAFETY IN PROCESS CONTROL AND INSTRUMENTATION Safety Considerations in Process Control Systems – Role of Sensors and Actuators in Safety Systems – Redundancy and Reliability in Instrumentation – Functional Safety of Safety-Critical Systems – Safety Compliance in Control System Design.	**9 Hours**
FIRE AND EXPLOSION PREVENTION IN INDUSTRIES Causes and Consequences of Fires and Explosions – Fire Detection and Suppression Systems – Explosion Protection Techniques (Inerting, Venting) – Safety Measures in Flammable and Combustible Material Handling – Case Studies on Industrial Fires and Explosions.	**9 Hours**
OCCUPATIONAL HEALTH AND SAFETY IN INDUSTRIES Occupational Health Hazards (Chemical, Biological, Physical) – Personal Protective Equipment (PPE) and Safety Training – Ergonomics and Human Factors – Health and Safety Audits and Compliance – Incident Reporting and Investigation Techniques.	**9 Hours**

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

Learning Resources

Textbooks:

1. C. Ray Asfahl and David W. Rieske, *Industrial Safety and Health Management*, 7th Edition, Pearson, 2022
2. Frank P. Lees, *Lees' Loss Prevention in the Process Industries: Hazard Identification, Assessment and Control*, 4th Edition, Butterworth-Heinemann (Elsevier), 2012.
3. Center for Chemical Process Safety (CCPS), *Guidelines for Hazard Evaluation Procedures*, 3rd Edition, Wiley, 2008.

References:

1. Paul Gruhn and Harry L. Cheddie, *Safety Instrumented Systems: Design, Analysis, and Justification*, 2nd Edition, ISA (International Society of Automation), 2006.
2. Charles D. Reese, *Occupational Health and Safety Management: A Practical Approach*, 4th Edition, CRC Press, 2020.
3. Daniel A. Crowl and Joseph F. Louvar, *Chemical Process Safety: Fundamentals with Applications*, 4th Edition, Pearson, 2020.
4. Dennis P. Nolan, *Handbook of Fire and Explosion Protection Engineering Principles*, 4th Edition, William Andrew (Elsevier), 2019.



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5. CCPS (Center for Chemical Process Safety), *Guidelines for Risk Based Process Safety*, 1st Edition, Wiley-AIChE, 2007.

Online Educational Resources:

1. Directorate General Factory Advice Service & Labour Institutes (DGFASLI), Ministry of Labour & Employment, Government of India
   Industrial Safety, Occupational Health, Factory Safety, Industrial Hygiene, Safety Legislation and Training.
2. Petroleum and Explosives Safety Organisation (PESO), Government of India
   Safety regulations for hazardous chemicals, explosives, petroleum installations and pressure vessels.
3. National Disaster Management Authority (NDMA), Government of India
   Industrial disaster management, emergency planning, chemical disaster management and risk mitigation guidelines.
4. National Safety Council of India (NSCI) – Training & E-Learning Portal
   Industrial Safety, Fire Safety, Chemical Safety, Electrical Safety, Occupational Health and Safety training programmes.
5. Occupational Safety and Health Administration (OSHA), U.S. Department of Labor
   Industrial safety standards, hazard communication, machine safety, process safety management and safety regulations.
6. National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention (CDC)
   Occupational health, ergonomics, workplace exposure assessment and industrial hygiene.
7. Center for Chemical Process Safety (CCPS), American Institute of Chemical Engineers (AIChE) *HAZOP, Risk Assessment, Layer of Protection Analysis (LOPA), Process Safety Management and Chemical Process Safety.*
8. International Society of Automation (ISA) – Functional Safety Resources
   Safety Instrumented Systems (SIS), Safety Integrity Level (SIL), IEC 61511 and Functional Safety.

Assessment (Theory course)
SA, Activity and Learning Tasks, Mini project, MCQ, End Semester Examination (ESE)

Course Curated by		
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**
		Mr. V. Athappan Assistant Professor Department of E&I
Recommended by BoS on	XX/YY/2026	
Academic Council Approval	No.	Date XX/YY/2026

BOS Chair

24EIE014	BUILDING AUTOMATION	L	T	P	J	C
		3	0	0	0	3
PE		SDG	7, 9, 11			

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

Course Objectives:	
The purpose of taking this course is to:	
1	Acquire the fundamental concepts of Building Management Systems (BMS), HVAC, security, fire protection, CCTV, energy management and communication systems used in modern buildings.
2	Develop the ability to analyse the operation and integration of building automation subsystems for improving safety, occupant comfort, energy efficiency and sustainable building operation.
3	Demonstrate competency in designing integrated Building Management Systems by selecting appropriate automation technologies and communication protocols for smart building applications.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	Explain the architecture, components and operation of Building Management Systems and HVAC automation.	Un
CO 2	Analyse the operation of access control, fire alarm, CCTV, energy management and communication systems used in intelligent buildings.	An
CO 3	Analyse the integration and operation of building automation subsystems for safe, secure, and energy-efficient building management.	An
CO 4	Design an integrated Building Management System by selecting appropriate automation technologies for smart building 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	Conduct Investigations of Complex	Engineering Tool Usage	The Engineer and The	Ethics	Individual and Collaborative	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2			2		1					3	2

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

Course Content	
INTRODUCTION TO BUILDING AUTOMATION • Introduction to smart buildings and Building Management Systems (BMS) • Architecture and components of BMS • Sensors, actuators and controllers • Communication protocols (BACnet, Modbus, KNX) • Benefits and applications of building automation	9 Hours
HVAC AUTOMATION AND ENERGY MANAGEMENT • Components of HVAC systems • Heating, ventilation and air-conditioning control • Building Energy Management System (BEMS) • Lighting control and occupancy sensors • Energy-efficient and green buildings	9 Hours
ACCESS CONTROL AND FIRE SAFETY SYSTEMS • Physical security systems • RFID, biometric and smart card access control • Fire detection and alarm systems • Smoke, heat and gas detectors • Public Address (PA) and emergency evacuation systems	9 Hours
CCTV AND BUILDING COMMUNICATION SYSTEMS • CCTV system architecture and components • IP cameras and video recording systems • EPABX/IP telephony systems • Elevator and parking automation • Water supply and utility monitoring	9 Hours
BUILDING MANAGEMENT SYSTEM INTEGRATION • Integration of HVAC, fire, security, CCTV and lighting systems • Supervisory monitoring and control • IoT applications in building automation • Cybersecurity basics in smart buildings • Case studies of intelligent buildings	9 Hours

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

Learning Resources

Textbooks:

1. Shengwei Wang, *Intelligent Buildings and Building Automation*, 2nd Edition, Routledge, 2022.



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2. Jim Sinopoli, *Smart Buildings Systems for Architects, Owners and Builders*, 2nd Edition, Elsevier (Butterworth-Heinemann), 2010.
3. CIBSE Guide H: Building Control Systems, Chartered Institution of Building Services Engineers (CIBSE), Latest Edition.

References:

1. H. Michael Newman, *HVAC Control Systems*, McGraw-Hill Education, 2019.
2. Robert Gagnon, *Design of Special Hazard and Fire Alarm Systems*, 3rd Edition, Delmar Cengage Learning, 2018.
3. Honeywell Building Technologies, *Building Management Systems Engineering Guide*, Latest Edition.
4. Schneider Electric, *EcoStruxure Building Operation Technical Guide*, Latest Edition.
5. Siemens Smart Infrastructure, *Building Automation Systems Handbook*, Latest Edition.

Online Educational Resources:

1. ASHRAE Learning Institute – Building Automation and HVAC Controls.
2. CIBSE Knowledge Portal – Building Services Engineering.
3. Schneider Electric – EcoStruxure Building Operation Documentation.
4. Siemens Smart Infrastructure – Building Automation Learning Portal.
5. Honeywell Building Technologies – Building Management Systems Resources.
6. IGBC (Indian Green Building Council) – Green Building Guidelines.

Assessment (Theory course)
SA, Activity and Learning Tasks, Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
		Dr. P.S. Mayurappriyan Professor Department of E&I	
Recommended by BoS on	/YY/2026		
Academic Council Approval	No.	**Date**	XX/YY/2026

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24EIE021	Bio Sensors and Medical Instrumentation	L	T	P	J	C
		3	0	0	0	3
PE		SDG	3 , 9			

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

Course Objectives:	
The purpose of taking this course is to:	
1	build literacy in bioelectric and biomagnetic phenomena underlying medical sensors.
2	develop competence in biopotential amplifiers, electrode systems, and noise mitigation.
3	introduce medical device electrical safety per IEC 60601 with sustainability framing.

Course Outcomes		
After successful completion of this course, the students shall be able to		RBT Levels
CO 1	explain the origin of bioelectric and bio-magnetic signals (ECG, EEG, EMG, EOG).	U
CO 2	design biopotential amplifier front-ends meeting CMRR and isolation requirements.	An
CO 3	apply electrode selection criteria (Ag/AgCl, dry, capacitive) to clinical contexts.	Ap
CO 4	configure instrumentation for non-electrical physiological measurements (BP, SpO_2, temp, respiration).	Ap
CO 5	apply IEC 60601-1 electrical-safety classifications to device design	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	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	2	-	-	-	-	-	-	-	-	1	3	1
2	3	3	2	-	2	-	-	-	-	-	1	3	1
3	2	3	2	-	2	-	-	-	-	-	1	3	1
4	2	3	2	-	2	3	2	-	-	-	1	3	1
5	2	2	2	-	-	3	2	-	-	-	1	3	2

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Course Content	
BIOELECTRIC ORIGINS AND PHYSIOLOGICAL SIGNALS Membrane potentials; action potential; cardiac cycle; ECG/EEG/EMG/EOG origins; signal characteristics, Brief introduction to wearable PPG and continuous-glucose-monitor signals **Case Study** • Wearable ECG and Continuous Glucose Monitoring System	09 Hours
ELECTRODES & BIOPOTENTIAL AMPLIFIERS Types of electrodes: Ag/AgCl electrodes; electrode-electrolyte interface; Signal acquisition systems -Noise and interference in biomedical signals instrumentation amplifiers; CMRR; isolation amplifiers; driven-right-leg; Dry and capacitive electrodes for wearables; INA819-class modern instrumentation amplifier ICs **Case Study** • ICU ECG Acquisition System using Instrumentation Amplifier	09 Hours
NON-ELECTRICAL PHYSIOLOGICAL MEASUREMENTS Blood pressure measurement systems(oscillometric, auscultatory);SpO_2; Temperature; respiration; - blood-flow (Doppler basics);Cuffless BP awareness with accuracy caveats; multi-wavelength pulse oximetry **Case Study** • Smart Pulse Oximeter and Cuffless BP Monitoring	09 Hours
PATIENT MONITORING SYSTEMS Multi-parameter monitors; alarms; trends; ICU and OT instrumentation; Networked monitors; HL7 / FHIR awareness; **Case Study** • Smart ICU Multi-Parameter Monitoring System	09 Hours
ELECTRICAL SAFETY & SUSTAINABILITY Electrical safety in medical equipment - Macroshock and microshock; leakage currents; equipment classes (I, II); applied parts (B, BF, CF); IEC 60601-1 latest edition updates; sustainability — reusable vs. single-use trade-offs; reprocessing standards **Case Study** • IEC 60601-Based Electrical Safety Testing in Hospitals	09 Hours

Theory Hours:	45	Tutorial Hours:	00	Practical Hours:	00	Project Hours:	00	Total Hours:	45

Learning Resources
Textbooks:
1. R. S. Khandpur, *Handbook of Biomedical Instrumentation*, 4th ed., New Delhi, India: McGraw Hill Education, 2020. 2. J. G. Webster and J. W. Clark, *Medical Instrumentation: Application and Design*, 5th ed., Hoboken, NJ, USA: Wiley, 2018.
References:
1. J. Carr and J. Brown, *Introduction to Biomedical Equipment Technology*, 5th ed., London, U.K.: Pearson, 2021. 2. J. Enderle and S. Blanchard, *Introduction to Biomedical Engineering*, 3rd ed., Burlington, MA, USA: Elsevier, 2019.

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3. A. Turner, “Biosensors: Fundamentals and Applications,” *IEEE Sensors Journal*, vol. 21, no. 5, pp. 5678–5690, 2021.

Online Educational Resources:

NPTEL / SWAYAM Courses

- **Biomedical Instrumentation**
  https://nptel.ac.in/courses/108105101
- **Biosensors and Applications**
  https://swayam.gov.in/nd2_cec20_bt08/preview
- **Medical Devices and Healthcare Technology**
  https://nptel.ac.in/courses/102106065

MOOC Platforms

1. **Digital Health and Wearable Technologies (Coursera)**
   https://www.coursera.org/learn/digital-health
2. **Introduction to Biomedical Engineering (Coursera)**
   https://www.coursera.org/learn/biomedical-engineering
3. **AI in Healthcare (edX)**
   https://www.edx.org/course/ai-for-healthcare

IEEE & Research Resources

1. **IEEE Xplore – Biosensors Collection**
   https://ieeexplore.ieee.org
2. **Nature Biomedical Engineering Journal**
   https://www.nature.com/natbiomedeng
3. **PubMed Central (Biomedical Articles)**
   https://www.ncbi.nlm.nih.gov/pmc

Visual Learning (YouTube – Educational Channels)

1. **Biomedical Instrumentation Lectures (NPTEL)**
   https://www.youtube.com/playlist?list=PLbMVogVj5nJQJqJkFvFzYw5dQkX9X2sFJ
2. **Biosensors Explained (Learn Engineering)**
   https://www.youtube.com/watch?v=QG2J0ZzZ1eE
3. **Medical Imaging Systems (MRI/CT Basics)**
   https://www.youtube.com/watch?v=6l3z2H9s0tM

Simulation & Practical Learning Tools

1. **NI Multisim (Circuit Simulation)**
   https://www.ni.com/en-in/shop/multisim.html
2. **MATLAB for Biomedical Signal Processing**
   https://www.mathworks.com/solutions/biomedical-engineering.html
3. **LabVIEW for Medical Instrumentation**
   https://www.ni.com/en-in/shop/labview.html

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



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Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
[Name, Organization]	[Name, Institution]		Dr. Anilkumar K K Professor and Associate Dean -CCE, KCT
Recommended by BoS on	XX/YY/2026		
Academic Council Approval	No.	**Date**	XX/YY/2026



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