KUMARAGURU COLLEGE OF TECHNOLOGY

An Autonomous Institution Affiliated to Anna University, Chennai

COIMBATORE – 641 049

B.E. ELECTRONICS & INSTRUMENTATION ENGINEERING

REGULATIONS 2024

I TO VIII SEMESTERS

CURRICULUM

Department of

Electronics & Instrumentation Engineering

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BoS Chairman 

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.

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PSO 2 : Integrate programmable logic controllers (PLC), distributed control systems (DCS) for

PROGRAMME OUTCOMES

manufacturing and processing systems and gain proficiency in relevant software tools.

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

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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)

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 insociety 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 behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity

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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**

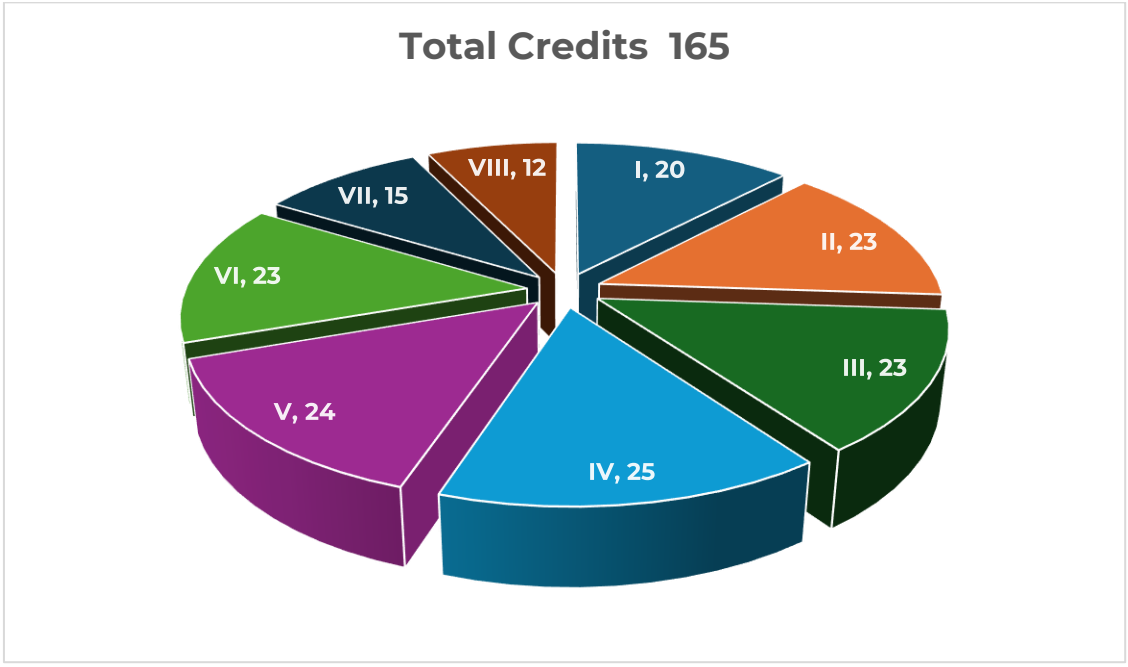
HNIQUES									
S. No.	**Course Code**	**Course Title**	**Course Type**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1	24HSP005	Mastering Conversations	Theory	HS	0	0	2	0	1
2	24MAI233	Probability and Applied Statistics	Embedded	BS	3	0	2	0	4
3	24MET205	Thermodynamics & Fluid Mechanics	Theory	ES	3	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	0	2	1
8	24INO---	FCLF – General Stack - 3	Theory	OE	0	0	2	0	1
9	24INM201	Universal Human Values - 2	Theory	HS	1	0	0	0	1
10	24EIJ204	Internship/Camps/MiniProjects-1	Project	PC	0	0	0	2	1
								Total Credits	**23**
								Total Contact Hours/Week	**27**
Semester IV									
S. No.	**Course Code**	**Course Title**	**Course Type**	**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	24EEI204	Digital System Design	Embedded	PC	3	0	2	0	4
4	24EII204	Signal Processing Techniques	Embedded	PC	3	0	2	0	4
5	24EII205	Microcontroller and Applications	Embedded	PC	2	0	2	0	3
6	24EII206	Control Panel Design and Relay Logic System	Embedded	PC	2	0	2	0	3
7	24INO---	FCLF – Tech. Stack - 1	Theory	OE	0	0	2	0	1
8	24INO---	FCLF – Emerging Tech Stack - 1	Theory	OE	0	0	2	0	1
9	24INP202	Innovation Practicum - 4	Practical	ES	0	0	2	0	1
10	24INM202	Environmental Science & Sustainability	Theory	BS	2	0	0	0	2
11	24INMXXY	Indian Knowledge System	Theory	HS	1	0	0	0	1
								Total Credits	**25**
								Total Contact Hours/Week	**30**

Semester V									
S. No.	**Course code**	**Course Title**	**Course Type**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1	24HSTP007	Building Professional Readiness	Theory	HS	0	0	2	0	1
2	24EIT301	Field Instrumentation	Embedded	PC	2	0	2	0	3
3	24EIT302	Embedded Microcontrollers	Embedded	PC	2	0	2	0	3
4	24EII303	Control systems	Embedded	PC	3	0	2	0	4
5	24EII304	Industrial Automation	Embedded	PC	2	0	2	0	3
6	24EIT305	Object-Oriented Programming and Data Structures	Theory	PC	3	0	0	0	3
7	24INO---	FCLF – Tech. Stack - 2	Theory	OE	1	0	0	0	1
8	24INO---	FCLF – Emerging Tech Stack - 2	Theory	OE	1	0	0	0	1
9	24EIE---	Professional Elective - 1	Theory	PE	3	0	0	0	3
10	24EIJ306	Internships/Camps/Mini Projects - 2	Project	PC	0	0	0	4	2
								Total Credits	**24**
								Total Contact Hours/Week	**30**

Semester VI									
S. No.	**Course Code**	**Course Title**	**Course Type**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1	24EII307	VLSI Design	Embedded	PC	2	0	2	0	3
2	24EII308	Process Dynamics and Control	Embedded	PC	3	0	2	0	4
3	24EII309	Robotics and Automation	Embedded	PC	2	0	2	0	3
4	24HS---	Industrial Communication and Networking	Theory	HS	3	0	0	0	3
5	24EIE---	Professional Elective - 2	Theory	PE	3	0	0	0	3
6	24EIE---	Professional Elective - 3	Theory	PE	3	0	0	0	3
7	24INO---	FCLF – Tech Stack - 3	Theory	OE	1	0	0	0	1
8	24INO---	FCLF – Emerging Tech Stack - 3	Theory	OE	1	0	0	0	1
9	24HS----	Indian/Foreign Languages	Theory	HS	2	0	0	2	2
10		Indian Constitution	Theory	HS	2	0	0	0	0
								Total Credits	**23**
								Total Contact Hours/Week	**30**

Semester VII									
S. No.	**Course Code**	**Course Title**	**Course Type**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1	24HS----	Project Management and Finance	Theory	HS	3	0	0	0	3
2	24EIE---	Professional Elective - 4	Theory	PE	3	0	0	0	3
3	24EIE---	Professional Elective - 5	Theory	PE	3	0	0	0	3
4	24EIE---	Professional Elective - 6	Theory	PE	3	0	0	0	3
5	24EIJ401	Capstone Project Phase-1I / Industrial Internship	Project	PJ	0	0	0	6	3
								Total Credits	**15**
								Total Contact Hours/Week	**18**
Semester VIII									
S. No.	**Course Code**	**Course Title**	**Course Type**	**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**

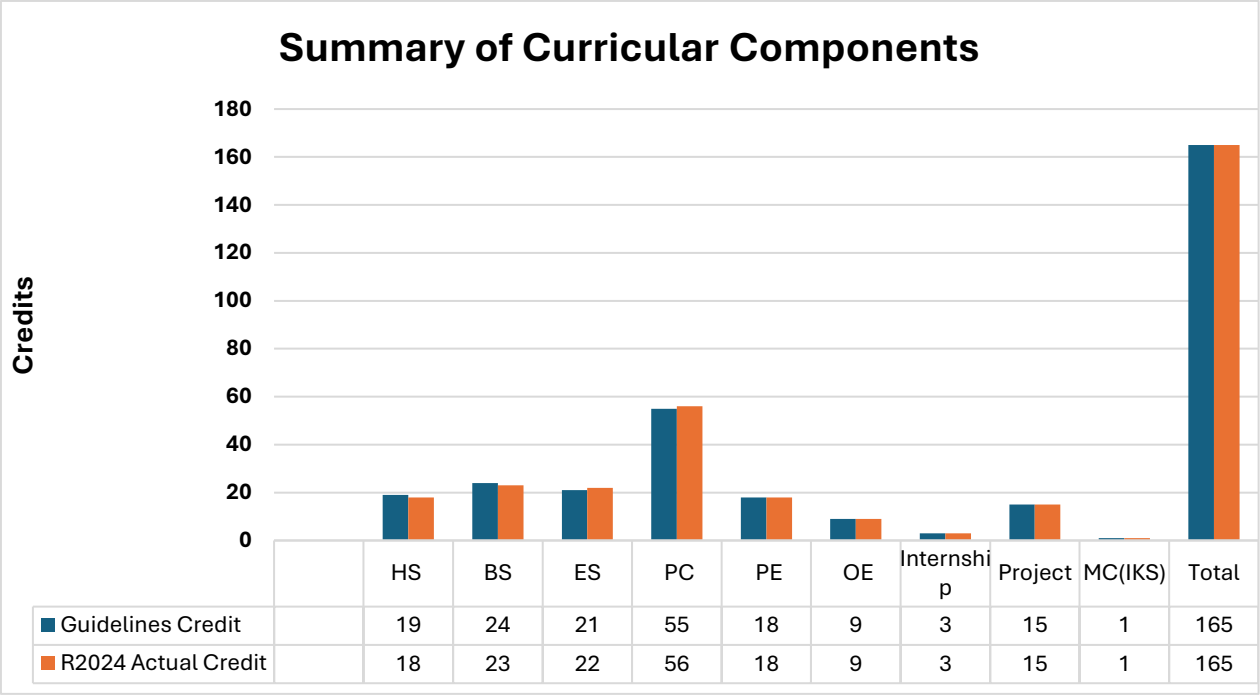
Semester	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
Credits/Semester	**20**	**23**	**23**	**25**	**24**	**23**	**15**	**12**
							Total Credits	**165**



Institutional Mandatory Courses										
Sl. No.	**Course Code**	**Course Title**	**Course Mode**	**Course Category**	**L**	**T**	**P**	**J**	**C**	**Sem**
1	24INM001	Indian Knowledge Systems (IKS)-1	Theory	HS	1	0	0	0	0	**I/II**
2	24INM---	Indian Knowledge Systems (IKS)-2	Theory	HS					1	**IV**
3	24INM---	Indian Constitution	Theory	HS	2	0	0	0	0	**IV**

Summary

Category	Guidelines Credit	R2024 Actual Credit
Humanities & Social Sciences - HS	18	18
Basic Sciences - BS	24	23
Engineering Sciences - ES	22	22
Professional Cores – PC	55	56
Professional Electives – PE	18	18
Open Electives – OE	9	9
Internship	3	3
Project	15	15
Mandatory courses (Indian Knowledge System, Indian Constitution, UHV-I)	1	1
Total	**165**	**165**



Professional Electives									
S.No	**Couse Code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
TRACK-I Automation									
1	24EIE001	Power Electronics	Theory	PE	3	0	0	0	3
2	24EIE002	Real Time Operating Systems (RTOS)	Theory	PE	3	0	0	0	3
3	24EIC003	Human Machine Interfaces	Embedded	PE	2	0	2	0	3
4	24EIE004	Robotics and Flexible Automation	Theory	PE	3	0	0	0	3
5	24EIE005	Digital Manufacturing	Theory	PE	3	0	0	0	3
6	24EIC006	Industry 4.0 and beyond	Embedded	PE	1	0	0	4	3
7	24EIE007	Hybrid and Electric Vehicles	Theory	PE	3	0	0	0	3
8	24EIC008	Smart Farming	Embedded	PE	2	0	0	2	3
9	24EIC009	Augmented Reality and Virtual Reality	Embedded	PE	2	0	2	0	3
10	24EIE010	Building Automation	Theory	PE	3	0	0	0	3

TRACK-II -Advanced Control Instrumentation									
S.No	**Couse Code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24EIC021	Analytical Instrumentation	Embedded	PE	2	0	2	0	3
2	24EIC022	System Identification, Modelling and Simulation	Embedded	PE	2	0	2	0	3
3	24EIC023	Adaptive Control	Embedded	PE	2	0	0	2	3
4	24EIE024	Optimal and Robust Control	Theory	PE	3	0	0	0	3
5	24EIE025	Advanced Intelligent Controllers	Theory	PE	3	0	0	0	3
6	24EIC026	Fault Detection and Diagnosis	Embedded	PE	2	0	2	0	3
7	24EIC027	Machine Monitoring System	Embedded	PE	2	0	2	0	3
8	24EIE028	Fibre Optics Instrumentation	Theory	PE	3	0	0	0	3
9	24EIE029	Power Plant Instrumentation	Theory	PE	3	0	0	0	3
10	24EIE030	Instrumentation in Petrochemical Industry	Theory	PE	3	0	0	0	3
11	24EIE031	Aircraft Instrumentation	Theory	PE	3	0	0	0	3
12	24EIE032	Automotive Instrumentation	Theory	PE	3	0	0	0	3
13	24EIC033	MEMS and Sensor Design	Embedded	PE	2	0	2	0	3

Track III Health Care Instrumentation									
S. No.	**Couse Code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24EIC041	Bio Sensors and Medical Instrumentation	Embedded	PE	2	0	2	0	3
2	24EIC042	Bio Signal Processing	Embedded	PE	2	0	2	0	3
3	24EIC043	Biomedical Signal Analysis for Remote Monitoring	Embedded	PE	2	0	2	0	3
4	24EIE044	Bio-MEMS and Lab-on-Chip Devices	Theory	PE	3	0	0	0	3
5	24EIE045	Embedded Systems in Biomedical Devices	Theory	PE	3	0	0	0	3
6	24EIC046	Internet of Medical Things (IoMT)	Embedded	PE	2	0	0	2	3
7	24EIE047	Smart Healthcare Systems and Telemedicine	Theory	PE	3	0	0	0	3
8	24EIC048	Flexible and Wearable Electronics	Embedded	PE	2	0	0	2	3
9	24EIE049	Robotics for Surgery and Rehabilitation	Theory	PE	3	0	0	0	3

Track IV Robotics and Automation									
S. No.	**Couse Code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24EIE061	Basics of Robotics and Mechanisms	Theory	PE	3	0	0	0	3
2	24EIC062	Robotics and Flexible Automation	Embedded	PE	2	0	2	0	3
3	24EIC063	Industrial Robotics	Embedded	PE	2	0	2	0	3
4	24EIC064	Robot Programming and Simulation	Embedded	PE	2	0	2	0	3
5	24EIC065	Autonomous Systems and Path Planning	Embedded	PE	2	0	0	2	3
6	24EIC066	Machine Vision and Image Processing for Robotics	Embedded	PE	2	0	2	0	3
7	24EIC067	Human-Machine Interaction	Embedded	PE	2	0	0	2	3
8	24EIC068	Collaborative Robots (Cobots)	Embedded	PE	2	0	2	0	3
9	24EIC069	Mobile Robotics	Embedded	PE	2	0	2	0	3
10	24EIE070	Robotics in Healthcare	Theory	PE	3	0	0	0	3

TRACK V Industrial Process Management									
S. No.	**Couse Code**	**Course Title**	**Course Mode**	**Course Category**	**L**	**T**	**P**	**J**	**C**
1.	24EIE081	Safety Instrumented Systems and Hazardous Operations	Theory	PE	3	0	0	0	3
2.	24EIE082	Optimization Techniques	Theory	PE	3	0	0	0	3
3.	24EIE083	Financial Management	Theory	PE	3	0	0	0	3
4.	24EIE084	Total Quality Management	Theory	PE	3	0	0	0	3
5.	24EIE085	Blockchain and Supply Chain Management	Theory	PE	3	0	0	0	3
6.	24EIC086	Product Design and Development	Embedded	PE	1	0	0	4	3
7.	24EIC087	Lean Manufacturing and Six Sigma	Embedded	PE	2	0	2	0	3
8.	24EIC088	Project Management for Engineers	Embedded	PE	2	0	0	2	3
9.	24EII089	Sustainable Industrial Practices	Theory	PE	3	0	0	0	3

Minor Specialisation - Industrial Automation (OFFERED TO STUDENTS OF OTHER DEPARTMENTS)									
S.No	**Course code**	**Course Title**	**Course Mode**	**CT**	**L**	**T**	**P**	**J**	**C**
1.	24EIT330	Introduction to Industrial Automation	Theory	PC	3	0	0	0	3
2.	24EIT331	Basics of Sensor and Transducer	Theory	PC	3	0	0	0	3
3.	24EIT332	Process Control and Instrumentation	Theory	PC	3	0	0	0	3
4.	24EIT333	PLC Programming and Applications	Theory	PC	3	0	0	0	3
5.	24EIT334	SCADA Systems and Applications	Theory	PC	3	0	0	0	3
6.	24EIT335	Distributed Control Systems	Theory	PC	3	0	0	0	3
7.	24EIT336	Industrial Internet of Things	Theory	PC	3	0	0	0	3
8.	24EIT337	Industrial Communication Protocols	Theory	PC	3	0	0	0	3

Honours Specialisation (Tentative)										
S.No.	Course code	Course Title	Course Mode	CT	L	T	P	J	C	Suggested Sem
1.	24EIC022	System Identification, Modelling and Simulation	Embedded	PC	2	0	2	0	3	V
2.	24EIC023	Adaptive Control	Embedded	PC	2	0	0	2	3	VI
3.	24EIE025	Advanced Intelligent Controllers	Theory	PC	3	0	0	0	3	VI
4.	24EIC026	Fault Detection and Diagnosis	Embedded	PC	2	0	2	0	3	VII
5.	24EIC033	MEMS and Sensor Design	Embedded	PC	2	0	2	0	3	VII
6.	24EIE028	Fibre Optics Instrumentation	Theory	PC	3	0	0	0	3	VIII

This honours track is ideally suited for students aspiring to pursue *higher studies (M.Tech./MS/PhD)* **in**

- ***Instrumentation,***
- ***Smart Systems,***
- ***Intelligent Control, or***
- ***Mechatronics***

Contribute to R&D in

- **Aerospace,**
- **Healthcare,**
- **Process Automation, or**
- **Energy Sectors**

as well as for careers in

- **smart manufacturing**,
- **IIoT**, or
- **cyber-physical instrumentation**

Credits may vary from 4 credits, 3 credits and 2 credits, allowing a total of a minimum 18 credits for Honours.

FIRST SEMESTER

BoS Chairman 

BoS Chairman 

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

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

Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes

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

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

Course Content

மொழி மற்றும் இலக்கியம் இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தொடக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு. **LANGUAGE AND LITERATURE** Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.	**3 Hours**
மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புற தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு. **HERITAGE – ROCK ART PAINTINGS TO MODERN ART SCULPTURES** Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.	**3 Hours**
நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	**3 Hours**

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

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

Learning Resources

Reference books:

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

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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

BoS Chairman

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		Revised Bloom's Taxonomy Levels (RBT)
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 evaluate integrals using the residue theorem for performing contour integration.	Ap

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

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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**
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**	**5 Hours** **3 Hours**

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Perform contour integration around a circular contour	

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)

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)

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

Course Curated by

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

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

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

Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	apply electrochemical principles to solve challenges in advanced battery and 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

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

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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.	**9 Hours**
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.	**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**
Practical Component: • Determination of molecular weight of polymer using Viscometric method.	**3 Hours**
INSULATING AND HIGH-RESISTIVITY MATERIALS IN ELECTRONICS Insulating materials in electronics: Introduction (Importance and Key properties) - Classification (Solid, liquid, and gas insulators) - Properties (Dielectric properties and breakdown) - Preparation, properties, and uses of Solid inorganic (Mica and Porcelain) and organic insulators (Bakelite and Rubber) - Liquid insulators (Epoxy resin and Transformer oil) – Gas Insulator (Sulfur hexafluoride) High Electrical resistivity materials: Factors influencing electrical resistivity - High resistivity materials (Composition, properties, and applications of Manganin and Molybdenum disilicide) - Nanocomposite insulators	**9 Hours**
Practical Component: • Determination of pH and Conductivity in different Transformer Oils	**3 Hours**
NANOMATERIALS AND NANOELECTRONICS	

BoS Chairman

Introduction to nano chemistry - Distinction between molecules, nanoparticles, and bulk materials - Size-dependent properties of nanomaterials - Quantum confinement effects - Carbon nanotubes and graphene (Preparation by Chemical Vapor Deposition and Laser Ablation, Properties and Applications in electronics) - Nanowires (Preparation by Electrochemical Deposition and Electrospinning, Properties and Applications in electronics) – Nanoparticles, nanoclusters, and nanorods (Preparation by Sol-gel, Solvothermal, Properties and Applications in electronics) - Nanotubes and nanowires in sensing applications. **Practical Component:** • Synthesis of Nanoparticle using Solvo-Thermal Method	**9 Hours** **3 Hours**
GREEN CHEMISTRY AND SUSTAINABLE ELECTRONICS Introduction to sustainable electronics (Importance and Environmental challenges in the electronics industry) - Environmental impact (Conductors, semiconductors, and polymers), Toxicity and persistence of electronic materials - Green chemistry principles in electronics manufacturing (12 principles of green chemistry applied to electronics and Eco-friendly materials and processes) - Life cycle assessment of electronic products - Recycling and e-waste management strategies (Recovery, Challenges and innovations in electronics recycling) - Future trends in eco-friendly electronic materials. **Practical Component:** • Determination of Copper from electronic waste by Complexometric method. • Estimation of copper ion by spectrophotometry. • Estimation of strength of sulphuric acid in spent Battery Electrolytes by pH metry	**9 Hours** **9 Hours**

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

Learning Resources

References:

1. Singh, G. (2019). Advanced battery technology for energy storage applications (1st ed.). New Age International Publishers.
2. Beguin, F., & Frackowiak, E. (2013). Supercapacitors: Materials, systems, and applications (1st ed.). Wiley-VCH.
3. Kumar, V., & Kumar, A. (2015). Conducting polymers: Synthesis, properties, and applications (1st ed.). Narosa Publishing House.
4. Chandrasekhar, S. (2014). Organic electronics: Concepts and applications (1st ed.). Springer.
5. Sharma, R. K. (2022). Electrochemistry for energy systems (1st ed.). Narosa Publishing House.
6. Hironis, N. P., & Pal, M. (2004). Electrical insulating materials (1st ed.). S. Chand & Company Ltd.
7. Kulkarni, S. K. (2014). Nanotechnology: Principles and practices (3rd ed.). Capital Publishing Company.
8. Ahluwalia, V. K. (2009). Green chemistry: Environmentally benign reactions (1st ed.). Ane Books Pvt. Ltd.
9. Shina, S. G. (2008). Green electronics design and manufacturing (1st ed.). McGraw-Hill.

BoS Chairman

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

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

BoS Chairman

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		Revised Bloom's Taxonomy Levels (RBT)
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 Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2	2		2							2			
2		1	2								1			
3	2	3	2	2							2			
4		1	1						2		1			
5				2	2			1			1			
6				2	2			1			1			

BoS Chairman

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

Learning Resources

Textbooks

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

BoS Chairman

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

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
Mr. 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

BoS Chairman

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		Revised Bloom's Taxonomy Levels (RBT)
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 Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3					2						2		
2	3					2						2		
3	3					2						2		
4	3					2						2		
5	3					2						2		

Course Content

STATICS OF RIGID BODIES — **9 Hours**

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 –

BoS Chairman

Resolution of a given force into force couple system – Equilibrium of a rigid bodies 2D space – Reactions and supports Analysis of structures.	
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 Hours: 45	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 45

Learning Resources

Textbooks

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

Reference books

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

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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

BoS Chairman

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

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

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

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

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

Course Content

Introduction to Artificial Intelligence (AI) **Practical Component** Introduction to Artificial Intelligence (AI) - Generative AI Overview and Use Cases - Impact and Examples of AI - Application Domains for AI - Generative AI Applications. AI	**8 Hours**

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

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

Learning Resources

Textbooks:

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

References:

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

Online Resource (Weblinks)

1. Introduction to Artificial Intelligence (AI) | Coursera

BoS Chairman

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

BoS Chairman

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

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

Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes

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

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

Course Content

INTRODUCTION TO HOLISTIC WELLNESS: • Overview of holistic wellness: physical, mental, emotional, and internal health. • The importance of balance in overall well-being. • Hands-on activity: Self-assessment of current wellness status.	**4 Hour**

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

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

Learning Resources

Textbooks:

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

References:

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

Online Resources (Weblinks)

1. Learning Suryanamskar
2. Yoga for well-being
3. Nutritional Educational contents

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4. Introduction to Psychology
5. Guided Meditation
6. Simplified physical exercises instructions
7. Simplified Physical Exercises
8. Life skills and value education
9. James Allen Library

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

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

BoS Chairman

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

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

Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes

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

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

Course Content

Introduction to Problem Solving and Ground Rules Introduction to problem-solving strategies without mentioning Design Thinking-Emphasize problem-solving attitudes, mindsets, and behaviours necessary for iterative problem solving (e.g., openness to failure, patience, empathy)-Set ground rules for the course, including incentives for creative risk-taking and penalties for non-participation or lack of reflection-Overview of the Design Thinking process and its importance.	**6 Hours**
Empathy and Problem Definition	

BoS Chairman

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

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

Learning Resources

Textbooks:

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

Online Resources (Weblinks)

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

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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 Chairman

SECOND SEMESTER

BoS Chairman

BoS Chairman 

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

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

Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes:

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

BoS Chairman

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

Course Content

நெசவு மற்றும் பானைத் தொழில்நுட்பம்: சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள். Weaving Industry during Sangam Age - Ceramic technology - Black and Red Ware Potteries (BRW)-Graffiti on Potteries.	**3 Hours**
வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் ரூ சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் -சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை. Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.	**3 Hours**
உற்பத்தித் தொழில் நுட்பம்: கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள்- நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள். Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel- Copper and gold- Coins as source of history - Minting of Coins - Beads making- industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidence - Gem stone types described in Silappathikaram.	**3 Hours**

BoS Chairman

வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம்- கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள்- வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம். Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries - Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.	**3 Hours**
அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள்- சொற்குவைத் திட்டம். Development of Scientific Tamil - Tamil computing- Digitalization of Tamil Books- Development of Tamil Software - Tamil Virtual Academy - Tamil Digital Library - Online Tamil Dictionaries - Sorkuvai Project.	**3 Hours**

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

Reference books

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

Online Resources

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

BoS Chairman

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

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

BoS Chairman

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

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

BoS Chairman

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

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

Learning Resources

References:

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

Online Resources (Weblinks)

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

BoS Chairman

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

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

BoS Chairman

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

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

Course Content

Mastering Professional Communication Industry-specific terminology (Business / Technical Register) - Crafting professional emails - Essential elements of an effective email (subject line, salutation, body, closing)	**6 Hours**

BoS Chairman

- reading and responding to email communication – Networking Emails - Analyzing and interpreting technical texts (Loud Reading).	
Navigating Digital Media Introduction to Digital media and online communication tools (instant messaging, video conferencing, social media, blogs, forums) - Listening and analyzing advanced audio materials - Creative & Blog Writing (General & Technical).	**6 Hours**
Technical Writing Techniques Writing Reflective Essays / Experience Sharing, Process writing, Transcoding graphics (interpreting technical texts), Writing Reviews (Research Articles & Books).	**6 Hours**
Building a Professional Digital Presence Creating Digital Profile - Overview of different digital platforms (LinkedIn, GitHub, personal websites) - Setting Up a LinkedIn Profile – Crafting a Video Resume – Digital Etiquette and Professionalism - Cross-cultural communication and diversity awareness.	**6 Hours**
Social Responsibility in Practice Environmental and social responsibilities - Case studies and real-world applications - Project Work - Writing Project reports.	**6 Hours**

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

Learning Resources

Reference books

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

Online Resources (Web Links)

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

BoS Chairman

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

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

BoS Chairman

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		Revised Bloom's Taxonomy Levels (RBT)
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
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

BoS Chairman

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

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Practical Component: • Solution of PDE by Variable Separable Method	**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.	**9 Hours**
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.	**6 Hours**

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

Learning Resources

Textbooks:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 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
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

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Assessment
CAT, 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 Chairman

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

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

Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	apply the principles of applied optics to demonstrate the operation of laser systems and their applications.	Ap
CO 2	apply quantum mechanical concepts to solve problems related to wave-particle duality and quantum tunnelling.	Ap
CO 3	apply principles of green energy technologies to assess their efficiency and practical applications.	Ap
CO 4	0075nderstanding semiconductor physics concepts to analyze carrier transport phenomena and properties of semiconductor devices.	U
CO 5	apply knowledge of magnetic materials to evaluate their properties and uses in modern applications like spintronics.	Ap
CO 6	apply optics, quantum physics, green energy, and semiconductor physics methods to design practical solutions in experimental setups.	Ap

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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 Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	1												
2	3	1												
3	3	1												
4	3	1									2			
5	3	1												
6	3	1									2			

Course Content

APPLIED OPTICS Interaction of light and matter - Quantization of electromagnetic radiation – Absorption, Spontaneous emission and Stimulated emission - Einstein's theory of stimulated emission- Population inversion - Sources of excitation - Active medium -Laser beam output- Nd-YAG laser - CO_2 laser - Applications – Laser Imaging, Holography and Laser gyroscopes.	**9 Hours**
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	**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	**9 Hours**
Practical Component 1. Compound pendulum – Determination of acceleration due to gravity 2. Determination of Planck's constant–electroluminescence method.	**6 hours**
GREEN ENERGY	**9 Hours**

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Introduction to Green energy – Solar energy: Energy conversion by photovoltaic principle – Solar cells – Efficiency measurements – Types (First, Second and Third Generation) - Wind energy: Basic components and principle of wind energy conversion systems – Ocean energy: Wave energy – Wave energy conversion devices. Futuristic Energy: Hydrogen – Methane Hydrates – Carbon capture and storage (CCS). **Practical Component** 1. Determination of efficiency of solar cell **2.** Melde's string – Determination of frequency of a tuning fork	**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).

BoS Chairman

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)

CAT, 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

BoS Chairman

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

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

Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes

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

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

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3		1										2		
4	3	2	1									3		

Course Content

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

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POINTERS AND FUNCTIONS **Pointers**: Definition - declaration - pointer arithmetic - pointers and arrays. **Functions**: Definition - declaration - types of functions (user-defined, library functions) - parameter passing (by value, by reference) pointers and functions, recursion. **Practical Component** Pointers and Functions. Additional programs on Files to be discussed.	**10 Hours** **6 Hours**

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

Learning Resources

Textbooks:

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

Reference

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

Online Resources (Weblinks)

1. https://nptel.ac.in/courses/106105214
2. https://www.coursera.org/learn/computer-fundamentals
3. https://www.khanacademy.org/computing/computer-science/algorithms
4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/
5. https://www.geeksforgeeks.org/c-programming-language/

Assessment (Embedded course)

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

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
-	-	Dr. S. Kavitha, Department of Information Technology

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

BoS Chairman

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		Revised Bloom's Taxonomy Levels (RBT)
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 Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	3			2								2	
2	3	3	2	2										
3	2	2			2									

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	**3 Hours**

BoS Chairman

on Earth, Evolutionary processes and their relevance to modern engineering applications.	
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 Hours: 15	**Tutorial Hours:** 0	**Practical Hours:** 0	**Project Hours:** 0	**Total 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

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 Chairman

24EII101	Semiconductor Devices and Applications	L	T	P	J	C
		3	0	2	0	4
Professional Core		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		Revised Bloom's Taxonomy Levels (RBT)
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 Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	2						2						
2		3											
3			2										
4				2									
5					2							2	

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Course Content	
MODULE 1: 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**
MODULE 2: 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**
MODULE 3: 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 • 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	**13 Hours** **8 Hours**

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MODULE 4: 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**
MODULE 5: 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). 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

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Assessment (Embedded course)
CAT, 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

BoS Chairman

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

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

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

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	analyse the effectiveness of various electronic tools and techniques in product development processes	An
CO 2	develop and implement functional software prototypes using open-source tools	Ap
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 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative Team work	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2	PSO-3
1	3	2	2	2	2									
2	2	2	2		2									
3	2	2	3	2	2									

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

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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
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

BoS Chairman

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

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

Course Objectives:

The purpose of taking this course is to:

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

Course Outcomes

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

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

Course Content

ADVANCED MINDFULLNESS AND MEDITATION: • Deepening mindfulness practices for enhanced mental clarity. • Exploring different forms of meditation (e.g., guided, transcendental, movement-based). • Hands-on activity: Daily meditation practice and journaling reflections.	**6 Hours**
EMOTIONAL RESILIENCE AND MENTAL HEALTH: • Building emotional resilience through positive psychology practices. • Cognitive-behavioural strategies for managing stress and anxiety. • Hands-on activity: Developing and practicing a resilience toolkit.	**6 Hours**
SOCIAL AND ENVIRONMENTAL WELLNESS:	**6 Hours**

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

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

Learning Resources

Textbooks:

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

References:

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

Online Resources (Weblinks)

- Introduction to Psychology
- Guided Meditation
- Life skills and value education

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- 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

BoS Chairman

THIRD SEMESTER

BoS Chairman

BoS Chairman 

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	Bloom's Taxonomy Level (BTL)
CO 1	Empathize with and understand people in both professional and personal contexts, reflecting on situations from multiple perspectives and participating in activities that mirror career-related scenarios	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 Finance	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

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

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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
BoS Approval date:	**16-8-2024**

BoS Chairman

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	Bloom's Taxonomy Level (BTL)
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 Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2	PSO-3
1	2	3							2	2				
2	3	3							2	2				
3	3	2							2	2				
4	3	3							2	2				
5	3	3							2	2				
6	3								2	2				

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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 BlockDesign (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 forattributes: 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. 2. Gupta S. P, Statistical Methods, Sultan Chand & Sons Publishers, 2021.
Reference books

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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.	CAT- I, CAT – II and End Semester Examination (ESE)

Course Curated By

Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
1. 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**	

BoS Chairman

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

Note: Course Objectives: - should cover Knowledge to be Acquired, Skills to be gained, and Competency to be Developed. Number of Course objectives must range from 3 to 5

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
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

No. of COs: Embedded (3 to 4 credits): 6; Theory only 5; Micro-credentials – 3; lab only – 3; project – 4

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

3. Yunus A. Cengel, Michael A. Boles, "Thermodynamics: An Engineering Approach**"**, McGraw-Hill.
4. R.K. Bansal, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications (P) Ltd, New Delhi (2006).
5. K.L. Kumar, "Engineering Fluid Mechanics", Eurasia publishing house, New Delhi,(2001).

References:

11. D. Patranabis, **"Principles of Industrial Instrumentation"**, Tata McGraw-Hill.
12. P.N. Modi & S.M. Seth, "Hydraulics and fluid mechanics including hydraulic machines", Standard book house, New Delhi, (2005).
13. V.L. Streeter – "Fluid mechanics", McGraw-Hill, New York, (2002).
14. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, Chennai, (2003).
15. Versteeg, H.K, and Malalasekera, W., "An Introduction to Computational Fluid Dynamics: The Finite Volume Method", Pearsons, United Kingdom, (2007).

Online Educational Resources:

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4. http://nptel.ac.in/courses/105101082/
5. http://bookboon.com/en/engineering-fluid-mechanics-ebook
6. http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv078
7. http://www.srividyaengg.ac.in/elearn1/coursematerial/Mech/114343. pdf
8. http://www.engineeringtoolbox.com/fluid-mechanics-t_21.html
9. https://www.youtube.com/watch?v=OGIkuJoQzok
10. https://www.youtube.com/watch?v=VZXVdPoy3zs
11. https://www.youtube.com/watch?v=3gxNrc_EEN8
12. https://www.youtube.com/watch?v=BaEHVpKc-1Q

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

*Activity and Learning Task(s): assessed through Active Learning Strategies (ALS) Eg: One-minute paper, exit tickets/exit slips, Think-pair-share, Socratic seminar, reflective journal, Low-stakes quizzes, Diagnostic questions, Open-ended questions, Concept map, Homework tasks. Delete Assessment tables that do not apply to this course.

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

BoS Chairman

24EII201	Electronic Circuit Design	L	T	P	J	C
		3	0	2	0	4
Professional Core		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		Revised Bloom's Taxonomy Levels (RBT)
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	Interpret and implement classical network theorems to simplify and analyze complex electrical circuits both theoretically and through simulation tools.	An
CO 4	Design, analyze, and evaluate the performance of analog amplifier circuits using BJTs and MOSFETs for signal amplification and conditioning.	An
CO 5	Integrate multistage, differential, and feedback amplifier configurations in analog front-end systems for biomedical and low-power applications.	An
CO 6	Design and simulate stable oscillators and multivibrator circuits for waveform generation and timing applications in embedded and communication systems.	An

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

BoS Chairman

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**
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	**9Hours** **6 Hours**

BoS Chairman

• Frequency Response of Common Source (CS) MOSFET Amplifier • Design and Analysis of Cascaded MOSFET Amplifier for Signal Conditioning	
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)
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

BoS Chairman

6. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/

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)**	
[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 Chairman

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		Revised Bloom's Taxonomy Levels (RBT)
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

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

BoS Chairman

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 Hour**
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 **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.	**9 Hours** **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,	**9 Hours**

BoS Chairman

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	**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:

1. Rangan, C. S., Sharma, G. R., Mani, S. V., Instrumentation Devices and Systems, Tata McGraw-Hill Education, New Delhi (1983).
2. Doebelin, Ernest O., Measurement Systems: Application and Design, McGraw-Hill, New York (2011).
3. Patranabis, D., Sensors and Transducers, PHI Learning Pvt. Ltd., New Delhi (2013).

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)

CAT, 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)
Mr. S.JEEVANANDHAM Senior Labview Developer Kg Invicta Pvt Ltd, Deputed at BOSCH Pvt. LTD , Coimbatore	[Name, Institution]	Ms.V.Manimekalai, Assistant Professor II EIE

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

BoS Chairman

24EII203	ELECTRICAL MACHINES AND MEASUREMENT SYSTEMS	L	T	P	J	C
		2	0	2	0	3
Professional Core		SDG		7,9,12,4		

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

Course Objectives:	
The purpose of taking this course is to:	
1	Understanding the working principles and characteristics of electrical machines and measurement systems.
2	Operate, test, and analyze electrical machines and modern sensors/transducers.
3	Select and integrate appropriate machines and measurement tools in industrial systems.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Explain the fundamental principles of electromechanical energy conversion and machine operations	U
CO2	Analyze the characteristics and performance of DC and AC machines for industrial applications	An
CO3	Apply measurement techniques for voltage, current, power, and energy using standard instruments	Ap
CO4	Integrate and calibrate sensors and transducers for physical parameter measurements	Ap
CO5	Design signal conditioning and DAQ circuits for monitoring systems with noise mitigation	An
CO6	Evaluate sustainable practices in machine operation and instrumentation system design.	E

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

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COURSE CONTENT	
FUNDAMENTALS OF ELECTROMECHANICAL ENERGY CONVERSION Magnetic circuits: MMF, flux, reluctance, hysteresis, eddy currents - Basic principles of electromechanical energy conversion - Torque equation and energy balance - Construction materials and machine classifications - Applications in robotic actuators and automation systems	**3 Hours**
DC MACHINES Construction, types and working principle of DC machines - EMF and torque equations, armature reaction and commutation - Types and characteristics of DC generators: separately excited, shunt, series, compound - Types and characteristics of DC motors: shunt, series, compound - Speed control and starting methods - Applications in electric mobility, elevators, and industrial drives - Efficiency and testing methods **PRACTICAL COMPONENT** **Lab 1:** DC Generator Characteristics (No-load and load characteristics, Voltage regulation) **Lab 2:** DC Motor Performance (Speed control, performance curves, efficiency)	**6 Hours** **6 Hours**
AC MACHINES Single-phase and three-phase induction motors: construction, working principle - Rotating magnetic field and slip concept - Torque-speed characteristics and equivalent circuit - Starting methods for single-phase and three-phase induction motors - Synchronous machines: construction, working principles - Synchronous generator: EMF equation, voltage regulation, parallel operation - Synchronous motor: starting methods, power factor control, V-curves - Applications in HVAC, renewable energy, and industrial drives **PRACTICAL COMPONENT** **Lab 3:** Single-Phase Induction Motor (Brake test, efficiency calculation) **Lab 4:** Three-Phase Induction Motor (No-load, blocked rotor test, torque-slip) **Lab 5:** Synchronous Machine Testing (Synchronisation, V-curves, efficiency) **Lab 6:** Motor Protection and Control (VFD testing, protection schemes)	**6 Hours** **9 Hours**
MEASUREMENT OF ELECTRICAL QUANTITIES (6 Hours) Measurement system components and characteristics - Static and dynamic performance parameters - Principles and construction of PMMC, moving iron, electrodynamic instruments - Digital multimeters and their principles - Measurement of voltage, current, power and energy - Current and voltage transformers - Power quality analyzers and energy meters - Error sources, accuracy, precision, and calibration standards **PRACTICAL COMPONENT** **Lab 7:** Basic Electrical Measurements (Analog/digital instrument calibration, error analysis) **Lab 8:** Power Measurement (Single/three-phase wattmeter readings, power factor)	**6 Hours** **5 Hours**
TRANSDUCERS AND SIGNAL CONDITIONING (5 Hours)	**5 Hours**

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Classification and characteristics of transducers- Temperature transducers: RTD, thermocouple, thermistor - Pressure, displacement, and flow measurement transducers - Signal conditioning circuits: amplifiers, filters, bridges - Interfacing with microcontrollers and sensor networks - Grounding, shielding and noise reduction techniques **PRACTICAL COMPONENT** **Lab 9:** Temperature Transducers (RTD, thermocouple, thermistor calibration) **Lab 10:** Mechanical Quantity Measurement (Strain gauge, LVDT for pressure/displacement) **Lab 11:** Signal Conditioning and DAQ (Partially) (Amplifiers, filters, sensor interfacing)	**5 Hours**
DATA ACQUISITION AND VIRTUAL INSTRUMENTATION Data Acquisition Systems (DAQ): ADC/DAC principles - Computer-based measurement systems - Virtual instrumentation concepts and LabVIEW basics - Machine condition monitoring and fault diagnosis - Automated test equipment and industrial applications - IoT applications in measurement systems **PRACTICAL COMPONENT** **Lab 11:** Signal Conditioning and DAQ (DAQ interfacing, LabVIEW, real-time logging) **Lab 12:** Advanced Measurement Techniques (Noise rejection, harmonic analysis, vibration-based fault diagnosis)	**5 Hours** **5 Hours**

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

LEARNING RESOURCES

TEXTBOOKS:

Electrical Machines:

1. A.E. Fitzgerald, Charles Kingsley Jr., Stephen D. Umans - "*Electric Machinery*", 7th Edition,McGraw-Hill, 2013
2. P.S. Bhimbra - "*Electrical Machinery*",7th Edition, Khanna Publishers, 2011
3. I.J. Nagrath and D.P. Kothari - "*Electric Machines*",5th Edition, McGraw-Hill, 2017

Measurement Systems:

1. Ernest O. Doebelin - "*Measurement Systems: Application and Design*", 5th Edition, McGraw-Hill,2003
2. A.K. Sawhney - "*A Course in Electrical & Electronic Measurements & Instrumentation*", Latest Edition, Dhanpat Rai & Co. , 2019
3. David M. Considine - "*Process/Industrial Instruments and Controls Handbook*", 5th Edition, McGraw-Hill, 1999

REFERENCES:

1. Norman Mariott - "*Practical Data Acquisition for Instrumentation and Control Systems*" , 1st Edition, 2003

BoS Chairman

2. Robert B. Northrop - "*Introduction to Instrumentation and Measurements*" ,3rd Edition, CRC Press, 2014
3. Jon S. Wilson - "*Sensor Technology Handbook*",1st Edition, Newnes (an imprint of Elsevier), 2004

ONLINE EDUCATIONAL RESOURCES:

Electrical Machines

1. **NPTEL (National Programme on Technology Enhanced Learning)**
   - *Courses:* Electrical Machines I & II by Prof. G. Bhuvaneshwari (IIT Delhi)
   - https://nptel.ac.in
2. **All About Circuits – Electrical Engineering Textbook**
   - *Modules:* Transformers, motors, magnetic circuits
   - https://www.allaboutcircuits.com
3. **Electrical4U**
   - *Content:* Tutorials, diagrams, MCQs on DC/AC machines and transformers
   - https://www.electrical4u.com

Measurement Systems

1. **NI (National Instruments) – LabVIEW Learning Resources**
   - *Resources:* LabVIEW fundamentals, DAQ systems, instrumentation tutorials
   - https://www.ni.com/en-us/learn
2. **Coursera – Measurement and Instrumentation Courses**
   - Offered by institutions like Georgia Tech and University of Colorado
   - https://www.coursera.org
3. **EdX – Electrical Engineering Instrumentation Modules**
   - *Courses:* Instrumentation, sensor networks, signal conditioning
   - https://www.edx.org

Simulation & Virtual Labs

1. **PSIM and MATLAB Online Resources**
   - Free tutorials and example simulations for motor drives and measurement systems
   - https://powersimtech.com
   - https://www.mathworks.com/learn/tutorials.html
2. **Virtual Labs – MHRD Government of India**
   - *Labs:* Electrical machines, instrumentation, and sensor systems
   - https://vlab.co.in

Essential Software:

1. **LabVIEW, Multisim** - Virtual instrumentation and data acquisition
2. **Proteus Design Suite (Labcenter Electronics)**
   - Combines microcontroller simulation with measurement circuit design.
3. **MATLAB/Simulink** - Machine modeling and measurement system design
4. **PSIM/PSPICE/LTspice/Ansys Maxwell** - Circuit simulation for measurement circuits

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5. **MS Excel/Python** - Data analysis and statistical calculations

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)

*Activity and Learning Task(s): assessed through Active Learning Strategies (ALS) Eg: One-minute paper, exit tickets/exit slips, Think-pair-share, Socratic seminar, reflective journal, Low-stakes quizzes, Diagnostic questions, Open-ended questions, Concept map, Homework tasks

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
[Name, Organization]	[Name, Institution]	Ranganathan	
Recommended by BoS on	07/05/2025		
Academic Council Approval	No.28	Date	26/062025

BoS Chairman

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

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

Course Content

INTRODUCTION TO VALUE EDUCATION — 3 Hours

Value Education- Self-exploration as the Process for Value Education- Basic Human Aspirations and their Fulfilment- Right Understanding, Relationship and Physical

BoS Chairman

Facility- Happiness and Prosperity – Current Scenario- Method to Fulfil the Basic Human Aspirations.	
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
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

BoS Chairman

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)**	
	Dr.	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 Chairman

FOURTH SEMESTER

BoS Chairman

BoS Chairman 

24HSP006	MASTERING GROUP 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	Bloom's Taxonomy Level (BTL)
CO 1	Create and deliver structured presentations with a clear introduction, body, and conclusion, utilizing effective visual tools and appropriate pacing to enhance clarity and impact.	C
CO 2	Analyse issues from multiple perspectives, articulate ideas effectively within group discussions	An
CO 3	Deliver confident presentations and speeches in professional and social settings, leveraging digital tools and technologies to enhance quality and effectiveness.	Ap

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

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Course Content	
MODULE 1 **Introduction to Group** Discussions - Key skills for effective participation - Phases in a GD - Conversational Phrases in GD. **Group Dynamics** - Understanding group roles and dynamics - Conflict resolution and management in groups - Techniques for fostering collaboration. **Presentations** - Introduction to Visual Aids and Technology in Presentations. **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**
MODULE 2 **Factual Group Discussions**: Focus on sharing and verifying accurate information on a given topic. Participants base their contributions on verifiable data and concrete evidence. **Opinion-based / Argumentative Group Discussion**: Encourages participants to express and defend their point of view on a topic. Evaluate different perspectives and build critical thinking skill.	**6 Hours**
MODULE 3 **Case Study Group Discussion**: Involves analyzing the complexities, identifying key issues, and developing insights or solutions based on the group's collective knowledge. **Abstract Discussion**: Deals with intangible concepts, ideas, or themes without concrete reference points. Encourages creative thinking and theoretical exploration.	**6 Hours**
MODULE 4 **Impromptu Presentations**: Participants speak on a given topic with little to no preparation. Helps develop quick thinking and effective communication skills. **Informative Presentation**: Aims to educate the audience on a specific topic by providing clear, factual information. The focus is on clarity, accuracy, and comprehensiveness. **Demonstrative Presentation**: Interactive sessions where participants engage in hands-on activities to learn practical skills. Often includes exercises, demonstrations, and collaborative tasks.	**6 Hours**
MODULE 5 **Training and Technical Presentation**: Designed to teach specific technical skills or procedures. Includes detailed instructions, demonstrations, and may involve technical jargon. **Academic Presentation**: Involves presenting research findings or theoretical concepts in an academic setting. Emphasizes clarity, evidence-based arguments, and adherence to scholarly standards. **Pitch Presentation:** A concise, persuasive presentation aimed at securing support, investment, or approval. Focuses on the value proposition, potential benefits, and unique selling points. **Persuasive Presentation**: Seeks to convince the audience to adopt a particular viewpoint or take a specific action. Utilizes logical arguments, emotional appeals, and credible evidence. **Multimedia Presentations**: Uses visual and auditory media to convey information and present arguments. Enhances engagement and aids in illustrating complex concepts.	**6 Hours**

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

Learning Resources*
Reference books/ Web Links
1. Powell, M. (2010). Dynamic presentations student's book with audio CDs (2). Cambridge University Press. 2. Reynolds, G. (2011). Presentation Zen: Simple ideas on presentation design and delivery. New Riders. 3. Galanes, G. J., Adams, K., & Brilhart, J. K. (2020). Effective group discussion: Theory and practice (15th ed.). McGraw-Hill Education. 4. Adams, K., & Galanes, G. (2018). Communicating in groups: Applications and skills, a practical guide (18th ed.). McGraw-Hill Education. 5. Ivy, D. K., & Backlund, P. (2018). Speak with confidence: A practical guide. Pearson. 6. Reynolds, G. (2019). Presentation Zen: Simple ideas on presentation design and delivery. New Riders.
Online Resources
1. https://www.coursera.org/learn/verbal-communications-and-presentation-skills 2. https://www.coursera.org/learn/present-with-purpose 3. https://www.coursera.org/learn/teamwork-skills-effective-communication

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

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

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

BoS Chairman

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		Revised Bloom's Taxonomy Levels (RBT)
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 Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2										3	
2	3	3	2									3	
3	3	3	2	2								3	
4	3	2	3	2	2				1			3	1
5	3	2	2	2	2							3	2
6	3	2	2	2	1				1			3	1

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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**

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

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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)
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 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 Chairman

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	Bloom's Taxonomy Level (BTL)
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 Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
CO1	3		1	1								2	1
CO2	3	2	1	1	2							2	2
CO3	3	3	1	2	2							2	2
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

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

BoS Chairman

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	CAT- I, CAT – II and End Semester Examination (ESE)

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

24EII204	SIGNAL PROCESSING TECHNIQUES	L	T	P	J	C
		3	0	2	0	4
Professional Core		SDG		9, 4, 12		

Pre-requisite courses	24MAI113,24MAI233	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		Revised Bloom's Taxonomy Levels (RBT)
CO1	Explain the classification and properties of signals and systems, and their mathematical representation using differential and difference equations.	U
CO2	Analyse signal behaviour in time and frequency domains using the Fourier series, CTFT, DTFT, 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	Implement and interpret DFT and FFT algorithms for frequency domain analysis of signals.	Ap
CO5	Design and evaluate FIR and IIR digital filters using appropriate techniques for performance and stability	E
CO6	Evaluate signal processing methods and tool-based implementations using analytical and simulation techniques.	E

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

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5	3	3	3	2	3						2	3	3
6	2	2	2	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 enhancing the voice commands by filtering background noise (CT-LTI and DT-LTI)-System Representation Using Differential and Difference Equations with applications such as smart home audio control systems **PRACTICAL COMPONENTS:** • Generation of elementary signals (unit step, ramp, exponential, sinusoid) • **Basic Signal Operation**: Time scaling, shifting, and reversal of signals • **Classification of Systems:** Simulate and identify system behaviour (linear/nonlinear, stable/unstable). • **Verification of System Properties**: Test for time invariance, memory, and causality in simulated systems • **Convolution with Real Data: Implement** the convolution operation /perform convolution for CT and DT LTI systems, and interpret outputs. • **Modelling and Implementation with Differential Equations:** Simulation of LTI system using difference equations / Model a system using a difference equation and simulate its response.	**9 Hours** **6 Hours**
FOURIER ANALYSIS OF CT AND DT SIGNALS 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 and plotting of CTFT for basic signals • Fourier series synthesis • Analysis of the frequency response of LTI systems • Visualisation of DTFT and filter responses	**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 • ROC visualisation for various signals • System analysis using Z-transforms	**5 Hours** **4 Hours**
DISCRETE FOURIER TRANSFORM AND FFT Introduction to DFT and Its Properties, and limitations- FFT Algorithms for Efficient Computation - Radix-2 FFT: DIT and DIF Algorithms - Butterfly	**10 Hours**

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Diagrams. - Practical application of FFT in real-time speech recognition systems **PRACTICAL COMPONENTS:** • DFT computation using FFT • Implementation of Radix-2 DIT and DIF • Spectral analysis using FFT • Audio signal spectrum visualization	**6 Hours**
DESIGN OF DIGITAL FILTERS FIR Filter Design: Linear Phase and Windowing (Rectangular, Hamming, Hanning, Blackman) - IIR Filter Design: Butterworth, Chebyshev - Impulse Invariant and Bilinear Transformation - FIR and IIR Structures: Direct Form I & II, Cascade, Parallel - Finite Precision Effects **PRACTICAL COMPONENTS:** • FIR filter design using windowing techniques • IIR filter design using Butterworth and Chebyshev approximations • Filter implementation and analysis • Precision effects on filter stability and response	**12 Hours** **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:

16. Simon Haykin & Barry Van Veen, *Signals and Systems*, Wiley, 2nd Edition, Wiley India, 2007.
17. Sanjit K. Mitra, *Digital Signal Processing: A Computer-Based Approach*, 4th Edition, McGraw-Hill Education, 2013
18. P. Ramesh Babu & R. Anandanatarajan, *Signals and Systems*, Vijay Nicole, 2022
19. 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

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

*Activity and Learning Task(s): assessed through Active Learning Strategies (ALS) Eg: One-minute paper, exit tickets/exit slips, Think-pair-share, Socratic seminar, reflective journal, Low-stakes quizzes, Diagnostic questions, Open-ended questions, Concept map, Homework tasks

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
[Name, Organization]	[Name, Institution]	Umesh M V Associate Professor E& I Manimekalai V Assistant Professor -II, E & I	
Recommended by BoS on	07.05.2025		
Academic Council Approval	No: 28	Date	26.06.2025

24EII205	**Microcontrollers and Applications**	**L**	**T**	**P**	**J**	**C**
		3	**0**	**2**	**0**	**4**

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Professional Core		SDG	9 and 3
Pre-requisite courses	**24ECI203**	**Data Book / Code book (If any)**	

Course Objectives:	
The purpose of taking this course is to:	
1	To understand the architecture and features of modern 32-bit microcontrollers, particularly ARM Cortex-M based STM32 devices.
2	To develop embedded C programming skills using industry-standard tools like STM32CubeIDE and STM32CubeMX.
3	To gain hands-on experience in interfacing sensors, actuators, and communication modules with microcontrollers
4	To design and implement embedded system applications relevant to biomedical and general engineering fields.
5	To foster problem-solving and system design skills through real-time project-based learning using STM32 microcontrollers.

Course Outcomes		
After successful completion of this course, the students shall be able to		**Revised Bloom's Taxonomy Levels (RBT)**
CO 1	Understand the evolution, classification, and architecture of modern microcontrollers.	U
CO 2	Analyze the functioning of STM32 peripherals including timers, interrupts, and communication interfaces.	Ap
CO 3	Demonstrate embedded C programming using STM32CubeIDE for real-time applications.	Ap
CO 4	Interface analog and digital sensors using ADCs, GPIOs, and other STM32 features	An
CO 5	Implement serial communication protocols (UART, SPI, I2C) with STM32 microcontrollers.	An
CO 6	Design and develop STM32-based embedded systems for biomedical and general-purpose applications	An

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

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4				2									
5					2							2	
6	2						2						

Course Content

INTRODUCTION TO MODERN MICROCONTROLLERS Overview of microcontroller evolution: From 8051 to ARM Cortex-M, Classification and features of modern microcontrollers: **ARM Cortex-M0/M3 (STM32, NXP LPC series), MSP430, PIC32, Atmel SAMD series and 8051.** Architecture and block diagram of ARM Cortex-M series, Pin configuration and GPIO overview. Memory architecture: Flash, SRAM, EEPROM. Development tools and compilers: STM32CubeIDE, Keil uVision, MPLAB X, Instruction formats and addressing modes (overview) **PRACTICAL COMPONENT:** • Blinking an LED using STM32 Nucleo board (GPIO control) • Toggling multiple LEDs with delay using SysTick timer • Creating delay using for-loop and SysTic	**7 Hours** **4 Hours**
TIMERS, COUNTERS, AND INTERRUPTS Timer and external interrupt programming- General-purpose timers in STM32 - SysTick and watchdog timer, NVIC and interrupt handling. Timer modes: PWM, input capture, output compare Writing ISR in embedded C **PRACTICAL COMPONENT:** • Generating software delay using timer peripheral (TIM2/TIM3) • PWM signal generation to control LED brightness & motor • External interrupt example using push-button and EXTI • Buzzer control using timer-generated PWM	**11 Hours** **6 Hours**
COMMUNICATION PROTOCOLS AND PROGRAMMING Basics of digital communication, UART configuration and programming, SPI: Clock polarity, phase, master/slave configuration I2C: Start/Stop conditions, addressing, multi-device communication USB **(overview only)** Use of debugging tools: Serial monitor, logic analyzer, and CAN **(overview only)** **PRACTICAL COMPONENT:** • UART communication: Sending/receiving data with PC terminal • I2C communication with EEPROM (24C02 or similar) • SPI communication with external device (e.g., 74HC595 shift register) • Reading data from a temperature sensor via I2C (e.g., LM75)	**11 Hours** **12 Hours**
INTERFACING AND REAL-TIME APPLICATIONS Interfacing with: Analog sensors using ADC, DAC for audio/waveform generation, Stepper/servo motors using PWM, Keypad matrix and switch debouncing, Character LCD (16×2), OLED displays, External memory (EEPROM/SRAM), Low-power modes and sleep states Biomedical case study (e.g., pulse sensor, temperature logger) **PRACTICAL COMPONENT:** • Analog sensor interfacing using ADC (e.g., potentiometer or LM35) • Stepper motor or servo control using PWM • Mini Project: Pulse or temperature-based monitoring system using STM32	**11 Hours** **8 Hours**

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

Learning Resources

Textbooks:

1. Jonathan Valvano – Embedded Systems: Real-Time Interfacing to ARM Cortex-M Microcontrollers
2. Yifeng Zhu – Embedded Systems with ARM Cortex-M Microcontrollers in Assembly and C
3. Muhammad Ali Mazidi – ARM Assembly Language and C Programming: Using Keil

References:

1. Trevor Martin – The Insider's Guide to the STM32 ARM Based Microcontroller
2. Texas Instruments – MSP430 Microcontroller Basics
3. Microchip – PIC32 Reference Manual
4. NXP – LPC Cortex-M3 Microcontrollers User Manual

Online Educational Resources:

- **STMicroelectronics Official STM32 Portal**
  https://www.st.com/en/microcontrollers-microprocessors/stm32-32-bit-arm-cortex-mcus.html
- **STM32CubeIDE and STM32CubeMX Documentation**
  https://www.st.com/en/development-tools/stm32cubeide.html
  https://www.st.com/en/development-tools/stm32cubemx.html
- **ARM Cortex-M Architecture Guide**
  https://developer.arm.com/documentation/dui0662/latest/
- **YouTube Channels:**
  - STMicroelectronics: https://www.youtube.com/user/STonlineMedia
  - ControllersTech: https://www.youtube.com/c/ControllersTech
- **Embedded Systems Course – NPTEL**
  https://nptel.ac.in/courses/108102045
- **STM32 Tutorials and Projects**
  - https://www.embedded.com
  - https://www.digikey.com/en/resources/design-tools/stm32

Assessment (Embedded course)

SAT, 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 Institution	Internal Expert(s)
[Name, Organization]	[Name, Institution]	Saravanakumar S Assistant Professor-II
Recommended by BoS on	07.05.2025	
Academic Council Approval	No: 28	Date 26.06.2025

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