



MRK INSTITUTE OF TECHNOLOGY

AN AUTONOMOUS INSTITUTION

(Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai)
KATTUMANNARKOIL-608 301, CUDDALORE DISTRICT, TAMILNADU, INDIA

CHOICE BASED CREDIT SYSTEM

Programme: B.E. Electronics and Communication Engineering

Regulations: 2026

Abbreviations:

HUM – Humanities (Languages, Management, Heritage, and others)

BS – Basic Science (Mathematics, Physics, Chemistry)

ES – Engineering Science (General (**G**), Programme Core (**PC**), Programme Elective (**PE**) & Emerging Technology (**ET**))

SD – Skill Development

SL – Self Learning

CDP – Capstone Design Project

OE – Open Elective

L – Laboratory Course

T – Theory

LIT – Laboratory Integrated Theory

PW – Project Work

IPW – Internship cum Project Work

DIC – Department Introductory Course

TCP – Total Contact Period(s)

Program Outcomes:

- 1. Engineering Knowledge:** Apply math, science and engineering fundamentals to complex problems.
- 2. Problem Analysis:** Identify and analyze complex problems using research and sustainability Principles
- 3. Design Solutions:** Design systems and processes considering health, safety, cost, culture, and environment.
- 4. Investigations:** Use experiments, modelling, and data analysis to reach valid conclusions.
- 5. Engineering Tools:** Apply modern tools for modelling and problem-solving, recognizing their limits.
- 6. Society & Environment:** Assess societal, legal, and environmental impacts of engineering solutions.
- 7. Ethics:** Commit to ethics, human values, diversity, and legal compliance.
- 8. Teamwork:** Work effectively as an individual and in multidisciplinary teams.
- 9. Communication:** Communicate clearly in reports, presentations and documentation across diverse groups.
- 10. Management & Finance:** Apply management and economic principles in projects and teamwork.
- 11. Lifelong Learning:** Engage in continuous learning, adapt to new technologies, and think critically.

Program Specific Outcomes:

- PSO1** Design and develop efficient electronic and modern communication systems for real time applications
- PSO2** To identify, formulate, and solve complex problems in the field of electronics and communication engineering using modern tools and techniques.
- PSO3** To keep pace with emerging technologies and demonstrate research aptitude, teamwork and ethical practices.



[Signature]
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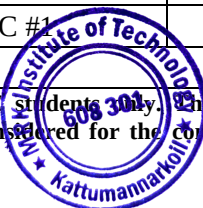
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CURRICULUM AND SYLLABI FOR SEMESTERS I TO VIII

Semester - I							
S.No.	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
3 Weeks Compulsory Induction Program							
1	26HSC01	தமிழர் மரபும் தொழில் நுட்பமும் / Tamils Heritage and Technologies	T	1-0-0	1	1	HUM
2	26ENC01	English for Engineers	T	3-0-0	3	3	HUM
3	26MAC01	Applied Calculus and Matrices	T	3-1-0	4	4	BS
4	26PHC01	Engineering Physics	LIT	3-0-2	5	4	BS
5	26CYC01	Engineering Chemistry	LIT	3-0-2	5	4	BS
6	26EEC02	Basic Electronics and Electrical Engineering	T	3-0-0	3	3	ES(PC)
7	26CSC01	Programming Language: C	T	3-0-0	3	3	ES(PC)
8	26MEC02	Makerspace Laboratory	L	0-0-4	4	2	SD
9	26CSC02	Programming in C Laboratory	L	0-0-4	4	2	ES(PC)
10	26HSC02	Physical Education	-	-	-	-	HUM
Total Credits					32	26	

Semester – II							
S.No.	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1	26MAC02	Linear Algebra	T	3-1-0	4	4	BS
2	26PHC05	Physics for Electronics Engineering	T	3-0-0	3	3	BS
3	26GEC01	Environmental Science and Sustainability	T	2-0-0	2	2	ES(GE)
4	26EC201	Electron Devices	T	3-0-0	3	3	ES(PC)
5	26EC202	Circuits and Network Analysis	T	3-0-0	3	3	ES(PC)
6	26CSC03	Problem Solving using Python Programming	LIT	3-0-2	5	4	ES(PC)
7	26EC203	Devices and Circuits Laboratory	L	0-0-4	4	2	ES(PC)
8	26ENC02	Communicative English Laboratory	L	0-0-4	4	2	ES(PC)
9		NCC / NSS / NSO/ YRC #1	-	-	-	-	-
Total Credits					28	23	

1 NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.



Semester - III							
S.No.	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1	26MAC04	Probability and Random Processes	T	3-1-0	4	4	BS
2	26EC301	Signals and Systems	T	3-1-0	4	4	ES(PC)
3	26EC302	Electronic Circuit Analysis	T	3-0-0	3	3	ES(PC)
4	26EC303	Analog and Digital Communication	T	3-0-0	3	3	ES(PC)
5	26EC304	Electromagnetic Fields and Transmission Lines	T	3-0-0	3	3	ES(PC)
6	26EC305	Digital System Design	LIT	3-0-2	5	4	ES(PC)
7	26EC306	Electronic Circuit Analysis Laboratory	L	0-0-4	4	2	ES(PC)
8	26EC307	Analog and Digital Communication Laboratory	L	0-0-4	4	2	ES(PC)
9	26SDC01	Foundation Aptitude and Verbal ability Skills	-	0-0-2	2	1	SD
10		Mandatory Course – I \$	T	1-0-0	1	-	MC
Total Credits					33	26	

\$ Mandatory Course-I is a Non-credit Course (Student shall select one course from the list given under MC-I)

Semester – IV							
S.No.	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1	26EC401	Control Systems	T	3-1-0	4	4	ES(PC)
2	26EC402	Linear Integrated Circuits	T	3-0-0	3	3	ES(PC)
3	26EC403	Digital Signal Processing	T	3-0-0	3	3	ES(PC)
4	26BMC01	Sensors and Measurement Systems	LIT	3-0-2	5	4	ES(PC)
5	26CSC16	Artificial Intelligence and Machine Learning	LIT	3-0-2	5	4	ES(PC)
6	26EC404	Digital Signal Processing Laboratory	L	0-0-4	4	2	ES(PC)
7	26EC405	Linear Integrated Circuits Laboratory	L	0-0-4	4	2	ES(PC)
8	26SDC02	Professional and Corporate Communication Skills	-	0-0-2	2	1	SD
9		Mandatory Course – II \$	T	1-0-0	1	-	MC
10		NCC / NSS / NSO/ YRC #2	-	-	-	-	-
Total Credits					31	23	

\$ Mandatory Course-I is a Non-credit Course (Student shall select one course from the list given under MC- I)

#2 NCC Credit Course level 2 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.



Semester – V							
S.No.	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1	26EC501	Introduction to Standards in Electronics and Communication	T	2-0-0	2	2	ES(PC)
2	26EC502	Microcontroller and Peripheral Interfacing	T	3-0-0	3	3	ES(PC)
3	26EC503	Antenna and Wave Propagation	T	3-0-0	3	3	ES(PC)
4		Programme Elective–I	T	3-0-0	3	3	ES(PE)
5		Open Elective – I	T	3-0-0	3	3	ES(ET)
6	26EC504	Data Communication Networks	LIT	3-0-2	5	4	ES(PC)
7	26EC505	Microcontroller and Peripheral Interfacing Laboratory	L	0-0-4	4	2	ES(PC)
8		Mandatory Course – III \$	T	1-0-0	1	-	MC
9	26IP501	Summer Internship*	-	-	-	1	IPW
10	26SDC03	Advanced Aptitude and Logical Reasoning Skills	-	0-0-2	2	1	SD
Total Credits					26	22	

\$ Mandatory Course-III is a Non-credit Course (Student shall select one course from the list given under MC)

*Two weeks Summer Internship carries one credit and it will be done during IV semester summer vacation and same will be evaluated in V semester.

For Honours Degree							
1		Capstone Design Project – Level I	CDP	0-0-12	12	6	SD
OR							
1		Honours Elective – I	T	3-0-0	3	3	
2		Honours Elective – II	T	3-0-0	3	3	

For Minors Degree							
1		Minor Elective – I	T	3-0-0	3	3	
2		Minor Elective – II	T	3-0-0	3	3	



Semester – VI							
S.No.	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1	26EC601	VLSI Design	T	3-0-0	3	3	ES(PC)
2		Programme Elective –II	T	3-0-0	3	3	ES(PE)
3		Programme Elective –III	T	3-0-0	3	3	ES(PE)
4	26HSC03	Engineering Entrepreneurship Development	T	3-0-0	3	3	HUM
5	26ECC01	Embedded Technology and IoT	LIT	2-0-2	4	3	ES(PC)
6	26CSC19	Full Stack Development	LIT	2-0-2	4	3	ES(PC)
7	26EC602	VLSI Design Laboratory	L	0-0-4	4	2	ES(PC)
8	26SDC04	Technical Interview and Advanced Competitive Examination Skills	-	0-0-2	2	1	SD
9		Mandatory Course – IV \$	T	1-0-0	1	-	MC
		Self-Learning Course	-	-	-	-	SL
10		NCC / NSS / NSO/ YRC #3	-	-	-	-	-
Total Credits					27	21	

\$ Mandatory Course-IV is a Non-credit Course (Student shall select one course from the list given under MC-IV).

#3 NCC Credit Course level 3 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

For Honours Degree							
1		Capstone Design Project – Level II	CDP	0-0-12	12	6	SD
OR							
1		Honours Elective – III	T	3-0-0	3	3	
2		Honours Elective – IV	T	3-0-0	3	3	

For Minors Degree							
1		Minor Elective – III	T	3-0-0	3	3	
2		Minor Elective – IV	T	3-0-0	3	3	



Semester – VII							
S.No.	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1	26EC701	Wireless Communication	T	3-0-0	3	3	ES(PC)
2		Programme Elective –IV	T	3-0-0	3	3	ES(PE)
3		Programme Elective –V	T	3-0-0	3	3	ES(PE)
4		Open Elective – II	T	3-0-0	3	3	ES(ET)
5	26HSC05	Professional Ethics and Human Values	T	2-0-0	2	2	HUM
6	26EC702	Optical and Microwave Engineering	LIT	2-0-2	4	3	ES(PC)
7	26EC703	Wireless Communication lab	L	0-0-4	4	2	ES(PC)
8	26SDC05	Professional Employability and Technical Communication Skills	-	0-0-2	2	1	SD
9		Mandatory Course – V \$	T	1-0-0	1	-	MC
10	26EC704	Design Project	PW	0-0-4	4	2	SD
11	26IP701	Summer Internship*	-	-	-	1	IPW
Total Credits					29	23	

\$ Mandatory Course-V is a Non-credit Course (Student shall select one course from the list given under MC- V)

*Two weeks Summer Internship carries one credit and it will be done during VI semester summer vacation and same will be evaluated in VII semester.

For Honours Degree							
1		Capstone Design Project – Level III	CDP	0-0-12	12	6	SD
OR							
1		Honours Elective – V	T	3-0-0	3	3	
2		Honours Elective – VI	T	3-0-0	3	3	

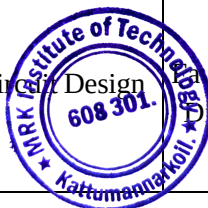
For Minors Degree							
1		Minor Elective – V	T	3-0-0	3	3	
2		Minor Elective – VI	T	3-0-0	3	3	

Semester – VIII							
S.No.	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1	26EC801	Project Work (Phase-II)	PW	0-0-12	12	8	SD
Total Credits					12	8	



PROGRAMME ELECTIVE COURSES – STREAMS

Semiconductor Chip Design and Testing	Signals and Image Processing	RF Technologies	Bio Medical and Sensor Technologies	Communication and Space Technologies	Emerging and Smart Technologies
ASIC IC Design	Advanced Digital Signal Processing	RF Transceivers Design	Smart Sensors	Radar and Navigation Systems	Natural Language Processing
CAD for VLSI Design	Digital Image and Video Processing	Smart Antennas	Body Area Networks	Remote sensing	Block Chain Technology
Low Power IC Design	VLSI Signal Processing	Signal Integrity for High Speed Design	Medical Imaging Systems	Advanced wireless communication	Deep Learning
Mixed Signal IC Design	DSP Architecture and Programming	MICs and RF System Design	MEMS and NEMS Design	Satellite Communication	Edge and Cloud Computing
VLSI Testing and Design for Testability	Computer Vision	RFID System Design & Testing	Automotive Electronics	MIMO and Millimeter wave communication	Cyber security
Network on Chip design	Pattern Recognition	Electromagnetic Interference and Compatibility	Brain Computer Interface and Applications	Quantum Communication (New)	Robotics and Automation
SOC Design	Signal Intelligence Systems	Global Navigation Satellite Systems	Electromagnetic Bio interaction	Software Defined Radio	Network Security and Cryptography
Adaptive Filter Theory and Applications	Fundamentals of System Verilog	Radiating Systems for RF Communication	Electronic Sensors / Ad Hoc & WSN	High Performance Networks	Drone Technology and UAV Systems
CMOS Analog and Mixed Signal IC Design	Switching Theory and Logic Design	RF Circuit Design	Target Detection in Digital Systems	Optical Communication Networks	Industrial IoT and Industry 4.0



PROGRAMME ELECTIVE COURSES: VERTICALS
VERTICAL 1: SEMICONDUCTOR CHIP DESIGN AND TESTING

1	26EC001	ASIC IC Design	T	3-0-0	3	3	ES(PE)
2	26EC002	CAD for VLSI Design	T	3-0-0	3	3	ES(PE)
3	26EC003	Low Power IC Design	T	3-0-0	3	3	ES(PE)
4	26EC004	Mixed Signal IC Design	T	3-0-0	3	3	ES(PE)
5	26EC005	VLSI Testing and Design for Testability	T	3-0-0	3	3	ES(PE)
6	26EC006	Network on Chip design	T	3-0-0	3	3	ES(PE)
7	26EC007	SOC Design	T	3-0-0	3	3	ES(PE)
8	26EC008	Adaptive Filter Theory and Applications	T	3-0-0	3	3	ES(PE)
9	26EC009	CMOS Analog and Mixed Signal IC Design	T	3-0-0	3	3	ES(PE)

VERTICAL 2: SIGNALS AND IMAGE PROCESSING

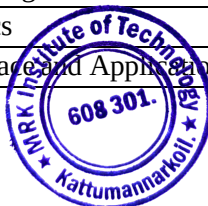
1	26EC001	Advanced Digital Signal Processing	T	3-0-0	3	3	ES(PE)
2	26EC002	Digital Image and Video Processing	T	3-0-0	3	3	ES(PE)
3	26EC003	VLSI Signal Processing	T	3-0-0	3	3	ES(PE)
4	26EC004	DSP Architecture and Programming	T	3-0-0	3	3	ES(PE)
5	26EC005	Computer Vision	T	3-0-0	3	3	ES(PE)
6	26EC006	Pattern Recognition	T	3-0-0	3	3	ES(PE)
7	26EC007	Signal Intelligence Systems	T	3-0-0	3	3	ES(PE)
8	26EC008	Fundamentals of System Verilog	T	3-0-0	3	3	ES(PE)
9	26EC009	Switching Theory and Logic Design	T	3-0-0	3	3	ES(PE)

VERTICAL 3: RF TECHNOLOGIES

1	26EC010	RF Transceivers Design	T	3-0-0	3	3	ES(PE)
2	26EC011	Smart Antennas	T	3-0-0	3	3	ES(PE)
3	26EC012	Signal Integrity for High Speed Design	T	3-0-0	3	3	ES(PE)
4	26EC013	MICs and RF System Design	T	3-0-0	3	3	ES(PE)
5	26EC014	RFID System Design & Testing	T	3-0-0	3	3	ES(PE)
6	26EC015	Electromagnetic Interference and Compatibility	T	3-0-0	3	3	ES(PE)
7	26EC016	Global Navigation Satellite Systems	T	3-0-0	3	3	ES(PE)
8	26EC017	Radiating Systems for RF Communication	T	3-0-0	3	3	ES(PE)
9	26EC018	RF Circuit Design	T	3-0-0	3	3	ES(PE)

VERTICAL 4: BIOMEDICAL AND SENSOR TECHNOLOGIES

1	26EC019	Smart Sensors	T	3-0-0	3	3	ES(PE)
2	26EC020	Body Area Networks	T	3-0-0	3	3	ES(PE)
3	26EC021	Medical Imaging Systems	T	3-0-0	3	3	ES(PE)
4	26EC022	MEMS and NEMS Design	T	3-0-0	3	3	ES(PE)
5	26EC023	Automotive Electronics	T	3-0-0	3	3	ES(PE)
6	26EC024	Brain Computer Interface and Applications	T	3-0-0	3	3	ES(PE)



7	26EC025	Electromagnetic Bio interaction	T	3-0-0	3	3	ES(PE)
8	26EC026	Electronic Sensors / Ad Hoc & WSN	T	3-0-0	3	3	ES(PE)
9	26EC027	Fault Detection in Digital Systems	T	3-0-0	3	3	ES(PE)

VERTICAL 5: COMMUNICATION AND SPACE TECHNOLOGIES

1	26EC028	Radar and Navigation Systems	T	3-0-0	3	3	ES(PE)
2	26EC029	Remote sensing	T	3-0-0	3	3	ES(PE)
3	26EC030	Advanced wireless communication	T	3-0-0	3	3	ES(PE)
4	26EC031	Satellite Communication	T	3-0-0	3	3	ES(PE)
5	26EC032	MIMO and Millimeter wave communication	T	3-0-0	3	3	ES(PE)
6	26EC033	Quantum Communication (New)	T	3-0-0	3	3	ES(PE)
7	26EC034	Software Defined Radio	T	3-0-0	3	3	ES(PE)
8	26EC035	High Performance Networks	T	3-0-0	3	3	ES(PE)
9	26EC036	Optical Communication Networks	T	3-0-0	3	3	ES(PE)
			T	3-0-0	3	3	ES(PE)

VERTICAL 6: EMERGING AND SMART TECHNOLOGIES

1	26EC037	Natural Language Processing	T	3-0-0	3	3	ES(PE)
2	26EC038	Block Chain Technology	T	3-0-0	3	3	ES(PE)
3	26EC039	Deep Learning	T	3-0-0	3	3	ES(PE)
4	26EC040	Edge and Cloud Computing	T	3-0-0	3	3	ES(PE)
5	26EC041	Cyber security	T	3-0-0	3	3	ES(PE)
6	26EC042	Robotics and Automation	T	3-0-0	3	3	ES(PE)
7	26EC043	Network Security and Cryptography	T	3-0-0	3	3	ES(PE)
8	26EC044	Drone Technology and UAV Systems	T	3-0-0	3	3	ES(PE)
9	26EC045	Industrial IoT and Industry 4.0	T	3-0-0	3	3	ES(PE)

**OPEN ELECTIVES
(EMERGING TECHNOLOGIES)**

S.No.	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1.	26OE901	AI-Driven Decision Support Systems	T	3-0-0	3	3	OE
2.	26OE902	Emerging Technologies for Digital Transformation	T	3-0-0	3	3	OE
3.	26OE903	Future Technologies for Intelligent Industries	T	3-0-0	3	3	OE
4.	26OE904	Climate Change and Infrastructure Resilience	T	3-0-0	3	3	OE
5.	26OE905	Environmental Sustainability and Resource Management	T	3-0-0	3	3	OE
6.	26OE906	Green Building Technologies	T	3-0-0	3	3	OE
7.	26OE907	Battery Technologies and Management Systems	T	3-0-0	3	3	OE
8.	26OE908	Energy Management and Conservation	T	3-0-0	3	3	OE

9.	26OE909	Renewable Energy Technologies	T	3-0-0	3	3	OE
10.	26OE910	Smart Grid Technologies	T	3-0-0	3	3	OE
11.	26OE911	IoT-Enabled Healthcare Technologies	T	3-0-0	3	3	OE
12.	26OE912	Wearable Health Technologies	T	3-0-0	3	3	OE
13.	26OE913	Biomedical Signal & Image Processing	T	3-0-0	3	3	OE
14.	26OE914	Mobile Communication	T	3-0-0	3	3	OE
15.	26OE915	Systems on Chip with IoT applications	T	3-0-0	3	3	OE
16.	26OE916	Opto Nano Electronics	T	3-0-0	3	3	OE
17.	26OE917	Mechatronics and Smart Systems	T	3-0-0	3	3	OE
18.	26OE918	Finite Element Analysis for Engineers	T	3-0-0	3	3	OE
19.	26OE919	Energy Audit and Energy Management	T	3-0-0	3	3	OE
20.	26OE920	Industrial Safety	T	3-0-0	3	3	OE

Mandatory Courses							
S.No.	Course Code	Course Title	Course Type	Periods / Week	Total Contact Periods	Credits	Category
				L-T-P			
1	26MCC01	Disaster Management and Safety Awareness	T	3-0-0	3	-	MC
2	26MCC02	Gender Sensitization and Inclusive Society	T	3-0-0	3	-	MC
3	26MCC03	Constitution of India	T	3-0-0	3	-	MC
4	26MCC04	Digital Literacy and Cyber Awareness	T	3-0-0	3	-	MC
5	26MCC05	Research Methodology and Intellectual Property Rights	T	3-0-0	3	-	MC

Semester wise Credit Distribution

Course Category	Code	I	II	III	IV	V	VI	VII	VIII	Total Credits	% Share
Basic Science	BS	12	7	4	-	-	-	-	-	23	13.29
Humanities	HUM	4	-	-	-	-	3	2	-	9	5.20
Engineering Science (General)	ES(GE)	-	2	-	-	-	-	-	-	2	1.1
Programme Core	PC	8	14	21	22	14	11	8	-	98	56.97
Programme Elective	PE	-	-	-	-	3	6	6	-	15	8.6
Emerging Technology	ET	-	-	-	-	3	-	3	-	6	3.4
Open Elective	OE	-	-	-	-	-	-	-	-	-	-
Skill Development	SD	2	-	1	1	1	1	3	8	17	9.8
Internship cum Project Work	IPW	-	-	-	-	1	-	1	-	2	1.15
Self-Learning / Industry Oriented Course	SL	-	-	-	-	-	-	-	-	-	-
Total Credits	-	26	23	26	23	22	22	23	8	172	100

SEMESTER – I



26HSC01	தமிழர் மரபும் தொழில் நுட்பமும் / Tamils Heritage and Technologies	L	T	P	C
		1	0	0	1
Course Objectives:					
- தமிழ்மொழி, திராவிட மொழிகள், சங்க இலக்கியம் மற்றும் தமிழர்களின் பண்பாட்டு மரபுகளை அறிந்து விளக்குதல். - தமிழர்களின் நாட்டுப்புறக் கலைகள், விளையாட்டுகள், தெய்வ வழிபாடு மற்றும் கைவினை மரபுகளை அறிந்து அவற்றின் முக்கியத்துவத்தை விளக்குதல். - தமிழர்களின் பாரம்பரிய கட்டிடக்கலை, சிற்பக்கலை மற்றும் கட்டுமானத் தொழில்நுட்பங்களை அறிந்து அவற்றின் சிறப்புகளை விளக்குதல். - பண்டைய தமிழர்களின் கப்பல் கட்டுதல், உலோகத் தொழில்நுட்பம், மணிகள் தயாரித்தல் மற்றும் வாணிபத் தொழில்நுட்பங்களை அறிந்து விளக்குதல். - தமிழர்களின் வேளாண்மை, நீர்ப்பாசன முறைகள், கால்நடைப் பராமரிப்பு மற்றும் கடல்சார் அறிவியல் தொழில்நுட்பங்களை அறிந்து அவற்றின் முக்கியத்துவத்தை விளக்குதல்.					
அலகு I	மொழி மற்றும் இலக்கிய மரபுகள்	3			
இந்திய மொழிக் குடும்பங்கள், திராவிட மொழி வகைகள், முச்சங்க வரலாறு, சங்க இலக்கியத்தில் அறச்சிந்தனைகள், சங்க இலக்கியமும் பண்பாட்டு மரபுகளும், தமிழ் ஒரு செம்மொழி, திருக்குறளில் மேலாண்மைக் கருத்துகள், சங்ககாலத்தில் கல்வி, சங்ககால நகரங்களும் துறைமுகங்களும், பெரியபுராணம், நாயன்மார்கள் மற்றும் ஆழ்வார்களின் பக்திநெறி					
அலகு II	நாட்டுப்புறக் கலைகளின் மரபுகள்	3			
நாட்டுப்புறக் கலையின் தோற்றம் மற்றும் வளர்ச்சி, தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், புலியாட்டம், தமிழர்களின் விளையாட்டுகள், நாட்டுப்புறத் தெய்வங்களின் வகைகள், சிற்பக்கலை, நடுகல் வழிபாடு, கைவினைப் பொருட்கள், இசைக்கருவிகளின் வகைகள்.					
அலகு III	தமிழர்களின் கட்டிடத் தொழில்நுட்பம்	3			
சங்க காலத்தில் நெசவு மற்றும் பாணைத் தொழில்நுட்பம், சங்ககாலத்தில் கட்டுமானங்கள், வீட்டு பொருட்களின் வடிவமைப்பு, சங்ககாலத்தில் கட்டுமான பொருட்கள், சிலப்பதிகாரத்தில் மேடை அமைப்பு, மாமல்லபுரம் சிற்பங்களும் கோவில்களும் சோழர் கால பெருங்கோயில்கள், வழிபாட்டுத்தலங்கள், மீனாட்சி அம்மன் ஆலயம், செட்டிநாட்டு கட்டிடக் கலை, திருமலை நாயக்கர் மஹால்.					
அலகு IV	உற்பத்தித் தொழில்நுட்பம்	3			
கப்பல் கட்டும் கலை, இரும்பு தொழிற்சாலை, செம்பு மற்றும் தங்க நாணயங்கள் அச்சடித்தல், கண்ணாடி மணிகள், சுடுமண் மணிகள், சங்கு மணிகள், கல்மணிகள் சிலப்பதிகாரத்தில் மணிகளின் வகைகள், தொல்லியல் சான்றுகள், சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி.					
அலகு V	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்	3			
அணை ஏரி குளங்கள் மதகு அமைப்பு சோழர் கால குழுழி தூம்பின் முக்கியத்துவம், கால்நடை பராமரிப்பு, வேளாண்மை சார்ந்த செயல்பாடுகள், பெருங்கடல் குறித்த பண்டைய அறிவு, முத்துக்குளித்தல், அறிவுசார் சமூகம், கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி. அறிவியல் தமிழின் வளர்ச்சி, கணித்தமிழ் வளர்ச்சி.					
TOTAL : 15 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. மா. இராசமாணிக்கனார், தமிழர் நாகரிகமும் பண்பாடும், சைவசித்தாந்த நூற்பதிப்புக் கழகம், சென்னை.					
2. கே. கே. பிள்ளை, தமிழக வரலாறு – மக்களும் பண்பாடும், உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை.					

References:

1. ந. சுப்பிரமணியன், தமிழக வரலாறு, தமிழ்நாட்டுப் பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம், சென்னை.
2. இரா. நாகசாமி, தமிழகத் தொல்லியல், தமிழ்நாடு அரசு தொல்லியல் துறை, சென்னை.
3. குடவாயில் பாலசுப்ரமணியன், தமிழர் கட்டிடக்கலை, தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்.
4. கா. சிவத்தம்பி, தமிழின் சமூக வரலாறு, நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை.
5. தமிழ்ப் பல்கலைக்கழகம், தமிழர் தொழில்நுட்பம், தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்.

E-resources:

1. <https://www.tamilvu.org/>
2. <https://www.projectmadurai.org/>
3. <https://www.tnarch.gov.in/>

CO	CO Description	PO	PSO
CO1	தமிழ்மொழி, திராவிட மொழிகள், சங்க இலக்கியம் மற்றும் தமிழர்களின் பண்பாட்டு மரபுகளை அறிந்து விளக்குதல்.	PO1(2) PO2(2)	PSO3(2)
CO2	தமிழர்களின் நாட்டுப்புறக் கலைகள், விளையாட்டுகள், தெய்வ வழிபாடு மற்றும் கைவினை மரபுகளை அறிந்து அவற்றின் முக்கியத்துவத்தை விளக்குதல்.	PO1 (2) PO7 (3) PO8 (3)	PSO1(1) PSO3 (2)
CO3	தமிழர்களின் பாரம்பரிய கட்டிடக்கலை, சிற்பக்கலை மற்றும் கட்டுமானத் தொழில்நுட்பங்களை அறிந்து அவற்றின் சிறப்புகளை விளக்குதல்.	PO1 (3) PO2 (3)	PSO2 (2) PSO3 (2)
CO4	பண்டைய தமிழர்களின் கப்பல் கட்டுதல், உலோகத் தொழில்நுட்பம், மணிகள் தயாரித்தல் மற்றும் வாணிபத் தொழில்நுட்பங்களை அறிந்து விளக்குதல்.	PO1 (2) PO2 (2) PO3 (2) PO7 (3)	PSO2 (2) PSO3 (2)
CO5	தமிழர்களின் வேளாண்மை, நீர்ப்பாசன முறைகள், கால்நடைப் பராமரிப்பு மற்றும் கடல்சார் அறிவியல் தொழில்நுட்பங்களை அறிந்து அவற்றின் முக்கியத்துவத்தை விளக்குதல்.	PO2 (3) PO5 (3) PO6 (3)	PSO1 (2) PSO2 (2) PSO3 (3)

(1) = Low; (2) = Medium; (3) = High



26HSC01	Tamils Heritage and Technologies	L	T	P	C
		1	0	0	1
Course Objectives: - Identify and explain the Tamil language, Dravidian languages, Sangam literature, and cultural heritage of the Tamils. - Identify and explain the importance of folk arts, traditional games, folk deities, and handicraft traditions of the Tamils. - Study and explain the significance of traditional architecture, sculpture, and construction technologies of the Tamils. - Explain the shipbuilding, metallurgical, bead-making, and trade technologies practiced by the ancient Tamils. - Explain the importance of agriculture, irrigation systems, animal husbandry, and maritime knowledge and technologies of the Tamils.					
Unit I	Language and Literary Heritage	3			
Indian language families, varieties of Dravidian languages, history of Muthamizh, ethical thoughts in Sangam literature, Sangam literature and cultural traditions, Tamil as a classical language, management concepts in Thirukkural, education during the Sangam period, Sangam-age cities and ports, Periyapuram, and the devotional traditions of Nayanmars and Alvars.					
Unit II	Traditions of Folk Arts	3			
Origin and development of folk arts, Therukoothu, Karagattam, Villupattu, Kaniyan Koothu, Oyilattam, Tholpavai Koothu, Silambattam, Puliyattam, traditional games of the Tamils, types of folk deities, sculpture, hero-stone worship, handicrafts, and types of musical instruments.					
Unit III	Architectural Technology of the Tamils	3			
Weaving and pottery technology during the Sangam period, construction practices during the Sangam period, design of household articles, construction materials used during the Sangam period, stage arrangement described in Silappathikaram, sculptures and temples of Mamallapuram, great temples of the Chola period, places of worship, Meenakshi Amman Temple, Chettinad architecture, and Thirumalai Nayak Palace.					
Unit IV	Manufacturing Technology	3			
Shipbuilding technology, iron industry, production and minting of copper and gold coins, glass beads, terracotta beads, conch-shell beads, stone beads, varieties of beads mentioned in Silappathikaram, archaeological evidences, and export and import during the Sangam period.					
Unit V	Agriculture and Irrigation Technology	3			
Dams, lakes and ponds, sluice structures, significance of the Kumizhi Thoempu during the Chola period, animal husbandry, agriculture-related activities, ancient knowledge of the ocean, pearl diving, knowledge-based society, achievements of the Cholas in overseas countries, development of scientific Tamil, and development of computational Tamil.					
TOTAL : 15 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books: 1. K. K. Pillay, A Social History of the Tamils, University of Madras, Chennai. 2. R. Nagaswamy, Tamil Nadu: An Archaeological Perspective, Tamil Nadu State Department of Archaeology, Chennai.					
References: 1. K. A. Nilakanta Sastri, A History of South India: From Prehistoric Times to the Fall of Vijayanagar, Oxford University Press, 4th Edition, New Delhi, 2015. 2. N. Subrahmanian, Social and Cultural History of Tamil Nadu, Koodal Publishers, Madurai. 3. S. R. Balasubrahmanyam, Early Chola Art, Asia Publishing House, Bombay. 4. C. Sivaramamurti, South Indian Bronzes, Lalit Kala Akademi, New Delhi. 5. Noboru Karashima, A Concise History of South India: Issues and Interpretations, Oxford University Press, New Delhi. 1st Edition, 2014					

E-resources:

1. <https://www.tamilvu.org/>
2. <https://www.projectmadurai.org/>
3. <https://www.tnarch.gov.in/>

CO	CO Description	PO	PSO
CO1	Identify and explain the Tamil language, Dravidian languages, Sangam literature, and cultural heritage of the Tamils.	PO1 (2) PO2 (2)	PSO3 (2)
CO2	Identify and explain the importance of folk arts, traditional games, folk deities, and handicraft traditions of the Tamils.	PO1 (2) PO7 (3) PO8 (3)	PSO1 (1) PSO3 (2)
CO3	Study and explain the significance of traditional architecture, sculpture, and construction technologies of the Tamils.	PO1 (3) PO2 (3)	PSO2 (2) PSO3 (2)
CO4	Explain the shipbuilding, metallurgical, bead-making, and trade technologies practiced by the ancient Tamils.	PO1 (2) PO2 (2) PO3 (2) PO7 (3)	PSO2 (2) PSO3 (2)
CO5	Explain the importance of agriculture, irrigation systems, animal husbandry, and maritime knowledge and technologies of the Tamils.	PO2 (3) PO5 (3) PO6 (3)	PSO1 (2) PSO2 (2) PSO3 (3)

(1) = Low; (2) = Medium; (3) = High



26ENC01	English for Engineers	L	T	P	C
		3	0	0	3
Course Objectives: • Develop vocabulary and grammatical competence by strengthening students’ knowledge and appropriate usage in different contexts. • Facilitate reading and comprehension skills through the effective use in academic and professional texts. • Improve oral communication and presentation skills to strengthen content and context • Enhance effective listening skills by familiarizing students with different accents, dialects, varieties of English • Enable students to write professional correspondence and ethical writing practices.					
Unit I	Vocabulary and Grammar				9
Academic Word List (AWL) - Foreign Words - Semantics - synonyms, antonyms, one-word substitution - Phrasal verbs - Phrases and idioms - Misspelt words; Parts of Speech - Subject-verb agreement - Tenses - Articles - Voices - Reported speech – Modals- Sentence structure					
Suggested Activities: Gap fills exercises, Cloze Test, Error Detection and Spell Bee.					
Unit II	Reading and Comprehension				9
Four types of Reading Techniques - Scanning, Skimming, Intensive reading, Extensive reading - Fiction and Non-fiction texts - Difference, features, strategies, comprehension - Strategies for reading general and professional content - Identifying transitions in a text - Note making - Interpreting charts and data; Academic reading - PQRS, SQ3R - Critical reading - Effective use of resources - Index, table of contents and glossary					
Suggested Activities: Reading - newspaper and digital articles, Reading comprehension, note making and summarizing.					
Unit III	Speaking				9
Importance of oral communication - Phonetics - Pronunciation, Stress and Intonation; Speaking in different contexts - verbal and non-verbal behavior; Presentation Skills - Types of Presentations - informative, persuasive, business - effective slide presentation - delivering a presentation; Classroom participation – Group Discussions, Debates, Group activities					
Suggested Activities: Just a Minute (JAM) Video recording, Situational role plays, Usage of Apps.					
Unit IV	Listening				9
Listening - Types - Purpose - Barriers - Strategies for effective listening in various contexts - Note-taking as a tool for effective listening - Dialects, accents, and slang - Dialectal Varieties - English in India,					
Suggested Activities: Listening and Repeating, Note-taking					
Unit V	Writing				9
Importance of written communication - Letter writing and e-mail - Reporting/Reports - Introduction to abstracts and articles - Difference between abstract and executive summary; Summarizing - Paraphrasing - Synthesizing - Editing and Proofreading - Plagiarism - Referencing online and offline resources.					
Suggested Activities: Picture and poster description, Brainstorming and Mind Mapping.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. Meenakshi Raman and Sangeeta Sharma, Technical Communication: Principles and Practice, 4 th Edition, Oxford University Press, New Delhi, 2022.					
2. M. Ashraf Rizvi, Effective Technical Communication, 2 nd Edition, McGraw Hill Education, New Delhi, 2018.					



References:

1. Department of Humanities and Social Sciences, Anna University, English for Engineers and Technologists (Combined edition, Vol. 1 and 2), Orient Blackswan, Chennai, 2006.
2. Nitin Bhatnagar and Mamta Bhatnagar, Communicative English for Engineers and Professionals,
3. Pearson Education, 2010. Board of Editors, Vibrant English, Orient Blackswan, Chennai, 2013.
4. William Strunk Jr. & E.B. White, The Elements of Style, 4th Edition, Pearson, 1999.
5. David F. Beer and David McMurrey, Guide to Writing as an Engineer, 5th Edition, John Wiley, New York, 2021.

E-resources:

1. <https://learnenglish.britishcouncil.org/>
2. <https://www.bbc.co.uk/learningenglish>
3. <https://learnenglish.britishcouncil.org/skills/speaking>

CO	CO Description	PO	PSO
CO1	Apply appropriate vocabulary and grammatical structures accurately and effectively in academic, professional, and everyday communication.	PO7(2) PO9(3)	PSO2(1) PSO3(2)
CO2	Employ suitable reading strategies to comprehend, analyze, interpret, and critically evaluate general, academic, and professional texts.	PO2(3) PO9(3)	PSO2(1) PSO3(2)
CO3	Demonstrate effective speaking and presentation skills with appropriate pronunciation, stress intonation in individual and group settings.	PO8(3)	PSO1 (1) PSO2(1) PSO3(3)
CO4	Demonstrate effective listening skills by identifying key information, understanding different accents and varieties of English.	PO2(2) PO6(1)	PSO2(1) PSO3(2)
CO5	Produce clear, coherent, and professionally appropriate written documents.	PO10(2) PO11(3)	PSO1(1) PSO2(1) PSO3(2)

(1) = Low; (2) = Medium; (3) = High



26MAC01	Applied Calculus and Matrices	L	T	P	C
		3	1	0	4
Course Objectives: - To provide technical competence of modelling engineering problems using calculus. - To apply the calculus concepts in solving engineering problems using analytical methods and computational tools.					
Unit I	Differential Calculus	12			
Functions, graph of functions, Limit of a function, Continuity, Limits at infinity, Derivative as a function, Maxima and Minima of functions of single variable, Mean value theorem. Suggested Activities: Visualization of the functions, Maxima and Minima of a function using open-source software, Solving of Competitive Examination questions (Ex. GATE).					
Unit II	Functions of Several Variables	12			
Partial derivatives, Total derivative, Taylor’s series formula for functions of two variables, Maxima and minima of functions of two variables, Method of Lagrange’s Multipliers. Suggested Activities: Partial Derivatives with two or three variables, Maxima and Minima of a function using open-source software, Solving of Competitive Examination questions (Ex. GATE).					
Unit III	Integral Calculus	12			
Fundamental theorem of Calculus, Indefinite integrals and Improper integrals, Evaluation of double integrals, Change of order of integration, Evaluation of triple integrals. Suggested Activities: Definite and Indefinite Integrals, Determination of double and triple integrals, Solving of Competitive Examination questions (Ex. GATE).					
Unit IV	Matrices	12			
Eigen values and Eigen vectors of a real matrix, Characteristic equation, Properties of Eigen values and Eigen vectors (without proof) Cayley–Hamilton Theorem, Applications of Cayley–Hamilton Theorem. Suggested Activities: Compute Eigen values and Eigen vectors, verify the Cayley–Hamilton theorem, and perform matrix computations using open-source software.					
Unit V	Orthogonal Transformations and Quadratic Forms	12			
Diagonalization of matrices by orthogonal transformation – Quadratic forms – Reduction of a quadratic form to canonical form by orthogonal transformation, Nature of quadratic forms. Suggested Activities: Perform orthogonal diagonalization, reduce quadratic forms to canonical form, determine the nature of quadratic forms, and visualize quadratic forms using open-source software.					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books: 1. Grewal, B. S. (2025). Higher Engineering Mathematics, 45 th Edition, Khanna Publishers, New Delhi. . 2. Ramana, B. V. (2024). Higher Engineering Mathematics, 18 th Edition, McGraw Hill Education (India) Private Limited.					
References: 1. Anton, H., Bivens, I. C., & Davis, S. (2021). Calculus: Early transcendentals, John Wiley & Sons. 2. Waner, S., & Costenoble, S. (2024). Applied Calculus, 8 th Edition, Cengage Learning. 3. Stroud, K. A., & Booth, D. J. (2020). Engineering Mathematics, 8 th Edition, Red Globe Press. 4. Thomas, G. B., Jr., Weir, M. D., Hass, J., & Heil, C. (2022). Thomas' Calculus: Early Transcendentals, 15 th Edition, Pearson. 5. Anton, H., Rorres, C., & Kaul, A. (2021). Elementary Linear Algebra: Applications Version, 12 th Edition, John Wiley & Sons.					
E-resources: 1. https://onlinecourses.nptel.ac.in/noc17_hs04 2. https://math.libretexts.org/Bookshelves/Calculus/Book%3A_Applied_Calculus__Early_Transcendentals_(Stewart)/ 3. https://openstax.org/books/calculus-volume-1					



CO	CO Description	PO	PSO
CO1	Apply the concepts of limits, continuity and derivatives to analyze functions and solve optimization problems.	PO1(3) PO2(2)	PSO1(2) PSO2(1)
CO2	Analyze functions of several variables using partial derivatives, Taylor's formula and optimization techniques.	PO1(3) PO2(3)	PSO1(2) PSO2(2)
CO3	Apply integration techniques to evaluate single, double and triple integrals.	PO1(3) PO2(2)	PSO1(2) PSO2(1)
CO4	Determine eigenvalues and eigenvectors of matrices and apply the Cayley–Hamilton theorem to solve matrix problems.	PO1(3) PO2(2)	PSO1(2) PSO2(2)
CO5	Analyze matrices and quadratic forms using orthogonal transformations and determine the nature of quadratic forms.	PO1(3) PO2(3) PO5(2)	PSO1(2) PSO2(2) PSO3(1)

(1) = Low; (2) = Medium; (3) = High



26PHC01	Engineering Physics	L	T	P	C
		3	0	2	4
Course Objective: To impart essential physics concepts and demonstrate their relevance to diverse engineering applications.					
Unit I	Fundamental & Properties of Matter				9
Concept – Force, Mass & Weight, Velocity & Acceleration, Momentum & Impulse, Elasticity – Cantilever-Young’s modulus (non-uniform bending), Viscosity- Stokes method - Surface tension - Drop weight method – bimetallic Strip-Thermal Stress-Expansion joints and examples. Suggested Activities: Virtual demonstration of thermal stress.					
Unit II	Thermodynamics				9
Thermal conductivity – Modes of heat transfer- Conductivity of bad conductor, Lee’s disc method – Conductivity of good conductor Forbes’ Method. Conductivity of semiconductor- laws of Thermodynamics – Entropy- Carnot’s cycle as heat engine and refrigerator. Suggested Activities: Virtual demonstration of four-stroke engine.					
Unit III	Optics				9
Fiber Optics: Structure of fiber, fiber optics, communication fiber sensor, Displacement sensor, and pressure sensor & temperature sensor- Interference: constructive and destructive interference -Air Wedge- Determination of thin wire. Michelson’s Interferometer - Determination of thin film. Suggested Activities: Demonstration of optical fiber communication and study of fiber optic sensors.					
Unit IV	Quantum Physics				9
Concept – DE Broglie wave equation – Dual nature of matter waves - Properties of matter waves, Schrodinger Time dependent wave equation and Time independent wave equation, Particle in one dimensional box, Photo electric effect - Experimental verification of photo electric effect. Suggested Activities: Demonstration and analysis of the photoelectric effect and quantum phenomena.					
Unit V	Laser and its Application				9
Properties- Einstein Co-Efficient A and B, Ratio of stimulated and spontaneous emission construction, working. Solid laser (Nd-YAG Laser), Gas laser (CO ₂), Dye laser, Diode laser (hetero junction and homo junction laser) Advantage industrial and medical application. Suggested Activities: Demonstration of laser characteristics and study of industrial and medical applications of lasers.					
TOTAL (Theory): 45 PERIODS					
List of Experiments: 1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia 2. Non-uniform bending - Determination of Young’s modulus 3. Uniform bending –Determination of young’s modulus 4. Determination of band gap of semiconductor using post office box 5. Air wedge - Determination of thickness of a thin sheet/wire 6. Photoelectric effect-verification of electron flow 7. Laser- Determination of the wavelength of the laser using grating					
TOTAL (Lab.): 30 PERIODS TOTAL: 75 PERIODS					
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%.					
Assessment Methodology: Assignments (10%), Quiz (10%), Competitive Examinations (10%), Flipped Class (10%), Practical (20%), Internal Examinations (40%).					
Text Books: 1. M. N. Avadhanulu and P. G. Kshirsagar, A Textbook of Engineering Physics, S. Chand Publishing, 11 th Edition, New Delhi. 2. R. K. Gaur and S. L. Gupta, Engineering Physics, 3 rd Edition, Dhanpat Rai Publications, New Delhi.					
References: 1. A. K. Sawhney and Puneet Sawhney, A Course in Mechanical Measurements and Instrumentation, Dhanpat Rai & Co., New Delhi. 14 th Edition, 2017; Revised Edition 2009. 2. A. Ghatak and K. Thyagarajan, Optical Electronics and Fibre Optics, Cambridge University Press, Cambridge.					

3. Arthur Beiser, Concepts of Modern Physics, 6th Edition, 2006, McGraw-Hill Education, New Delhi.
4. S. O. Pillai, Solid State Physics, 10th Edition, New Age International Publishers, New Delhi.
5. K. R. Nambiar, Lasers: Principles, Types and Applications, New Age International Publishers, New Delhi. 1st Edition, 2004/2006 catalogue records.

E-resources:

1. Barrier penetration problem and Quantum tunnelling:
<https://archive.nptel.ac.in/courses/115/104/115104096/>
2. EM waves and wireless channelling: https://onlinecourses.nptel.ac.in/noc24_ee31/preview
3. Bimetallic Strips _ <https://www.youtube.com/watch?v=WZQ8lvxdzDk>

CO	CO Description	PO	PSO
CO1	Explain the fundamental principles of mechanics and the physical properties of materials.	PO1(3) PO2(2) PO3(1)	PSO1 (3)
CO2	Describe the basic concepts of thermodynamics, thermal conductivity and the Carnot cycle.	PO1(3) PO2(2) PO3(2)	PSO1 (3)
CO3	Apply the concepts of fiber optics and optical sensors in engineering applications and analyze interference phenomena.	PO1(3) PO2(3) PO4(2)	PSO1 (3)
CO4	Understand the basic principles of quantum mechanics and relate them to modern technological applications.	PO1(3) PO2(3) PO3(2)	PSO1 (3)
CO5	Analyze the operating principles of lasers and identify their applications in science and engineering.	PO1(3) PO2(2)	PSO1 (3)

(1) = Low; (2) = Medium; (3) = High



26CYC01	Engineering Chemistry	L	T	P	C
		3	0	2	4
Course Objectives: - Understand the fundamental principles and technological requirements of water treatment. - Acquire knowledge of the basics of polymers, including their preparation, properties, and applications. - Gain familiarity with renewable and non-renewable energy resources and various energy storage devices used in engineering applications. - Understand the mechanisms of metal corrosion and the methods used for its prevention and protection in engineering applications. - Develop an understanding of nanomaterials, their properties, and their applications.					
Unit I	Water Technology	9			
Introduction-sources and impurities in water-soft and hard water- water quality parameters. Types of hardness. - Determination of hardness by EDTA method. Domestic water treatment. Boiler feed water –requisites - scale and sludge formation in boilers-caustic embrittlement- boiler corrosion- treatment of boiler feed water. Internal conditioning (carbonate, phosphate, and calgon conditioning) - external conditioning – ion exchange process, zeolite process, Brackish water –water purification by reverse osmosis. Suggested Activities: Coagulation of water sample using Alum.					
Unit II	Polymer Chemistry	9			
Introduction - occurrence, definitions – functionality - degree of polymerization-, molecular weight - number and weight average method. Types of polymerizations - addition, condensation and copolymerization. Mechanism of polymerization (Free radical). Preparation - properties and applications of nylon 66, Poly Urethane, poly isoprene and Vulcanization of rubber, TEFLON, PET. Suggested Activities: Preparation of Biodegradable Polymer/Polymer Demonstration.					
Unit III	Energy Resources and Storage Devices	9			
Non - renewable energy - nuclear energy, nuclear reaction and its types. Nuclear power plant and its working (light water nuclear power plant & breeder reactor). Renewable energy and its sources. Recent advances in solar cell materials. Geothermal Energy and different type of geothermal power plants. Batteries and Fuel cells- Types of batteries - lead storage battery, lithium battery. Fuel cell - H ₂ -O ₂ fuel cell-applications. Suggested Activities: Performance Study of a Solar Cell.					
Unit IV	Corrosion and its Control	9			
Introduction- types of corrosion - chemical and electrochemical corrosion- galvanic corrosion- pitting corrosion- crevice corrosion- corrosion on wire fence and pipeline corrosion-factors influencing rate of corrosion. Corrosion control methods – sacrificial anode and impressed cathodic current. Protective coatings – paints: constituents and functions. Suggested Activities: Demonstration of Corrosion and Its Prevention.					
Unit V	Nano Chemistry	9			
Basics- distinction between molecules, nanoparticles and bulk materials, Size dependent properties. Nanoparticles: nanocluster- nanorod- nanotube (CNT) and nanowires. Synthesis- Top down process- chemical vapour deposition- electro deposition. Electro spinning method. Bottom up process- precipitation, sol-gel, solvothermal - properties and applications of nanomaterials in various fields. Suggested Activities: Synthesis/Demonstration of Nanomaterials.					
TOTAL (Theory) : 45 PERIODS					
List of Experiments: - Determination of Total, Temporary and Permanent hardness of water by EDTA Method. - Estimation of Alkalinity in water sample. - Determination of HCl using NaOH by pH metry - Estimation of Ferrous iron by Potentiometric titration. - Estimation of HCl using NaOH by Conductometric titration - Estimation of Dissolved Oxygen content in water by Winkler's method - Determination of Chloride in water by Argentometric method - Estimation of copper content of the given solution by redox metry. - Estimation of TDS of a water sample by gravimetry. - Determination of strength of acids in a mixture of acids using conductivity meter.					
TOTAL (Lab.): 30 PERIODS					
TOTAL: 75 PERIODS					

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%.
Assessment Methodology: Assignments (10%), Quiz (10%), Competitive Examinations (10%), Flipped Class (10%), Practical (20%), Internal Examinations (40%).
Text Books:
1. Dr.S.Mageswari, Dr.K.Balachandran, Dr.G.Vijayakumar, "Engineering Chemistry" Tata McGraw Hill Pvt. Ltd., 1 st Edition-2024.
2. O.G.Palanna, "Engineering Chemistry" Tata McGraw Hill Pvt. Ltd., 2 nd Edition -2017
References:
1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogel's Text book of Quantitative Chemical Analysis, 6 th Edition (2000).
2. P. C. Jain and Monica Jain, "Engineering Chemistry", 17 th Edition, Dhanpat Rai Publishing Company Pvt. Ltd., 2025.
3. Arun Bahl, B.S. Bahl, G.D. Tuli, "Essentials of Physical Chemistry" Published by S. Chand & Company Ltd., 2014
4. Sashi Chawla, Dhanpat Rai & Co. Pvt. Ltd., "Engineering Chemistry" 5 th Edition - 2017.
5. Dr.S.Vairam, Dr.Suba Ramesh, "Engineering Chemistry", 1 st Edition, Wiley Publication, Reprint-2016.
E-resources:
1. https://nptel.ac.in/courses/
2. https://swayam.gov.in/
3. https://www.chemguide.co.uk/

CO	CO Description	PO	PSO
CO1	Explain the principles of water technology, water treatment methods, and boiler feed water conditioning for industrial applications.	PO3(3)	PSO1(2)
CO2	Apply the concepts of polymer chemistry to classify polymers and relate their preparation, properties, and engineering applications.	PO3(3) PO6(2)	PSO2(3)
CO3	Analyze renewable and non-renewable energy resources, energy storage devices, and fuel cells for sustainable energy applications.	PO6(3)	PSO1(3)
CO4	Analyze the mechanisms of corrosion and recommend suitable corrosion prevention and protective coating techniques for engineering systems.	PO2(2) PO3(2) PO6(2)	PSO2(3)
CO5	Evaluate the synthesis methods, properties, and applications of nanomaterials in medical and electronic devices.	PO2(3)	PSO1(3) PSO2(2)

(1) = Low; (2) = Medium; (3) = High



26EEEC02	Basic Electronics and Electrical Engineering	L	T	P	C
		3	0	0	3
Course Objective: To impart foundational knowledge in principles and applications of electrical and electronics engineering.					
Unit I	Basic Electronics	9			
Passive and active components – Resistors, Capacitors, Inductors-types, features and specification, Energy band diagram of conductors, semiconductor and insulator – Intrinsic & extrinsic semiconductor - types. PN junction diode – Zener diode. Suggested Activities: VI characteristics of PN junction and Zener diode.					
Unit II	Electrical Machines	9			
Electrical Machines: Construction, Principle of Operation, Basic Equations and Applications - DC Generators, DC Motors, Single Phase Transformer, Single phase Induction Motor, Three phase Induction Motor, Three phase Alternator, Stepper and BLDC motors. Suggested Activities: Demonstration of Electrical Machines.					
Unit III	Measurements and Instrumentation	9			
Measurements and Instrumentation: Functional elements of an instrument, Standards and calibration, Operating Principle, types - Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram- Data acquisition. Suggested Activities: Demonstration of measuring equipment's.					
Unit IV	Basics of Power Systems	9			
Basics of Power Systems: Power system structure -Generation, Transmission and distribution , Various voltage levels, Earthing – methods of earthing, protective devices, switch fuse unit- Miniature circuit breaker- moulded case circuit breaker- earth leakage circuit breaker, safety precautions and First Aid. Suggested Activities: Demonstration of Earthing and safety precautions in electrical circuits.					
Unit V	Sensors and Transducers	9			
Sensors and Transducers Solenoids, electro-pneumatic systems, proximity sensors, limit switches, piezoelectric, hall effect, photo sensors, Strain gauge, LVDT, piezo electric crystals, differential pressure transducer, optical and digital transducers, Smart sensors, Thermal Imagers. Suggested Activities: Demonstrate the working of proximity sensors, limit switches, hall-effect sensors, photo sensors and strain gauges using simple real-life examples.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books: 1. Hughes, E., Electrical and Electronic Technology, Pearson, 12 th Edition, 2016. 2. Theraja, B.L. and Theraja, A.K., A Textbook of Electrical Technology – Volume I, S. Chand & Company Ltd., New Delhi, 2024.					
References: 1. Bell, D., Electronic Devices and Circuits, Oxford University Press, 5 th Edition, 2008. 2. Tooley, M.A., Electronic Circuits: Fundamentals and Applications, Elsevier Limited, 5 th Edition, 2006. 3. Malvino, A. and Bates, D.J., Electronic Principles, 9 th Edition, McGraw-Hill Education, 2012. 4. Sawhney, A.K. and Sawhney, P., A Course in Electrical and Electronic Measurements and Instrumentation, 20 th Edition, Dhanpat Rai & Co. New Delhi, 2010. 5. Patranabis, D., Sensors and Transducers, PHI Learning Pvt. Ltd., 2 nd Edition, New Delhi, 2003.					
E-resources: 1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science 2. https://www.khanacademy.org/science/electrical-engineering 3. https://nptel.ac.in					

CO	CO Description	PO	PSO
CO1	Understand and explain basic electrical and electronic concepts.	---	---
CO2	Apply and analyse electrical circuits in real-time applications.	PO1 (3) PO2 (3)	PSO1(3) PSO2(2)
CO3	Apply measurement and instrumentation techniques to measure electrical quantities using appropriate instruments.	PO1 (3) PO2 (3) PO4 (3)	PSO1(3) PSO2(3) PSO3(2)
CO4	Explain the basic structure of power systems, electrical protection and safety practices.	PO1 (3) PO2 (3) PO6 (3)	PSO2(3) PSO3(2)
CO5	Explain the working principles and applications of sensors and transducers used in modern engineering systems.	PO1 (3) PO4 (3) PO5 (3)	PSO1(3) PSO2(3) PSO3(3)

(1) = Low; (2) = Medium; (3) = High



26CSC01	Programming Language: C	L	T	P	C
		3	0	0	3
Course Objectives: - To equip engineering students with the foundational knowledge and practical skills in ‘C’ programming to analyses and solve computational problems effectively. - To faster problem-solving, critical thinking, and modular programming skills essential for engineering domains.					
Unit I	Introduction to C& Problem Solving				9
Problem Solving, Problem Analysis Chart, Developing an Algorithm, Flowchart and Pseudo code, program structure, Compilation & Execution process, Interactive and Script mode, Comments, Indentation, Error messages, Primitive data types, Constants, Variables, Reserved words, Operators, Input/output Functions, Built-in Functions.					
Suggested Activities: Solve GATE-style MCQs on algorithms, flowcharts, pseudocode, Interactive and Script mode, Comments, Indentation.					
Unit II	Control Structures & Functions				9
If, if-else, nested if, switch-case, while, do-while, for, nested loops, Jump statements. Function Declaration, Definition and Calling, Function Parameters and Return Types, Call by Value and Call by Reference, Recursive Functions, Scope and Lifetime of Variables, Header files and Modular Programming.					
Suggested Activities: Solve GATE-style MCQs on if, if-else, nested if, switch-case, loops, nested loops, and jump statements with output prediction..					
Unit III	Arrays, Strings & Pointers				9
One-dimensional and Multi-dimensional Arrays, Array operations and traversals, String Handling: String declaration, input/output, string library functions, Pointer arithmetic, Pointers and Arrays, Pointers to function, Dynamic memory allocation.					
Suggested Activities: Solve GATE-style MCQs on one-dimensional and multi-dimensional arrays, array operations, traversals, and string handling with output prediction.					
Unit IV	Structures & Unions				9
Defining and using structures, Array of structures, Sorting an array of structures, Difference between structures and unions, Pointers to structures, Unions and their uses, Unions with pointers, Enumerations.					
Suggested Activities: Analyze GATE-style MCQs on structures, arrays of structures, sorting, and pointers to structures.					
Unit V	File operations & Standard Libraries				9
Open, read, write, close file operations, Binary vs Text files, File pointers, Error handling in file operations. Using standard libraries like stdio.h, stdlib.h, string.h, math.h, Creating and using user-defined header files and libraries.					
Suggested Activities: Interpret GATE-style MCQs on file operations, text and binary files, file pointers, and error handling.					
TOTAL (Theory) : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books: 1. Thareja, R. (2021). Programming in C, 3 rd Edition, Oxford University Press. 2. Balagurusamy, E. (2024). Programming in ANSI C, 9 th Edition, Tata McGraw Hill.					
References: 1. Kanetkar, Y. (2020). Let us C, 21 st Edition, BPB Publications. 2. Kalicharan, N. (2022). Learn to program with C (An introduction to programming using the C language. A press. 3. Forouzan, B. A., & Afyouni, H. (2023). Computer Science: A structured programming approach in C, 4 th Edition, Cengage. 4. Pradip Dey, Manas Ghosh, “Computer Fundamentals and Programming in C”, 2 nd Edition, Oxford University					

Press, 2013.

5. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, 1st Edition, Pearson Education, 2013.

E-resources:

1. Learn-C.org - <https://www.learn-c.org/>
2. Geeks for Geeks - C Programming - <https://www.geeksforgeeks.org/c-programming-language/>
3. GNU C Library Documentation - <https://www.gnu.org/software/libc/manual/> “Introduction to C Programming”, Swayam MOOC Course,

CO	CO Description	PO	PSO
CO1	Develop algorithms, flowcharts, and basic C programs for problem solving.	PO1 (3) PO2 (2)	PSO1 (3)
CO2	Implement control structures, functions, and modular programming in C.	PO2 (3) PO5 (2)	PSO1 (3)
CO3	Apply arrays, strings, pointers, and dynamic memory allocation in C programming.	PO2 (2) PO3 (3) PO5 (2)	PSO1 (3) PSO2 (2)
CO4	Construct C programs using structures and unions.	PO3 (3) PO5 (3)	PSO1 (3) PSO2 (3)
CO5	Develop C applications using file handling techniques, standard libraries, user-defined libraries and mini projects.	PO3 (3) PO5 (3) PO9 (2)	PSO1 (3) PSO2 (3)

(1) = Low; (2) = Medium; (3) = High



26MEC02	Makerspace Laboratory	L	T	P	C
		0	0	4	2
Course Objectives: - To impart practical skills in the assembly, disassembly, and welding of components using appropriate tools and techniques. - To provide hands-on training in electrical wiring practices, and the use of electronic components, sensors, and actuators.					
List of Suggested Activities:					
(A). Dis-assembly & Assembly Practices - Tools and its handling techniques. - Dis-assembly and assembly of home appliances – Grinder Mixer Grinder, Ceiling Fan, Table Fan & Washing Machine. - Dis-assembly and assembly of Air-Conditioners & Refrigerators. - Dis-assembly and assembly of a Bicycle. (B). Welding Practices - Welding Procedure, Selection & Safety Measures. - Power source of Arc Welding – Gas Metal Arc Welding & Gas Tungsten Arc Welding processes. - Hands-on session of preparing base material & Joint groove for welding. - Hands-on session of MAW, GMAW, GTAW on Carbon Steel & Stainless Steel plates /pipes for fabrication of a simple part. (C). Electrical Wiring Practices - Electrical Installation tools, equipment & safety measures. - Hands-on session of basic electrical connections for Fuses, Miniature Circuit Breakers and Distribution Box. - Hands-on session of electrical connections for Lightings, Fans, Calling Bells. - Hands-on session of electrical connections for Motors & Uninterruptible Power Supply. (D). Electronics Components / Equipment Practices - Electronic components, equipment & safety measures. - Dis-assembly and assembly of Computers. - Hands-on session of Soldering Practices in a Printed Circuit Board. - Hands-on session of Bridge Rectifier, Op-Amp and Trans impedance amplifier. - Hands-on session of integration of sensors and actuators with a Microcontroller. - Demonstration of Programmable Logic Control Circuit. (E). Contemporary Systems - Demonstration of Solid Modelling of components. - Demonstration of Assembly Modelling of components. - Fabrication of simple components / parts using 3D Printers. - Demonstration of cutting of wood / metal in different complex shapes using Laser Cutting Machine.					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)					
Text Books:					
S. K. Hajra Choudhury, A. K. Hajra Choudhury and S. K. Bhattacharya, Elements of Workshop Technology – Volume I: Manufacturing Processes, 16th Edition, Media Promoters & Publishers, Mumbai. R. S. Khurmi and J. K. Gupta, A Textbook of Workshop Technology – Manufacturing Processes, 6th Edition, S. Chand Publishing, New Delhi.					



References:

1. P. N. Rao, Manufacturing Technology: Foundry, Forming and Welding, 4th Edition, 2017, McGraw Hill Education, New Delhi.
2. S. Kalpakjian and S. R. Schmid, Manufacturing Engineering and Technology, 9th Edition, 2025, Pearson Education, New Delhi.
3. B. L. Theraja and A. K. Theraja, A Textbook of Electrical Technology – Volume I, S. Chand Publishing, New Delhi. 2024 Edition.
4. David P. Leach, Electrical and Electronic Technology, McGraw Hill Education, New Delhi.
5. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes and Systems, 7th Edition, 2019, Wiley, New Delhi.

CO	Description of CO	PO	PSO
CO1	Demonstrate proper use and handling of tools and perform disassembly and assembly of mechanical systems, home appliances and bicycles.	PO1(3) PO5(3) PO8(2)	PSO1(3)
CO2	Perform welding and fabrication of simple components using suitable welding processes, materials, tools and safety practices.	PO1(3) PO3(3) PO5(3) PO7(3)	PSO1(3) PSO2(3)
CO3	Carry out basic electrical wiring and connections for domestic and industrial applications using appropriate electrical equipment and safety procedures.	PO1(3) PO5(3) PO7(3)	PSO2(2) PSO3(2)
CO4	Demonstrate electronic assembly, soldering, circuit implementation and integration of sensors, actuators and microcontrollers for practical applications.	PO1(3) PO2(3) PO5(3) PO8(3) PO11(3)	PSO2(3) PSO3(3)
CO5	Apply contemporary engineering tools for solid and assembly modelling, 3D printing and laser cutting to develop simple components.	PO3(3) PO5(3) PO11(3)	PSO1(3) PSO2(3) PSO3(2)

(1) = Low; (2) = Medium; (3) = High



26CSC02	Programming in C Laboratory	L 0	T 0	P 4	C 2
Course Objectives: • To familiarize with C programming constructs. • To develop programs in C using basic constructs. • To develop programs in C using arrays. • To develop applications in C using strings, pointers, functions. • To develop applications in C using structures. • To develop applications in C using file processing.					
Note: The lab instructor is expected to design problems based on the topics listed. The Examination shall not be restricted to the sample experiments designed. 1. Create Problem Analysis Charts, Flowcharts and Pseudo code for simple C programs 2. I/O statements, operators, expressions. 3. Decision-making constructs: if-else, go to, switch-case, break-continue. 4. Loops: for, while, do-while. 5. Arrays: 1D and 2D, Multi-dimensional arrays, traversal. 6. Strings: operations. 7. Functions: call, return, passing parameters by (value, reference), passing arrays to function. 8. Recursion. 9. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers 10. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions. 11. Files: reading and writing data in text and binary files, File pointers, file operations, random access and processor directives. 12. Use of standard and user-defined libraries in solving problems. TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)					
Text Books:					
1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, 2nd Edition, Prentice Hall. 2. E. Balagurusamy, Programming in ANSI C, 8th Edition, McGraw Hill Education, New Delhi.					
References:					
1. Thareja, R. (2021). Programming in C .3rd Edition, Oxford University Press. 2. Balagurusamy, E. (2019). Programming in ANSI C, 9th Edition, McGraw Hill Education. 3. Kanetkar, Y. (2020). Let us C, 21st Edition, BPB Publications. 4. Kalicharan, N. (2022). Learn to program with C: An introduction to programming using the C language. Apress. 5. Forouzan, B. A., & Afyouni, H. (2023). Computer science: A structured programming approach in C, 4th Edition, Cengage.					
E-resources:					
1. Learn-C.org - https://www.learn-c.org/ 2. Geeks for Geeks - C Programming - https://www.geeksforgeeks.org/c-programming-language/ 3. GNU C Library Documentation - https://www.gnu.org/software/libc/manual/					



CO	CO Description	PO	PSO
CO1	Develop algorithms, flowcharts, and basic C programs for problem solving.	PO1 (3) PO2 (2)	PSO1 (3)
CO2	Implement control structures, functions, and modular programming in C.	PO2 (3) PO5 (2)	PSO1 (3)
CO3	Apply arrays, strings, pointers, and dynamic memory allocation in C programming.	PO2 (2) PO3 (3) PO5 (2)	PSO1 (3) PSO2 (2)
CO4	Construct C programs using structures and unions.	PO3 (3) PO5 (3)	PSO1 (3) PSO2 (3)
CO5	Develop C applications using file handling techniques, standard libraries, user-defined libraries and mini projects.	PO3 (3) PO5 (3) PO9 (2)	PSO1 (3) PSO2 (3)

(1) = Low; (2) = Medium; (3) = High



26HSC02	Physical Education	L	T	P	C
		-	-	-	-
Course Objectives: - To impart the fundamentals of physical education for the development of students' physical, mental, and social well-being. - To instil a lifelong appreciation for physical activity, develop a positive attitude, and foster the values of teamwork and sportsmanship.					
Introduction to physical education: Exercise for good posture – conditioning and calisthenics before starting physical activities – jogging, bending, twisting, standing, sitting, and relaxation exercises – training in basic first-aid practices.					
Participation of athletic events: Rules and regulations of important athletic events – sprints, jumps, throws, and hurdles.					
Skill development in any one of the following outdoor games: Basket Ball, Volley Ball, Ball Badminton, Football, Hockey, Kho-Kho, Kabaddi, Cricket, Hand ball and Tennis.					
Skill development in any one of the following indoor games: Shuttle Badminton, Chess and Table Tennis.					
TOTAL: 30 PERIODS					
References:					
1. Ajmer Singh, Essentials of physical education. Kalyani Publishers, 7 th Revised Edition, 2025. 2. Kamlesh, M.L. (2006). Psychology in physical education and sports, 3 rd Edition, Metropolitan Book Co. 3. S.K. Mangal & Shubhra Mangal: Sports Psychology: Concepts and Applications, 1 st Edition, "Psychology of Sports Performance" 2024, Routledge India.					
E-resources:					
1. https://www.who.int/health-topics/physical-activity					

CO	CO Description	PO	PSO
CO1	Demonstrate appropriate physical exercises, conditioning, calisthenics, posture, relaxation techniques and basic first-aid practices for maintaining physical fitness and safety.	PO1(2) PO4(2) PO7(3)	PSO3(2)
CO2	Demonstrate knowledge of rules and regulations and apply fundamental skills in athletic events including sprints, jumps, throws and hurdles.	PO7(2) PO8(3)	PSO3(2)
CO3	Develop and demonstrate fundamental skills, techniques and game strategies in a selected outdoor game through regular practice and teamwork.	PO2(2) PO3(2) PO5(2) PO7(2) PO8(3)	PSO3(3)
CO4	Develop and demonstrate fundamental skills, techniques and strategies in a selected indoor game with emphasis on concentration, discipline and fair play.	PO2(2) PO7(3) PO9(2)	PSO3(2)
CO5	Apply physical fitness, sports skills, teamwork, discipline, ethical values and safety practices to promote a healthy and active lifestyle.	PO6(3) PO7(3) PO8(3) PO11(3)	PSO3(3)

(1) = Low; (2) = Medium; (3) = High



SEMESTER – II



26MAC02	Linear Algebra	L	T	P	C
		3	1	0	4
Course Objectives: • To impart foundational knowledge in linear algebra essential for analyzing and solving problems in engineering applications. • The Objectives of the course are to equip students with the ability to formulate and solve various types of Ordinary Differential Equations for solving differential equations encountered in engineering problems.					
Unit I	Vector Spaces	12			
Introduction to Vector Spaces, Examples, Subspaces, Linear Combinations, Span, Generating Sets, Linear Dependence and Independence, Basis and Dimension.					
Suggested Activities: Open-Source software, exercises to test linear dependence and independence using rank, solving Competitive Examination questions					
Unit II	Inner Product Spaces	12			
Inner product, Norms, Cauchy, Schwarz inequality, Gram-Schmidt orthogonalization, Simple problems (up to R^3).					
Suggested Activities: Open-Source software, exercises to compute inner products and vector norms, solving Competitive Examination questions.					
Unit III	Matrix Decomposition	12			
QR decomposition (Gram- Schmidt method and House holder method), Singular Value Decomposition (SVD), Least squares solutions, simple problems (up to 3×3 matrices).					
Suggested Activities: Open-Source software, exercises to check if a matrix is positive definite, solving Competitive Examination questions.					
Unit IV	First order Ordinary Differential Equations	12			
Basic concepts of ordinary differential equations, Formation of first order differential equations from physical problems, First order and first-degree ODE: Variables separable, Exact equations, Leibnitz’s equation, Bernoulli’s equation.					
Suggested Activities: Application and Visualization of the first order ODE using open-source software and solving Competitive Examination questions.					
Unit V	Higher order Ordinary Differential Equations	12			
Formation of second order differential equations from physical problems Linear equations of second and higher order with constant coefficients, Euler’s linear equations, Method of variation of parameters.					
Suggested Activities: Solving ordinary differential equations using open-source software and solving of Competitive Examination questions.					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. Friedberg, S. H., Insel, A. J., & Spence, L. E. (2022). Linear algebra. 5 th Edition, Pearson. 2. Boyce, W. E., DiPrima, R. C., & Meade, D. B. (2022). Elementary differential equations and boundary value problems, 12 th Edition, Wiley.					
References:					
1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 45 th Edition, 2026. 2. Lay, D. C., Lay, S. R., & McDonald, J. J. (2020). Linear algebra and its applications with MATLAB, 6 th Edition, Pearson. 3. Bronson, R., Costa, G. B., Saccoman, J. T., & Gross. D (2023). Linear algebra: Algorithms, applications, and techniques, 4 th Edition. 4. Lay, D. C., Lay, S. R., & McDonald, J. J. (2021). Linear algebra and its applications, 6 th Edition, Pearson 5. Kreyszig, E. (2025). Advanced engineering mathematics, 11 th Edition, Wiley.					
E-resources:					
1. https://math.libretexts.org/Bookshelves/Linear_Algebra/Book%3A_Linear_Algebra_(Schilling_Nachtergaele_and_Lankham)/09%3A_Inner_product_spaces 2. https://ocw.mit.edu/courses/18-03-differential-equations-spring-2010/ 3. https://archive.nptel.ac.in/content/syllabus_pdf/111107053.pdf					

CO	CO Description	PO	PSO
CO1	Explain the fundamental concepts of Linear Algebra.	PO1(3)	PSO1(2)
CO2	Compute inner products and vector norms, validate the Cauchy-Schwarz inequality	PO1(3)	PSO1(2)
CO3	Factorize matrices using QR decomposition to solve physical least-squares approximation problems.	PO1 (3)	PSO1(1)
CO4	Explain first and higher-order ODEs using appropriate analytical and numerical techniques.	PO1 (2) PO2 (2)	PSO3(1)
CO5	Solve higher-order ODEs using classical and finite Difference methods.	PO1(3) PO5(3)	PSO1(2)

(1) = Low; (2) = Medium; (3) = High



26PHC05	Physics for Electronics Engineering	L	T	P	C
		3	0	0	3
Course Objectives: - To impart fundamental knowledge of rigid body dynamics, crystalline physics and functional materials - To provide analytical abilities for evaluating physical phenomena in mechanical engineering applications.					
Unit I	Crystallography	9			
Introduction - Lattice - Unit cell-Seven crystal system - Bravais lattice-Lattice planes-Calculation of number of atoms per Unit Cell, Atomic Radius, Coordination Number and Packing Factor of SC, BCC, FCC and HCP Structures. Miller Indices-Derivation for Inter-Planar Spacing in term of Miller Indices. Suggested Activities: Calculate and compare the number of atoms, coordination number and packing factor for SC, BCC, FCC and HCP structures.					
Unit II	Magnetic and Superconducting materials	9			
Magnetic material: Dia, Para and Ferromagnetic Material and its Properties - Ferromagnetic Material Domains-Wiess Theory of Ferromagnetism - Hysteresis - B-H Curve - Soft and Hard Magnetic Materials -Application. Superconducting materials: Properties- Messiner Effect- type I and II Superconductors - London Equations - High Temperature Superconductor - Application: SQUIDS-Magnetic Levitated Train. Suggested Activities: Plot and interpret the B–H hysteresis curve and identify soft and hard magnetic materials.					
Unit III	Semiconductor Physics	9			
Semiconductor-Intrinsic and Extrinsic-Energy Level Diagram- Carrier Concentration Intrinsic and Extrinsic Semiconductor (N type –P type), Variation of Carrier Concentration with Temperature, Drift and Diffusion current - Hall Effect-Experiment to find Hall effect - Schottky diode. Suggested Activities: Study the V–I characteristics of a Schottky diode and compare it with a PN-junction diode.					
Unit IV	Modern Engineering Materials	9			
Shape Memory Alloys - Structures - types - properties - Application. Metallic Glasses-types-preparation, properties and application. Ceramics - Types - Properties and Application- Composites - Fibre Reinforced Plastics (FRP) - Fibre Reinforced Metals (FRM)-types-properties and application Suggested Activities: Compare FRP and FRM based on properties, advantages and applications.					
Unit V	Nano Devices	9			
Density of states for solids - Significance between Fermi energy and volume of the material – Quantum confinement – Quantum structures – Density of states for quantum wells, wires and dots – Band gap of nanomaterials – Tunneling – Single electron phenomena – Single electron Transistor - Carbon nanotubes: Properties and applications. Suggested Activities: Demonstrate or simulate electrode deposition for the preparation of nanomaterials.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. Kittel, C., Introduction to Solid State Physics, Wiley India Edition, 8 th Edition, New Delhi, 2019. 2. Callister, W.D. and Rethwisch, D.G., Materials Science and Engineering: An Introduction, 10 th Edition, John Wiley & Sons, 2014.					
References:					
1. Hanson, G.W., Fundamentals of Nanoelectronics, Pearson Education, Indian Edition, 2009. 2. Pierret, R.F., Semiconductor Device Fundamentals, 2 nd Edition, Pearson Education, 2006. 3. Balasubramaniam, R., Callister's Materials Science and Engineering, Wiley India 2 nd Edition, 2014. 4. Theraja, B.L., Basic Electronics Solid State, S. Chand and Company Ltd., New Delhi, 2002. 5. Ashcroft, N.W. and Mermin, N.D., Solid State Physics, 1 st Edition, Cengage Learning, 2011.					
E-resources:					

1. Crystalline physics: <https://ocw.mit.edu/courses/3-091sc-introduction-to-solid-state-chemistry-fall-2010/pages/crystalline-materials/15-introduction-to-crystallography/>
2. Moment of Inertia: https://youtu.be/fDJeVR0o__w
3. Magnetic Susceptibility – <https://em-amrt.vlabs.ac.in/exp/quinckes-method>

CO	CO Description	PO	PSO
CO1	Understand crystal structures and crystal growth techniques.	PO1(3) PO2(3)	PSO1(3) PSO2(3)
CO2	Explain magnetic and superconducting materials and their applications.	PO1(3) PO2(2) PO4(3)	PSO1(3) PSO2(3)
CO3	Analyze semiconductor properties and devices.	PO1(3) PO2(3) PO5(3)	PSO1(3) PSO2(3)
CO4	Describe modern engineering materials and their applications.	PO1(3) PO2(2) PO3(3)	PSO1(3) PSO2(3)
CO5	Understand nanomaterials, preparation methods and applications.	PO1(3) PO2(3) PO5(3)	PSO1(1) PSO2(3)

(1) = Low; (2) = Medium; (3) = High



26GEC01	Environmental Science and Sustainability	L	T	P	C
		2	0	0	2
Course Objectives: - To understand environment, ecosystems, biodiversity, and conservation. - To understand sustainability, SDGs, and environmental issues. - To learn sustainable practices, circular economy, and green engineering. - To understand pollution, prevention, control, and waste management. - To learn energy conservation and renewable energy sources					
Unit I	Environment and Biodiversity	6			
Nature and scope of environmental education, natural resources, Ecosystem Structure, characteristics and functions of ecosystem. Biodiversity, definition, conservation of biodiversity (in-situ and Ex-situ).					
Suggested Activities: Know Your Campus Biodiversity & Campus Biodiversity Survey.					
Unit II	Social Issues and Sustainability	6			
Sustainability, Definition, Sustainable development Goals, Environmental issues - global warming and Ozone depletion ,Climate change, Acid rain, Carbon foot print-Possible solutions to Environmental issues.					
Suggested Activities: Sustainability Action Challenge & Sustainability Action Plan.					
Unit III	Sustainability Practices	6			
Zero waste and R-concept-circular economy, material life cycle assessment, Sustainable habitat - Sustainable transports, Sustainable urbanization, Green Engineering, Green buildings, Green materials- GRIHA- IGBC Green & Net Zero Buildings Rating System.					
Suggested Activities: Unsustainable Campus Challenge – “From Waste to Resource Green Campus” solution.					
Unit IV	Environmental Pollution and Its Control	6			
Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Environmental protection, Environmental protection acts.					
Suggested Activities: Environmental Pollution Audit and Control Plan, Prepare a Pollution Control Chart.					
Unit V	Renewable Sources of Energy	6			
Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources. Concept, origin and power plants of geothermal energy.					
Suggested Activities: Comparative Study of Renewable Energy Sources, Design a Renewable Energy Syllabus.					
TOTAL : 30 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. Anubha Kaushik and C. P. Kaushik’s “Perspectives in Environmental Studies”, 6 th Edition, New Age International Publishers, 2018.					
2. G. Tyler Miller and Scott E. Spoolman, Environmental Science, 15th Edition, Cengage Learning, Boston.					
References:					
1. Benny Joseph, ‘Environmental Science and Engineering’, Tata McGraw-Hill, New Delhi, 2016.					
2. Gilbert M.Masters, ‘Introduction to Environmental Engineering and Science’, 3 rd Edition, Pearson Education, 2023.					
3. P. Meenakshi – Elements of Environmental Science and Engineering, 2 nd Edition, latest print 2023, PHI Learning					
4. Jay H. Withgott & Matthew Laposata – Essential Environment: The Science Behind the Stories, 7 th Edition, Pearson.					
5. Cunningham and cooper-“Environmental Science, Jaico”, The current Cunningham environmental-science text is 16 th Edition, 2026, McGraw Hill					
E-resources:					
1. https://nptel.ac.in/courses/103107215					

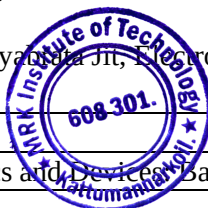


CO	CO Description	PO	PSO
CO1	Explain environmental concepts, ecosystems, biodiversity, and conservation.	PO6(3)	PSO3(3)
CO2	Describe sustainability, SDGs, environmental issues, and solutions.	PO7(3)	PSO2(3)
CO3	Apply sustainable practices, circular economy, green engineering, and green buildings.	PO6(3) PO7(3)	PSO1(3)
CO4	Identify pollution causes, effects, control measures, and waste management practices.	PO3(3) PO6(3)	PSO2(3)
CO5	Explain energy conservation and emerging renewable energy sources.	PO6(3)	PSO1(3) PSO2(2)

(1) = Low; (2) = Medium; (3) = High



26EC201	Electron Devices	L	T	P	C
		3	0	0	3
Course Objective: To acquaint with the construction, theory and operation of the basic electronic devices such as PN junction diode, Bipolar and Field Effect Transistors, Power control devices, LED, LCD and other Optoelectronic devices.					
Unit I	Semiconductor Fundamentals				9
Types, Conductivity, Electron energy levels and energy band diagram, Carrier concentration, Mass action law, Characteristics of intrinsic and extrinsic semiconductors, Variation in properties with temperature, Carrier drift and diffusion, Current density equation, Excess carrier generation and recombination rates, Carrier lifetime, Semiconductor fabrication basics, Introduction to Semiconductor IC Technology. Suggested Activities: Virtual demonstration of energy levels, Drift and diffusion current.					
Unit II	PN Junction Diodes and special diodes				9
Energy band diagram of open-circuited PN junction, Forward and reverse bias characteristics, Diode resistance, Transition and diffusion capacitance, Effect of temperature on diode behavior, clippers and clampers-Applications of PN junction diodes, Zener diode – breakdown mechanisms and voltage regulation, Varactor diode, Tunnel diode, Photodiode – construction, operation, and applications. Suggested Activities: Virtual demonstration of characteristics of junction diodes, Design of a constant voltage regulator using Zener Diode					
Unit III	BJT and FET				9
Construction, working, characteristics in CB, CE, and CC configurations, regions of operation, current gain, input/output characteristics, Early effect. JFET – construction, working, characteristics, parameters. MOSFET, MOS capacitor, depletion and enhancement modes, nMOS and pMOS, threshold voltage, transfer and output characteristics, BJT Applications in Biomedical Signal Amplifiers, CMOS Technology. Suggested Activities: SPICE simulation of diode, BJT, and MOSFET characteristics					
Unit IV	Thyristors and UJT				9
Shockley diode, Silicon Controlled Rectifier (SCR), TRIAC and DIAC – operation and applications, Thyristor protection techniques. UJT Construction, characteristics and application as relaxation oscillator, Power BJT. Suggested Activities: Design and simulate a UJT relaxation oscillator and Power BJT switching circuit.					
Unit V	Optoelectronic Devices				9
LED, LCD, Phototransistor, Optocoupler – principle, characteristics and applications. Power MOSFETs: Construction, switching characteristics and applications in power circuits, Optoelectronic Sensors, Advanced Optoelectronics, Optoelectronics in AI and Robotics. Suggested Activities: Design and simulate LED, phototransistor, and optocoupler-based circuits.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. Ben G. Streetman and Sanjay Kumar Banerjee, Solid State Electronic Devices, 7 th Edition, Pearson Education India, 2015. 2. Jacob Millman, Christos C. Halkias and Satyendrajit, Electronic Devices and Circuits, 4 th Edition, McGraw Hill Education, 2015.					
References:					
1. Donald A. Neamen, Semiconductor Physics and Devices Basic Principles, 4 th Edition, McGraw Hill, 2012.					



2. S.M. Sze and Kwok K. Ng, Physics of Semiconductor Devices, 3rd Edition, John Wiley & Sons, 2007.
3. S.O. Kasap, Principles of Electronic Materials and Devices, 3rd Edition, McGraw Hill, 2007.
4. S. Salivahanan and N. Suresh Kumar, Electronic Devices and Circuits, 4th Edition, McGraw Hill, 2016.
5. David A. Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 2008

E-resources:

1. <https://archive.nptel.ac.in/courses/108/108/108108122/>
2. https://onlinecourses.nptel.ac.in/noc21_ee80/preview
3. Razavi Electronics 1, Lec 1, Intro., Charge Carriers, Doping

CO	CO Description	PO	PSO
CO1	Explain semiconductor physics and the operating principles of semiconductor electronic devices..	PO1 (3) PO2 (2) PO4 (2)	PSO2 (2)
CO2	Apply semiconductor concepts to analyze and compare the configurations and characteristics of PN junction diodes, BJTs and FETs.	PO1 (3) PO2 (3) PO3 (2) PO4 (2) PO5 (2)	PSO1 (3) PSO2 (3)
CO3	Analyze the characteristics and operating regions of semiconductor devices for suitable applications.	PO1 (3) PO2 (3) PO3 (3) PO5 (3)	PSO1 (3) PSO2 (3) PSO3 (2)
CO4	Perform experiments to evaluate and compare the characteristics of electronic components.	PO1 (3) PO2 (3) PO3 (3) PO4 (2) PO5 (3)	PSO1(3) PSO2(3)
CO5	Explain the principles, characteristics and applications of optoelectronic and power semiconductor devices.	PO1 (3) PO2 (3) PO3 (3) PO5 (3) PO11 (3)	PSO1 (3) PSO2 (3) PSO3 (3)

(1) = Low; (2) = Medium; (3) = High



26EC202	Circuits and Network Analysis	L	T	P	C
		3	0	0	3
Course Objectives: - To impart the fundamental principles of circuit laws, network analysis techniques, and DC and AC circuits. - To develop the ability to analyze steady-state and transient responses of RL, RC, and RLC circuits using phasor and Laplace transform techniques. - To provide knowledge of resonance, coupled circuits, mutual inductance, and transformer characteristics. - To impart the concepts and applications of diode circuits, rectifiers, voltage regulators, and passive filters.					
Unit I	Circuit Laws	9			
Basic electrical components, voltage, current, power, Network terminology- Node, Junction, Branch, Loop, Short and Open Circuits, DC and AC circuits, Ohm's Law, Kirchhoff's Laws, Resistors, inductors, and capacitors in series and parallel, Mesh and Nodal Analysis for AC and DC circuits, Source transformation techniques, Star-delta transformation techniques.					
Suggested Activities: Verification of Ohm's Law and Kirchhoff's Voltage and Current Laws using a DC circuit.					
Unit II	Steady-State and Transient Analysis of Ac and DC Circuits	9			
Component behavior (R, L, and C) in AC and DC, Characteristics of sinusoids, Phasor relationship for R, L, and C, Phasor diagram, Natural and forced response, Steady-state and Transient analysis of RL, RC, RLC circuits using Laplace transform.					
Suggested Activities: Experimental study of the transient response of RC and RL circuits and determination of time constant using an oscilloscope.					
Unit III	Resonance and Coupled Circuits	9			
Natural frequency and damping ratio, Series resonance, Parallel resonance, Quality factor (Q), Bandwidth, Selectivity, Effect of Q on bandwidth and selectivity. Self-inductance, Mutual inductance, Dot conversion, Ideal Transformer.					
Suggested Activities: Determine the resonant frequency, bandwidth and Q-factor of a series RLC circuit and plot its frequency response.					
Unit IV	Diode and Filter Circuits	9			
Diode circuits - clipper, clamper, voltage doubler, voltage quadrupler, half-wave rectifier, centre-tapped full-wave rectifier, and bridge rectifier circuits. Power supply design. Regulators – Voltage regulator circuits using Zener diode. Passive filters – analysis of RC, RL, RLC filters.					
Suggested Activities: Construction and testing of a bridge rectifier with capacitor filter and Zener voltage regulator.					
Unit V	BJT Circuits	9			
Load-line analysis, different biasing techniques of BJT, bias stabilization, and Early effect, RC-coupled and transformer-coupled multistage amplifiers, and current mirror circuits.					
Suggested Activities: Plot the BJT characteristics and DC load line, determine the operating point, and demonstrate a common-emitter amplifier.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. Hayt, W. H., Kemmerly, J. E., & Durbin, S. M., Engineering Circuit Analysis, McGraw Hill Education, 2024.					
2. Alexander, C. K., & Sadiku, M. N. O., Fundamentals of Electric Circuits, McGraw Hill Education, 2017.					

References:

1. Boylestad, R. L., Introductory Circuit Analysis, Pearson Education India, 2014.
2. Kuo, F. F., Network Analysis and Synthesis, Wiley India, 2012.
3. Dorf, R. C., & Svoboda, J. A., Introduction to Electric Circuits, Wiley, 2018.
4. Edminister, J. A., & Nahvi, M., Schaum's Outline of Electric Circuits, McGraw Hill Education, 2014.
5. Millman, J., & Grabel, A., Microelectronics, McGraw Hill Education, 1987.

E-resources:

1. <https://nptel.ac.in/courses/108102042>
2. <https://nptel.ac.in/courses/108105159>
3. <https://archive.nptel.ac.in/courses/108/104/108104139/>

CO	CO Description	PO	PSO
CO1	Explain semiconductor physics and the operating principles of semiconductor electronic devices.	PO1(3)	PSO2(2)
CO2	Apply semiconductor concepts to analyze and compare the configurations and characteristics of PN junction diodes, BJTs and FETs.	PO1(2) PO2(2)	PSO1(3)
CO3	Analyze the characteristics and operating regions of semiconductor devices for suitable applications.	PO2(3) PO4(2)	PSO1(3)
CO4	Perform experiments to evaluate and compare the characteristics of electronic components.	PO2(2) PO4(3)	PSO2(2)
CO5	Explain the principles, characteristics and applications of optoelectronic and power semiconductor devices.	PO1(2) PO2(2)	PSO2(3) PSO3(2)

(1) = Low; (2) = Medium; (3) = High



26CSC03	Problem Solving using Python Programming	L	T	P	C
		3	0	2	4
Course Objectives: - To equip engineering students with the foundational knowledge and practical skills in Python programming to analyse and solve computational problems effectively. - To faster problem-solving, critical thinking, and modular programming skills essential for engineering domains.					
Unit I	Introduction to Python Programming	9			
Problem Solving, Problem Analysis Chart, Developing an Algorithm, Flowchart and Pseudocode, Interactive and Script Mode, Indentation, Comments, Error Messages, Variables, Reserved Words, Data Types, Arithmetic Operators and Expressions, Built-in Functions, Importing from Packages.					
Suggested Activities: Interpret GATE-style MCQs on pseudocode, interactive/script mode, indentation, comments, errors, variables, reserved words, and data types.					
Unit II	Control Structures and Functions	9			
If, if-else, Nested if, Multi-way if-elif Statements, while Loop, for Loop, Nested Loops, pass Statements. Functions: Hiding Redundancy and Complexity, Parameters, Arguments and Return Values, Formal and Actual Arguments, Named Arguments, Recursive Functions, Lambda Functions.					
Suggested Activities: Practice GATE-style MCQs on Control Statements, while, for, nested loops, and pass statements.					
Unit III	Strings and Collections	9			
String Comparison, Formatting, Slicing, Splitting, Stripping. Collections: Lists, Tuples, Sets and Dictionaries, Basic List Operators, Searching and Sorting Lists, Dictionary Literals, Adding and Removing Keys, Accessing and Replacing Values.					
Suggested Activities: Evaluate GATE-style MCQs on string comparison, formatting, slicing, splitting, stripping, lists, tuples, sets, and dictionaries.					
Unit IV	File Operations and Data Processing	9			
Creating, Opening, Reading, Writing, Appending and Closing Files, Manipulating Directories, OS and Sys Modules, Reading and Writing Text and Numbers, Creating and Reading Formatted Files such as CSV and Tab-Separated Files.					
Suggested Activities: Examine GATE-style MCQs on creating, opening, reading, writing, appending, closing files, directories, and OS/Sys modules.					
Unit V	Python Modules, Packages and Project	9			
Packages: Built-in Modules, User-Defined Modules, NumPy, SciPy, Pandas and Scikit-learn.					
Suggested Activities: Assess GATE-style MCQs on built-in modules, user-defined modules, and their applications.					
TOTAL (Theory) : 45 PERIODS					
List of Experiments: - Problem Analysis Chart, Flowchart and Pseudocode Practices. (Minimum Three) - Usage of Conditional Logics in Programs. (Minimum Three) - Usage of Functions in Programs. (Minimum Three) - String Manipulation and Operations on Lists, Tuples, Sets and Dictionaries. (Minimum Three) - Opening, Closing, Reading and Writing Formatted Files and Sorting Data. (Minimum Three) - Usage of Modules and Packages to Solve Engineering Problems. (Minimum Three) - Project: Development of Python-based applications using appropriate programming concepts, modules and packages. (Minimum Two Projects)					
TOTAL (Lab.): 30 PERIODS					
TOTAL: 75 PERIODS					
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%.					

Assessment Methodology: Assignments (10%), Quiz (10%), Competitive Examinations (10%), Flipped Class (10%), Practical (20%), Internal Examinations (40%).	
Text Books:	
1. Thareja, R. (2023). Python Programming: Using Problem Solving Approach (2 nd Edition). Oxford University Press.	
2. Liang, Y. D. (2017). Introduction to Programming Using Python (1 st Edition). Pearson Education.	
References:	
1. Matthes, E. (2019). Python crash course: A hands-on, project-based introduction to programming (2 nd Edition). No Starch Press.	
2. Brown, M. C. (2018). Python: The complete reference (4 th Edition). McGraw Hill Publishers.	
3. Guttag, J. V. (2016). Introduction to computation and programming using Python: With applications to understanding data (2 nd Edition). MIT Press.	
4. McKinney, W. (2017). Python for data analysis: Data wrangling with pandas, NumPy, and IPython. Shroff/O'Reilly.	
5. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2 nd Edition, O'Reilly Media, 2016.	
E-resources:	
1. Official Python Documentation – https://docs.python.org/3/	
2. Python Tutorials – https://www.w3schools.com/python/	
3. NumPy – https://numpy.org/doc/	

CO	CO Description	PO	PSO
CO1	Apply problem-solving techniques, algorithms, flowcharts, and Python programming fundamentals to develop simple programs.	PO1 (3) PO2 (3)	PSO1 (3) PSO2 (2)
CO2	Implement conditional, looping, and function construct to develop modular Python programs.	PO1 (3) PO2 (3) PO5 (2)	PSO1 (3) PSO2 (3) PSO3 (2)
CO3	Develop Python programs using strings, lists, tuples, sets, and dictionaries for data manipulation.	PO1 (3) PO2 (3) PO3 (2) PO5 (2)	PSO1 (3) PSO2 (3) PSO3 (2)
CO4	Implement file and directory operations to store, retrieve, process, and organize data in formatted files.	PO2 (3) PO5 (3)	PSO1 (2) PSO2 (3) PSO3 (2)
CO5	Develop problem-solving applications using Python modules and packages such as NumPy, SciPy, Pandas, and Scikit-learn.	PO2 (3) PO3 (3) PO5 (3) PO11 (2)	PSO1 (3) PSO2 (3) PSO3 (3)

(1) = Low; (2) = Medium; (3) = High



26EC203	Devices and Circuits Laboratory	L	T	P	C
		0	0	4	2
Course Objectives: - To learn the characteristics of basic electronic devices such as diode, BJT, FET, SCR & UJT. - To gain hands on experience in KVL, KCL, Thevenin, Norton, Super position, Reciprocity and Maximum Power Transfer theorem. - To understand the working of RL, RC and RLC Circuits.					
List of Experiments: - Characteristics of PN junction & Zener Diode. - Input and Output Characteristics of BJT. - Drain and Transfer Characteristics of FET. - Design clipper and clamper circuits. - VI Characteristics of SCR & UJT. - Demonstration of rectifier Circuits. - Verification of KVL & KCL. - Verification of Thevenin and Norton theorem. - Verification of super position theorem & Reciprocity theorem. - Verification of Maximum power transfer theorem. - Determination of resonance frequency of series & parallel circuits. - Transient Analysis of RL and RC circuits.					
TOTAL: 60 PERIODS					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)					
References: - Boylestad, R. L. and Nashelsky, L. – Electronic Devices and Circuit Theory, Pearson, 11th Edition, 2015. - Millman, J. and Halkias, C. C. – Integrated Electronics: Analog and Digital Circuits and Systems, McGraw-Hill, 2nd Edition, 2010. - Alexander, C. K. and Sadiku, M. N. O. – Fundamentals of Electric Circuits, McGraw-Hill Education, 6th Edition, 2017. - Hayt, W. H., Kemmerly, J. E. and Durbin, S. M. – Engineering Circuit Analysis, McGraw-Hill Education, 8th Edition, 2012. - Floyd, T. L. – Electronic Devices, Pearson, 9th Edition, 2012.					

CO	CO Description	PO	PSO
CO1	Perform experiments to evaluate and compare the characteristics of electronic components.	---	
CO2	Apply the concepts and demonstrate the different configuration of various electron devices.	PO1 (3)	PSO1(2)
CO3	Experimentally analyze and interpret of various theorems.	PO2 (2)	PSO1(3)
CO4	Perform experiments to evaluate the electric and magnetic circuits.	PO2 (2) PO4 (2)	PSO2(2) PSO3(1)

(1) = Low; (2) = Medium; (3) = High



26ENC02	Communicative English Laboratory	L	T	P	C
		0	0	4	2
Course Objectives: To make students proficient and confident communicators in English across a variety of contexts. To enable learners to comprehend both spoken English in diverse settings. To develop students' ability in the nuances Reading English. To enhance the ability of different formal and technical writings. To prepare learners to tackle situations and seek employment with assurance in the modern globalized world.					
List of Suggested Activities					
LISTENING SKILL a) Listening Comprehension b) Listening Native Speakers and Repeat c) Listening to Pod casts d) Experiencing Listening Technical Reports e) Listening Barriers SPEAKING SKILL a) Phonetics b) Pronunciation c) Accent d) Intonation e) Stress f) Pause g) Nuances READING SKILL a) General and Technical Comprehension b) Experiencing Intensive reading, c) Extensive reading d) Skimming and Scanning e) Practice on Terminologies f) Synonyms and Antonyms from technical subjects WRITING SKILL a) Common Errors b) Paragraphs and Essays c) Writing Technical Reports d) Business Letters, Emails, Notices e) Agenda and Minutes of Meeting PERSONALITY DEVELOPMENT a) SWOT Analysis b) Digital Presentation c) Role Play d) Dialogue and Conversation e) TED Talks – Extempore					
					TOTAL : 60 PERIODS
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)					
Text Books:					
1. Dutt, Kiranmai, et al. A Course in Communication Skills. Cambridge University Press, 2008. 2. Green, David. Contemporary English Grammar: Structures & Composition. Trinity Press, 2018.					
References:					
1. Narayanaswami, V. R. Strengthen Your Writing. Orient Blackswan, 2009. 2. Nicholls, Anne. Mastering Public Speaking. Jaico Publications, 1999. 3. Raman, Meenakshi. Principles and Practice in Technical Communication. Oxford University Thomson, 3 rd Edition, 2022 4. A.J. and A.V. Martinet. A Practical English Grammar. Oxford University Press. 5. Murphy, Raymond. Essential English Grammar. 2 nd Edition, Cambridge University Press, 2022.					

E-resources:

1. <https://www.shortform.com/summaries>
2. <https://www.skillsyouneed.com/rhubarb.html>
3. Sway am-NPTEL Business English Communication Portal

CO	CO Description	PO	PSO
CO1	Demonstrate effective interpersonal and intrapersonal communication skills in all the contexts.	PO7 (2) PO8 (3) PO9 (3)	PSO3(3)
CO2	Apply appropriate listening and speaking strategies to comprehend technical information.	PO8 (2) PO9 (3) PO10 (2) PO11 (2)	PSO2(2) PSO3(2)
CO3	Employ reading strategies to comprehend and interpret general and technical texts and acquire relevant technical vocabulary.	PO2 (2) PO9 (3) PO11 (2)	PSO2(2) PSO3(2)
CO4	Produce clear and accurate written communication to use in appropriate grammar and professional conventions.	PO2 (1) PO8 (2) PO9 (3)	PSO2(2) PSO3(3)
CO5	Develop personality and professional competencies for career development.	PO3 (1) PO7 (3) PO8 (3)	PSO2(2) PSO3(3)

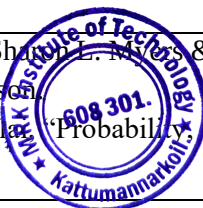
(1) = Low; (2) = Medium; (3) = High



SEMESTER – III



26MAC04	Probability and Random Processes	L	T	P	C
		3	1	0	4
Course Objective: To provide a rigorous mathematical foundation in statistical analysis and probability theory required for industrial quality control, semiconductor manufacturing, signal processing, and modern communication systems. The course emphasizes "small sampling theory" and stochastic processes essential for electronics R&D.					
Unit I	Descriptive And Bivariate Statistics				12
Univariate Measures: Mean, Median, Mode, Variance, and Standard Deviation, Relative Variation: Coefficient of Variation (CV) for comparing component stability., Bivariate Statistics: Covariance and the Correlation Coefficient (r), Linear Regression: Method of Least Squares for sensor calibration and trend analysis. Suggested Activities: Visualization of statistical measures and data distributions using open-source software.					
Unit II	Probability Foundations And Distributions				12
Probability Theory: Axioms, Conditional Probability, and Bayes' Theorem (Signal Detection). Random Variables:Discrete (Binomial,Poisson for shot noise) and Continuous (Uniform, Exponential). The Normal Distribution: Properties of Gaussian distributions, Central Limit Theorem. Suggested Activities: Sample data to calculate Binomial/Poisson probabilities and plot a Gaussian distribution, observing the effect of the Central Limit Theorem.					
Unit III	Statistical Inference And Small Sampling				12
Sampling Distributions: Population vs. Sample; Degrees of Freedom. Small Sample Tests: Student's t-distribution (One-sample and Two-sample tests). Variance Analysis: Chi-square distribution and F-distribution for comparing production batches. Estimation: Confidence Intervals for mean and variance of device parameters. Suggested Activities: Sampling & t-Test Activity- collect a small sample of device measurements and perform one-sample and two-sample t-tests, interpreting the results.					
Unit IV	Hypothesis Testing And Error Metrics				12
Testing Framework: Null (H0) and Alternative (H1) Hypotheses. Decision Errors: Type I error (Alpha), Type II error (Beta), and Power of a test. P-values: Interpretation of p-values in industrial datasheets and medical electronics. Parametric & Non-Parametric: ANOVA basics and Chi-square Goodness-of-Fit tests. Suggested Activities: Compare multiple productions groups using ANOVA and apply a Chi-square goodness-of-fit test to determine whether observed data match the expected distribution.					
Unit V	Random Processes				12
Classification – Stationary process – Markov process - Poisson process - Discrete parameter Markov chain – Chapman Kolmogorov equations (Statement only) - Limiting distributions. Suggested Activities: Simulate a Markov chain and Poisson process using simple real-world events, and observe the transition probabilities and event arrivals.					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. Ronald E. Walpole, Raymond H. Myers, Sharon W. Myers & Keying E. Ye, "Probability & Statistics for Engineers & Scientists", 9 th Edition, Pearson 2. Athanasios Papoulis & S. Unnikrishna Pillai, "Probability, Random Variables, and Stochastic Processes", 4 th Edition, McGraw-Hill.					



References:	
1. Roy D Yates and David J Goodman, “Probability and Stochastic Processes”, 4 th Edition, Wiley India, New Delhi, 2021 . 2. Douglas C Montgomery and George C Runger, “Applied Statistics and Probability for Engineers”, 7 th edition, Wiley India, New Delhi, 2020. 3. Oliver C. Ibe, “Fundamentals of Applied Probability and Random Processes”, 1 st Indian Reprint, Elsevier, 2014. 4. Saeed Ghahramani, “Fundamentals of Probability with Stochastic Processes”, 5 th Edition, CRC Press, USA, 2024. 5. Stark. H and Woods J.W, "Probability and Random Processes with Applications to Signal processing", 3 rd Edition, Pearson Education, Asia, 2001 .	
E-Resources:	
1. https://www.itl.nist.gov/div898/handbook/?utm 2. https://ocw.mit.edu/search/?q=probability+statistics&utm 3. https://nptel.ac.in/courses/111/105/111105041/?utm_source	

CO	CO Description	PO	PSO
CO1	Understand the basic concepts of probability, random variables, standard probability distributions and random processes.	-	-
CO2	Apply joint distributions, correlation, regression and transformation of random variables for real-world data analysis.	PO1(3)	PSO1(1) PSO2(2)
CO3	Model and simulate random phenomena using stochastic processes and analyze their long-term behavior.	PO2(3) PO5(3)	PSO2(2) PSO3(1)
CO4	Analyze spectral properties of random signals, including autocorrelation, cross-correlation and spectral density functions.	PO2(3)	PSO2(2)
CO5	Examine linear time-invariant systems with random inputs using transfer function analysis and stochastic system modeling.	PO2(3) PO5(3)	PSO2(2)

(1) = Low; (2) = Medium; (3) = High



26EC301	Signals and Systems	L	T	P	C
		3	1	0	4
Course Objective: The course builds foundational skills for analyzing continuous and discrete-time signals, including their classification and properties, and explores key transforms (Fourier, Laplace, Z, DTFT).					
Unit I	Introduction to Signals and Systems	12			
Definition of Signals and Systems, Classification of Signals, Operations on signals, Singularity functions and related functions. Analogy between vectors and signals, orthogonal signal space, complete set of orthogonal functions, Parseval's relations. Suggested Activities: Generate and sketch basic signals, then perform time shifting, scaling, and reversal.					
Unit II	Fourier Series Analysis	12			
Fourier series representation of continuous time periodic signals, Trigonometric and Exponential Fourier series, Properties of Fourier series. Suggested Activities: Verify key Fourier-series properties such as linearity, time shifting, and symmetry using simple periodic signals.					
Unit III	Fourier Transform & Laplace Transform	12			
Fourier transform of aperiodic signals, standard signals and periodic signals, Properties of Fourier transforms. Hilbert transform and its properties. Laplace transforms, RoC, properties. Inverse Laplace transforms. Suggested Activities: Apply the Fourier transform and Hilbert transform to standard signals and compare their time-domain and frequency-domain representations.					
Unit IV	Continuous-Time LTI Systems	12			
Continuous time Systems and its properties. Linear time invariant (LTI) system, Impulse response, Convolution. Analysis of LTI System using Laplace and Fourier transforms. Suggested Activities: Analyze an LTI system using Fourier and Laplace transforms, and compare the input, system response, and output in time and frequency domains.					
Unit V	Sampling, Quantization & Discrete-Time Systems	12			
Sampling and reconstruction of band limited signals. Low pass and band pass sampling theorems. Aliasing. Anti-aliasing filter. Practical Sampling-aperture effect. Quantization. Discrete-time signals and systems. Discrete Fourier series, DTFT, Z-transform and its properties. Analysis of LTI systems using Z transform. Suggested Activities: Sample a band-limited signal at different rates, observe aliasing, and study the role of anti-aliasing filters and reconstruction.					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. A.V.Oppenheim, A. S. Willsky and S. Hamid Nawab, Signals and Systems, 2 nd Edition, Pearson Education, 2015. 2. Ramesh Babu, Signals and Systems, 4 th Edition, Scitech Publications, 2013. 3. S. Haykin and Barry Van Veen, Signals and Systems, 2 nd Edition, Wiley, 2007.					
References:					
1. M. J. Roberts, Fundamentals of Signals and Systems, 2 nd Edition, McGraw-Hill Education, 2014. 2. John G. Proakis and Dimitris G. Manolakis, Digital Signal Processing: Principles, Algorithms, and Applications, 4 th Edition, Pearson, 2007. 3. Alan V. Oppenheim and Ronald W. Schaffer, Discrete-Time Signal Processing, 3 rd Edition, Pearson, 2010. 4. B. P. Lathi, Linear Systems and Signals, 3 rd Edition, Oxford University Press, 2018. 5. Simon Haykin, Communication Systems, 4 th Edition, Wiley, 2001.					

E-Resources:

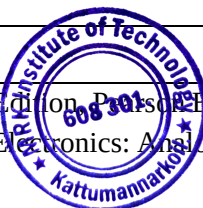
1. <https://www.mathworks.com/discovery/signal-processing.html>
2. <https://nptel.ac.in/courses/108/106/108106163>
3. <https://ocw.mit.edu/search/?q=signals+and+systems&utm>

CO	CO Description	PO	PSO
CO1	Analyze signals and systems using signal classifications, signal operations, orthogonal signal spaces, and Parseval's relations.	PO1(3) PO2(3) PO4(2) PO5(2)	PSO1(3) PSO2(2)
CO2	Apply Fourier series techniques to represent and analyze continuous-time periodic signals.	PO1(3) PO2(3) PO4(2) PO5(2)	PSO1(3) PSO2(2)
CO3	Apply Fourier and Laplace transform techniques to analyze continuous-time signals and systems.	PO1(3) PO2(3) PO4(2) PO5(3)	PSO1(3) PSO2(3)
CO4	Analyze continuous-time LTI systems using impulse response, convolution, Fourier transform, and Laplace transform techniques.	PO1(3) PO2(3) PO4(3) PO5(3)	PSO1(3) PSO2(3)
CO5	Apply sampling, quantization, Fourier, DTFT, and Z-transform techniques for the analysis of discrete-time signals and systems.	PO1(3) PO2(3) PO4(3) PO5(3)	PSO1(3) PSO2(3) PSO3(2)

(1) = Low; (2) = Medium; (3) = High



26EC302	Electronic Circuit Analysis	L	T	P	C
		3	0	0	3
Course Objective: Covers diode, BJT, and MOSFET circuits for designing amplifiers, feedback systems, and waveform generators using simulation and application-based problem solving.					
Unit I	Diode and Filter Circuits	9			
Diode circuits - clipper, clamper, voltage doubler, voltage quadrupler, half-wave rectifier, centre-tapped full-wave rectifier, and bridge rectifier circuits. Power supply design regulators – Voltage regulator circuits using Zener diode. Passive filters – analysis of RC, RL, RLC filters. Suggested Activities: Design and simulate RC, RL, and RLC passive filters, and observe their frequency response, cutoff frequency, and filtering characteristics.					
Unit II	BJT Circuits and MOSFET circuits	9			
Load-line analysis, different biasing techniques of BJT, bias stabilization, and early effect, RC-coupled and transformer-coupled multistage amplifiers, and current mirror circuits. Biasing by fixing VGS, biasing by fixing VG, and connecting a resistor in the source, Biasing using a drain-to-gate feedback resistor, and biasing using a current source. Analysis and design of common source, common drain, common gate amplifier configurations. Suggested Activities: Design and simulate common-source, common-drain, and common-gate amplifiers, comparing their voltage gain, input/output impedance, and frequency response.					
Unit III	Frequency Response of Amplifiers	9			
Frequency response of amplifiers – Low frequency response of BJT and FET amplifiers, lower cut off frequency - hybrid π equivalent circuit of BJT - high frequency response of BJT amplifiers –upper cut off frequency – transition frequency - Miller effect, high frequency response of FET amplifiers. Wide band amplifiers - Wide banding techniques – CC–CE /CD-CS cascade, cascode amplifier, Darlington pair. Suggested Activities: Design and simulate BJT and FET amplifiers to study their frequency response and identify the lower and upper cutoff frequencies					
Unit IV	Feedback Amplifiers and Waveform Generators	9			
Feedback and stability- negative and positive feedback in amplifiers, analysis of four feedback topologies, loop gain. Oscillators - Barkhausen criterion, effect of feedback on amplifier poles, Bode plots, gain and phase margins; positive feedback and sinusoidal oscillators using BJT - Wein bridge oscillator, RC phase shift oscillator, Hartley and Colpitts oscillators. Multivibrators using BJT – Astable, Monostable, and Bistable circuits. Suggested Activities: Plot the Bode magnitude and phase response of a feedback amplifier and determine its gain margin, phase margin, and stability.					
Unit V	Power Amplifiers and Wideband Techniques	9			
Power amplifiers –Analysis of Class A, B, AB, C, D & S power amplifiers, Conversion efficiency and relative performance, Total Harmonic Distortion (THD), Relationship Between Total Power and THD, Heat sinks. Suggested Activities: Simulate a push-pull Class B amplifier and observe crossover distortion in the output waveform.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. Thomas L. Floyd, Electronic Devices, 9 th Edition, Pearson Education, 2012. 2. J. Millman and C. C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, 2 nd Edition, McGraw-Hill Education, 2010.					



References:

1. Sedra, A. S., & Smith, K. C. (2020). Microelectronic circuits, 8th Edition, Oxford University Press.
2. Neamen, D. A. (2021). Microelectronics: Circuit analysis and design, 5th Edition, McGraw-Hill Education.
3. Razavi, B. (2016). Fundamentals of microelectronics, 2nd Edition, Wiley.
4. Bell, D. A. (2008). Electronic devices and circuits, 5th Edition, Oxford University Press.
5. Boylestad, R. L., & Nashelsky, L. (2021). Electronic devices and circuit theory, 11th Edition, Pearson Education.

E-Resources :

1. <https://nptel.ac.in/courses/108102112>
2. MIT OpenCourseWare – Circuits and Electronics.
3. All About Circuits (www.allaboutcircuits.com).

CO	CO Description	PO	PSO
CO1	Define the operating principles and characteristics of diode circuits, rectifiers, voltage regulators, and passive filters used in electronic circuits.	PO1(3) PO2(2)	-
CO2	Apply BJT and MOSFET biasing techniques to determine the operating point and performance of transistor amplifier circuits.	PO1(3) PO2(3) PO3(2)	PSO1(3) PSO2(2)
CO3	Analyze the frequency response of BJT and FET amplifiers and evaluate wideband amplifier configurations for improved bandwidth.	PO1(3) PO2(3) PO5(3)	PSO1(3) PSO2(3)
CO4	Design and analyze feedback amplifiers, oscillators, and multivibrator circuits for stable signal generation.	PO1(3) PO2(3) PO3(3)	PSO1(3) PSO2(3)
CO5	Analyze and evaluate the performance of power amplifiers based on efficiency, distortion, thermal considerations, and wideband characteristics.	PO1(3) PO2(2) PO3(3)	PSO1(2) PSO2(3) PSO3(2)

(1) = Low; (2) = Medium; (3) = High



26EC303	Analog and Digital Communication	L	T	P	C
		3	0	0	3
Course Objective:					
To impart knowledge in analog and digital modulation and demodulation techniques, and to introduce the applications of communication systems.					
Unit I	Analog Modulation	9			
Review of Fourier and Hilbert Transforms-Amplitude Modulation – AM, DSBSC, SSBSC, VSB–Spectral analysis of modulated signal, Angle modulation and demodulation: Narrow band, Wideband FM - Spectral analysis of modulated signal. Suggested Activities: Design and simulate Fourier and Hilbert transforms for standard signals and observe their time- and frequency-domain characteristics.					
Unit II	Digital Baseband Modulation	9			
Schematic of digital communication systems, Sampling - Quantization – Uniform and non-uniform quantization – Quantization noise– Speech Coders: Companding laws of speech signals, PCM, DPCM, ADPCM, DM, ADM. Suggested Activities: Design and simulate Delta Modulation (DM) and Adaptive Delta Modulation (ADM) and observe slope overload and granular noise.					
Unit III	Source Coding and Channel Coding	9			
Measure of information – Entropy – Source Coding: Source coding theorem, Shannon-Fano coding, Huffman Coding - Channel Coding: Shannon-Hartley law, Linear block codes, Cyclic codes, syndrome decoding, Convolutional codes, Viterbi decoding. Suggested Activities: Implement Huffman coding and compare its compression efficiency with Shannon-Fano coding.					
Unit IV	Base Band Signaling	9			
Line codes: RZ, NRZ, Manchester, Binary N-zero substitution codes - PSDs, ISI, Pulse shaping, Eye Diagram. Suggested Activities: Simulate pulse shaping techniques and observe their effect on bandwidth and signal quality.					
Unit V	Band Pass Signaling	9			
Generation and detection of coherent schemes: BPSK, BFSK, QPSK- BER and Power Spectral Density Comparison- Generation and detection of non-coherent schemes: BFSK, DPSK, Overview of QAM, MSK. Suggested Activities: Plot and compare the power spectral density (PSD) of BPSK, BFSK, and QPSK signals.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. Haykin, S. and Moher, M., Communication Systems, Wiley, 5 th Edition, 2009. 2. Sklar, B. and Harris, F.J., Digital Communications: Fundamentals and Applications, Pearson, 3 rd Edition 2021.					
References:					
1. Hsu, H. P. (2006). Analog and digital communications (Schaum’s outline series), 2 nd Edition, Tata McGraw-Hill. 2. Sklar, B. (2007). Digital communications: Fundamentals and applications, 2 nd Edition, Pearson Education. 3. Roddy, D., & Coolen, J. (2006). Electronic communications, 4 th Edition, Prentice Hall of India. 4. Chandra Sekar, V. (2012). Analog communication, 2 nd Edition, Oxford University Press. 5. Taub, H., Schilling, D. L. and Saha, G. (2008). Principles of Communication Systems, 2 nd Edition, Tata McGraw-Hill.					



E-resources:

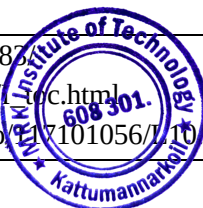
1. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science>
2. <https://www.khanacademy.org/science/electrical-engineering>
3. nptel.ac.in/courses/117/105/117105051

CO	CO Description	PO	PSO
CO1	Analyze and explain analog modulation and demodulation techniques, including AM, DSBSC, SSBSC, VSB and FM based on their spectral characteristics.	PO1 (3) PO2 (2) PO5 (3)	---
CO2	Explain and analyze sampling, quantization, and digital pulse modulation techniques such as PCM, DPCM, ADPCM, DM, and ADM.	PO1 (3) PO2 (3)	PSO1(3) PSO2(3)
CO3	Apply information theory concepts and coding techniques to analyze source coding and channel coding schemes for reliable communication.	PO1 (3) PO2 (3) PO5 (3)	PSO1(3) PSO2(3) PSO3(2)
CO4	Analyze baseband signaling techniques, line coding schemes, pulse shaping, power spectral density, and inter-symbol interference using eye diagrams.	PO1 (3) PO2 (3) PO3 (3)	PSO2(3) PSO3(2)
CO5	Analyze coherent and non-coherent digital modulation techniques such as BPSK, BFSK, QPSK, DPSK, QAM, and MSK based on BER and power spectral density.	PO1 (3) PO2 (3) PO3 (3) PO5 (3)	PSO1(3) PSO2(3) PSO3(3)

(1) = Low; (2) = Medium; (3) = High



26EC304	Electromagnetic Fields and Transmission Lines	L	T	P	C
		3	0	0	3
Course objective: Covers static, electric and magnetic field laws, Maxwell's equations, and electromagnetic wave propagation across media, transmission lines, and waveguides.					
Unit I	Coordinate Systems & Electrostatics	9			
Fundamentals of scalars and vectors, Coordinate systems. Coulomb's Law, Gauss's Law, Electric Scalar Potential, Electric Boundary Conditions, Capacitance, Electrostatic Potential Energy. Suggested Activities: Conduct an experimental study of Coulomb's Law using a Coulomb balance or electrostatic force apparatus.					
Unit II	Magnetostatics	9			
Ampere Circuital law- Biot-Savart Law, Magnetic Forces and Torques, Maxwell's Magnetostatic Equations, Vector Magnetic Potential, Magnetic Boundary Conditions, Inductance, Magnetic Energy. Suggested Activities: Measure the magnetic field around a current-carrying straight wire using a compass.					
Unit III	Maxwell's equations	9			
Equation of continuity, Maxwell's equations for time varying fields, boundary conditions. Wave equation, EM waves in conducting medium and dielectric medium, Uniform plane wave equation. Suggested Activities: Perform a simple experiment using a microwave oven and metal /dielectric materials.					
Unit IV	Transmission Lines	9			
Transmission Lines, types, two-wire line-Equivalent circuit, characteristic impedance, propagation constant, input impedance, VSWR, reflection and transmission coefficients, return loss, quarter-wave transformer - impedance matching using smith chart. Suggested Activities: Measure VSWR and reflection coefficient for different loads using transmission-line trainer and verify impedance matching using a Smith Chart.					
Unit V	Waveguide	9			
Semiconductor basics in RF, Waves between parallel planes of perfect conductors, TEM-TM-TE-Cut off frequency, rectangular waveguide, Parameters related to waveguides, Low noise amplifiers. Suggested Activities: Measure the cutoff frequency of a rectangular waveguide using a microwave trainer kit.					
TOTAL: 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Textbooks:					
1. D. K. Cheng, Field and Wave Electromagnetics, 2 nd Edition, Pearson India, 2002. 2. Edward C. Jordan and Keith G. Balmain, Electromagnetic Waves and Radiating Systems, 2 nd Edition, Prentice-Hall Electrical Engineering Series, 2012.					
References:					
1. William H. Hayt Jr. and John A. Buck, Engineering Electromagnetics, 8 th Edition, McGraw-Hill Education. 2. B. M. Notaros, Electromagnetics, Pearson Education, 1 st Edition, India. 3. R. F. Harrington, Time-Harmonic Electromagnetic Fields, Wiley-IEEE Press, 2001. 4. David M. Pozar, Microwave Engineering, 4 th Edition, John Wiley & Sons, 2012. 5. M. N. O. Sadiku and S. V. Kulkarni, Principles of Electromagnetics, 6 th Edition, Oxford University Press, 2015.					
E-Resources :					
1. https://onlinecourses.nptel.ac.in/noc21_ee87 2. https://www.feynmanlectures.caltech.edu/ 3. http://www.digimat.in/nptel/courses/video/117101056/117101056_7_10.html					



CO	CO Description	PO	PSO
CO1	Apply vector algebra and coordinate systems to analyze electrostatic fields, electric potential, capacitance, and boundary conditions in engineering applications.	PO1(3) PO2(2)	PSO1(2) PSO2(3)
CO2	Analyze magnetostatic fields using Ampere's law, Biot–Savart law, Maxwell's equations, magnetic vector potential, inductance, and magnetic energy concepts.	PO1(3) PO2(3) PO3(2)	PSO1(2) PSO2(3)
CO3	Apply Maxwell's equations to analyze electromagnetic wave propagation in free space, dielectric, and conducting media under time-varying conditions.	PO1(3) PO2(3) PO4(3) PO5(3)	PSO2 (3) PSO3 (2)
CO4	Analyze transmission line parameters and design impedance matching networks using transmission line theory and Smith chart techniques.	PO1(3) PO2(3) PO3(3) PO5(3)	PSO2(3) PSO3(2)
CO5	Analyze the propagation characteristics of electromagnetic waves in waveguides and evaluate the performance of rectangular waveguides for microwave applications.	PO1(3) PO3(3) PO5(3)	PSO2(3) PSO3(2)

(1) = Low; (2) = Medium; (3) = High



26EC305	Digital System Design	L	T	P	C
		3	0	2	4
Course objectives: This course aims to create a strong foundation for Digital Electronics. The students are taught the basic components of digital systems and the processes of their implementation. The students are also taught Boolean algebra, logic gates, the basics of memories, and the implementation of combinational and sequential digital circuits using logic gates. Students are trained to employ the principles of digital electronics to implement digital design for the given problem.					
Unit I	Boolean Algebra and K-Map				9
Boolean algebra and minimization, 4-variable Karnaugh Maps, SOP and POS Minimization using Karnaugh Maps, Digital Logic Gates, Introduction to Verilog HDL, Data Types and Operators-Different types of Modeling. Suggested Activities: Design and simulate a 4-variable logic circuit using Karnaugh Map minimization and Verilog HDL, then verify the SOP/POS output using basic logic gates.					
Unit II	Combinational Digital Circuits				9
Introduction to combinational circuits, realization of logic expressions using AOI, NOR, and NAND gates. Adders, Subtractors, Multiplexers, De-multiplexers, Encoders, Decoders, Code-converters – Programming using Verilog HDL. Suggested Activities: Design and simulate a 4-bit binary adder/subtractor using Verilog HDL and verify its operation using a simulation waveform.					
Unit III	Sequential Digital Circuits				9
Introduction to sequential circuits, Flip-flops and Latches, realization of flip-flops using S-R flip-flop, master slave flip-flop, JK flip-flop, T and D flip flops, Realization of flip-flops using logic gates, introduction to shift registers, realization of different types of shift registers, introduction to counters, realization of different types of counters, Introduction to different types of memories Programming using Verilog HDL. Suggested Activities: Design and simulate a 4-bit synchronous counter using JK/T flip-flops.					
Unit IV	Finite State Machines				9
Moore and Mealy machine, Need for FSM, Elements of FSM, Components in FSM, FSM in HDL, Issues in FSM design, Case studies: Sequence detector, Odd parity Checker, Vending Machine. Suggested Activities: Design and simulate a sequence detector using a Moore or Mealy FSM in Verilog HDL and verify its state transitions using simulation waveforms.					
Unit V	FPGA Architecture				9
Introduction to FPGA Architecture, Components of FPGA Architectures– Programming Technologies, Logic elements and Look-up Tables, Dedicated multipliers, Distributed RAM, Shift registers, Digital Clock Managers, Altera FPGA- Altera Cyclone, Arria and Agilex architectures and AMD Xilinx FPGA architectures and design flow-AMD Spartan, Virtex, -Introduction to IP Cores- AMD Microblaze V and Altera NIOS V Soft core processors. Suggested Activities: Implement a simple digital logic circuit on an FPGA development board using Verilog HDL.					
TOTAL : 45 PERIODS					
List of Experiments: 1. Verification of De Morgan’s Theorem, sum-of product and product-of- sum expressions using basic and universal gates. 2. Design, construction and verification of a BCD to Excess-3 and Excess-3 to BCD code converters 3. Design, construction and verification of a Binary to Gray and Gray to Binary code converters 4. Design and implementation of Multiplexer and Demultiplexer circuits using ICs and verification of their functions 5. Design and implementation of an encoder and decoder circuit using ICs. 6. Design and construction of Magnitude Comparator using appropriate IC					

7. Construction and verification of the functions of S-R latch, S-R, J-K, T and D Flip-Flops using NAND and NOR gates. 8. Design and verify 3 bit counter using Verilog HDL 9. Design and verify 3-bit Ripple carry adder using Verilog HDL
TOTAL (Lab.): 15 PERIODS TOTAL: 60 PERIODS
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%.
Assessment Methodology: Assignments (20%), Flipped Class (20%), Solving Competitive Examination questions (20%), Internal Examinations (40%).
Textbooks:
1. M. Morris Mano & Michael D. Ciletti – Digital Design with an Introduction to the Verilog HDL, VHDL, and System Verilog, 6 th Edition, Pearson Education, India. 2. Stephen Brown & Zvonko Vranesic – Fundamentals of Digital Logic with Verilog Design, 3 rd Edition, Tata McGraw Hill.
References:
1. Fletcher, W. I. (2015). An engineering approach to digital design, 1 st Edition, Pearson Education India. 2. Floyd, T. L. (2015). Digital fundamentals, 11 th Edition, Pearson. 3. Roth, C. H., Jr., Kinney, L. L., & John, E. B. (2019). Fundamentals of logic design, 7 th Edition, Cengage. 4. Tocci, R. J., Widmer, N. S., & Moss, G. L. (2010). Digital systems: Principles and applications, 11 th Edition, Pearson Education. 5. Wakerly, J. F. (2018). Digital design: Principles and practices, 5 th Edition, Pearson Education.
E-Resources:
1. https://www.altera.com/fpga 2. https://fpgacademy.org/ 3. nptel.ac.in/courses/108105132

CO	CO Description	PO	PSO
CO1	Apply Boolean algebra, Karnaugh maps, logic gates, and Verilog HDL concepts to analyze and simplify digital logic circuits.	PO1(3) PO2(3) PO5(3)	PSO2 (3)
CO2	Design and implement combinational logic circuits using logic gates and Verilog HDL.	PO1(3) PO2(3) PO3(3) PO5(3)	PSO1 (3) PSO2 (3)
CO3	Analyze and design sequential logic circuits, including flip-flops, shift registers, counters, memories, and their Verilog HDL implementation.	PO1(3) PO2(3) PO3(3) PO5(3)	PSO1 (3) PSO2 (3)
CO4	Design and analyze Finite State Machines (Moore and Mealy models) for digital system applications using HDL.	PO1(3) PO2(3) PO3(3) PO5(3)	PSO1 (3) PSO2 (3)
CO5	Explain FPGA architectures, design flow, IP cores, and implement digital systems using modern FPGA platforms and tools.	PO1(3) PO3(3) PO5(3)	PSO1 (3) PSO3 (3)

(1) = Low; (2) = Medium; (3) = High

26EC306	Electronic Circuit Analysis Laboratory	L	T	P	C
		0	0	4	2
Course Objectives: To develop hands-on skills in designing and analyzing electronic circuits including amplifiers, oscillators, and related applications.					
List of Experiments: 1. Study and simulation of clipper and clamper circuits. 2. Design and analysis of rectifiers (HWR, FWR, Bridge) with filters. 3. Design of Zener diode voltage regulator and power supply. 4. Design and analysis of BJT biasing circuits and RC-coupled amplifier. 5. Design and analysis of MOSFET biasing circuits. 6. Implementation of common source (CS), common drain (CD), and common gate (CG) amplifiers. 7. Frequency response analysis of BJT/FET amplifiers. 8. Design and simulation of RC phase shift and Wien bridge oscillators. 9. Study of multivibrator circuits (Astable and Monostable). 10. Analysis of Class A and Class B power amplifiers with efficiency calculation.					
TOTAL : 30 PERIODS					
Tools Required: Diodes, IC- Resistors, Capacitor, LT spice open-source software, Regulated Power Supply, Digital storage oscilloscope.					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)					
References: 1. Sedra, A. S., & Smith, K. C. – Microelectronic Circuits (Oxford University Press) 2. Boylestad, R. L., & Nashelsky, L. – Electronic Devices and Circuit Theory (Pearson) 3. Neamen, D. A. – Microelectronics: Circuit Analysis and Design (McGraw-Hill) 4. Razavi, B. – Fundamentals of Microelectronics (Wiley) 5. Floyd, T. L. – Electronic Devices (Conventional Current Version) (Pearson)					
E-Resources: 1. https://nptel.ac.in/courses/108102112 2. MIT OpenCourseWare – Circuits and Electronics. 3. LTspice /N spice simulation tools https://ngspice.sourceforge.io/					
Task T1. Design a power supply circuit for mobile phone charging applications. T2. Design an overheat protection circuit. T3. Design wave shaping circuit for signal conditioning applications. T4. Design surge protection circuit in consumer electronics.					



CO	CO Description	PO	PSO
CO1	Define and explain the operation of diode circuits, transistor biasing, amplifiers, feedback systems, oscillators, and power amplifiers.	PO1(3)	PSO1(3)
CO2	Apply circuit principles to design and implement rectifiers, filters, biasing circuits, amplifiers, and oscillators using simulation tools.	PO1(3) PO2(3) PO3(3)	PSO1 (3) PSO3 (2)
CO3	Analyze the performance of electronic circuits in terms of gain, frequency response, stability, and efficiency.	PO1(3) PO2(3) PO4(3)	PSO2 (3)
CO4	Design and evaluate advanced circuit behavior, including feedback effects, distortion, and power amplifier performance under practical conditions.	PO1(3) PO2(3) PO3(3) PO4(3)	PSO3 (3)
CO5	Apply simulation and laboratory measurement tools to investigate electronic circuits, interpret experimental results, and communicate findings effectively.	PO1(3) PO2(3) PO4(3) PO5(3)	PSO1 (3) PSO2 (3)

(1) = Low; (2) = Medium; (3) = High



26EC307	Analog and Digital Communication Laboratory	L	T	P	C
		0	0	4	2
Course Objectives: Demonstrate communication link architecture and technique comparison via case studies, simulations, policies, and socio-economic impact.					
List of Experiments 1. AM / FM Modulator and Demodulator 2. Time Division Multiplexing 3. Signal Sampling and reconstruction 4. Pulse Code Modulation and Demodulation 5. Delta Modulation and Demodulation 6. Line coding schemes (Simulation) 7. FSK, PSK and DPSK schemes (Simulation) 8. Error control coding schemes (Simulation) 9. Symbol Timing Synchronization 10. Spread spectrum communication (Simulation) 11. Communication link simulation					
Total : 30 PERIODS					
Tools Required : GNU Radio software , MATLAB or Equivalent S/w – 15 User License					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)					
References: 1. Haykin, S. and Moher, M., Communication Systems, Wiley, 5 th Edition, 2009. 2. Sklar, B. and Harris, F.J., Digital Communications: Fundamentals and Applications, Pearson, 3 rd Edition, 2021.					
E-Resources: 1. MIT OpenCourseWare – Principles of Digital Communications 2. NPTEL – Digital Communication 3. NPTEL – Analog Communication					
Task T1 Design and simulate AM/FM communication systems including modulation and demodulation techniques for reliable signal transmission and reception. T2 Design a multiplexed communication system using Time Division Multiplexing (TDM) and analyze channel sharing efficiency. T3 Design and implement digital communication systems using Sampling, Pulse Code Modulation (PCM), and Delta Modulation (DM) techniques for signal transmission and reconstruction. T4 Design and simulate digital data transmission schemes using Line Coding, FSK, PSK, and DPSK modulation techniques, and compare their performance. T5 Design and evaluate a complete communication link incorporating Error Control Coding, Symbol Timing Synchronization, and Spread Spectrum Communication techniques through simulation.					



CO	CO Description	PO	PSO
CO1	Analyze and implement analog and digital modulation and demodulation techniques such as AM, FM, FSK, PSK, and DPSK	PO1(3) PO2(3) PO4(3)	PSO1 (3) PSO2 (3)
CO2	Understand and implement sampling, signal reconstruction, TDM, PCM, and delta modulation techniques.	PO1(3) PO4(3) PO5(3)	PSO1 (3) PSO2 (3)
CO3	Simulate and analyze various line coding and error control coding schemes for reliable digital communication	PO1(3) PO2(3) PO4(3)	PSO1 (3) PSO2 (3)
CO4	Analyze synchronization techniques and spread spectrum communication systems using simulation tools.	PO1(3) PO2(3) PO4(3) PO5(3)	PSO1 (3) PSO2 (3) PSO3 (3)
CO5	Design, simulate, and evaluate communication links by interpreting system performance and experimental results using modern communication tools	PO1(3) PO2(3) PO4(3) PO5(3)	PSO1 (3) PSO2 (3) PSO3 (3)

(1) = Low; (2) = Medium; (3) = High



26SDC01	Foundation Aptitude and Verbal ability Skills	L	T	P	C
		0	0	2	1
Course Objectives: To Solve quantitative aptitude problems through practical exercises. To Apply logical and analytical reasoning techniques. To Improve grammar and vocabulary through practice-oriented activities. To Demonstrate effective reading, listening and speaking skills. To Demonstrate professional communication skills required for placement activities.					
List of Activities: 1. Number System, Simplification, Percentage and Ratio 2. Average, Profit and Loss, Simple and Compound Interest 3. Time, Work, Speed, Distance and Data Interpretation 4. Number Series, Analogy, Coding-Decoding and Logical Patterns 5. Blood Relations, Direction Sense, Ranking, Syllogism and Data Sufficiency 6. Grammar, Sentence Correction and Error Spotting 7. Vocabulary, Synonyms, Antonyms, Idioms and Sentence Completion 8. Reading Comprehension, Para Jumbles and Listening Skills 9. Speaking Skills, Group Discussion and Presentation Skills 10. Resume Preparation, Interview Skills and Mock Placement Activities					
TOTAL : 30 PERIODS					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)					
References: 1. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publishing. 2024 2. R. S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand Publishing. Fully Revised Video Edition 2024–25 3. Wren & Martin, High School English Grammar and Composition, S. Chand Publishing. Multicolour edition 2024 4. Arun Sharma, How to Prepare for Verbal Ability and Reading Comprehension for CAT, McGraw Hill Education. 2026					
E-resources: 1. https://nptel.ac.in/courses/109104030					

CO	CO Description	PO	PSO
CO1	Solve quantitative aptitude problems using appropriate numerical and arithmetic techniques.	PO1 (3) PO2 (2)	PSO2 (1)
CO2	Apply logical and analytical reasoning techniques to solve aptitude problems.	PO2 (3) PO4 (2)	PSO2 (2) PSO3 (1)
CO3	Apply grammar and vocabulary skills to solve verbal ability exercises.	PO1 (2) PO10 (3)	PSO3 (2)
CO4	Demonstrate effective reading, listening, speaking, group discussion and presentation skills.	PO8 (3) PO9 (3) PO10 (3)	PSO3 (3)
CO5	Demonstrate professional communication skills through resume preparation, interviews and mock placement activities.	PO6 (2) PO8 (3) PO9 (3)	PSO1 (1) PSO2 (2) PSO3 (3)

(1) = Low; (2) = Medium; (3) = High



SEMESTER – IV



26EC401	Control Systems	L	T	P	C
		3	1	0	4
Course Objectives: Model physical systems using differential equations, transfer functions, and state-space, then analyze time/frequency behavior to design stable, high-performance controllers					
Unit I	Introduction To Control System & Modelling of Physical Systems	12			
Fundamental concepts of Control Systems: open loop and closed loop systems – Control system Terminology – Applications. Transfer function – Modelling of Electric systems, Translational and rotational mechanical systems, Electrical analogous systems. Block diagram reduction, signal flow graphs, multivariable control system. Suggested Activities: Simulate simple open-loop and feedback control systems and compare their response, accuracy, and sensitivity to disturbances.					
Unit II	Time Domain Response	12			
Transient and Steady state response - Standard test inputs - Time response of first and second order systems - Time domain specifications. Effect of moving the pole in the s-plane, Effect of adding real pole and zero. Steady state error, error constants and system type. Suggested Activities: Simulate first-order systems with different time constants and study rise time, settling time, and system response.					
Unit III	Stability Analysis & Frequency Domain Response	12			
Concept of stability, characteristic equation, location of poles. Routh Hurwitz stability criterion - Root locus technique. Frequency response: Frequency response of standard second order system - Frequency domain specifications - Relationship between Frequency and time domain specifications – Plots: Bode and Polar - Nyquist stability criterion. Suggested Activities: Construct root locus plots for different open-loop transfer functions and study the movement of closed-loop poles with variation in gain.					
Unit IV	Controller and Compensator Design	12			
Controllers: P, PI, PD, PID - Analytical design of controllers. Compensators: needs and its types - Design of lag, lead, lag-lead compensators using root locus and bode plot. Suggested Activities: Design and simulate a PI controller to reduce steady-state error and investigate the effect of proportional and integral gains.					
Unit V	State Space Representation	12			
Concept of state, state variable and state model. Conversion: Transfer function from state equation, State equation to Transfer function. Solutions of state equations, Controllability and Observability. Suggested Activities: Simulate both transfer-function and state-space models of the same system and compare their input-output responses.					
TOTAL : 60 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books: 1. I. J. Nagrath and M. Gopal, Control Systems Engineering, 6th Edition, New Age International. 2. Katsuhiko Ogata, Modern Control Engineering, 5th Edition, Pearson.					
References: 1. Dukkupati, R. V. (2022). MATLAB for control system engineers, 2 nd Edition, New Age International Publishers. 2. Golnaraghi, F., & Kuo, B. C. (2017). Automatic control systems, 10 th Edition, McGraw-Hill Education. 3. Nagrath, J., & Gopal, M. (2021). Control Systems Engineering, 7 th Edition, New Age International Publishers. 4. Nise, N. S. (2019). Control systems engineering. John Wiley & Sons. 5. Ogata, K. (2020). Modern control engineering, 5 th Edition, Pearson Education India. Shankar Ram, C. S. (n.d.). Control systems [Video lectures]. NPTEL, IIT Madras.					

E-Resources:

1. NPTEL :: Engineering Design - NOC:Control systems
2. Control engineering - Course
3. All Control System Lecture Videos - YouTube

CO	CO Description	PO	PSO
CO1	Define and Explain fundamental concepts of control systems and model physical systems using transfer functions, block diagrams, and signal flow graphs.	-	-
CO2	Apply the concepts of time domain response, steady-state error, and system performance using standard test signals and specifications.	PO1(3) PO2(3)	PSO1 (3) PSO2 (2)
CO3	Analyze system stability using Routh-Hurwitz criterion, root locus, and frequency domain techniques like Bode and Nyquist plots.	PO1(3) PO2(3) PO3(3)	PSO1 (2) PSO2 (3)
CO4	Design controllers and compensators to improve the stability and performance of control systems using analytical and graphical methods.	PO1(3) PO2(3) PO3(3)	PSO1 (3) PSO2 (3)
CO5	Apply state-space techniques to model, analyze, and evaluate controllability and observability of dynamic systems.	PO1(3) PO2(3) PO4(3) PO5(3)	PSO1 (3) PSO2 (3)

(1) = Low; (2) = Medium; (3) = High



26EC402	Linear Integrated Circuits	L	T	P	C
		3	0	0	3
Course Objectives: • To introduce the basic building blocks of linear integrated circuits • To learn the linear and non-linear applications of operational amplifiers • To introduce the theory and applications of analog multipliers and PLL • To learn the theory of ADC and DAC • To introduce the concepts of waveform generation and introduce some special function ICs					
Unit I	Basics of Operational Amplifiers	9			
Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations – MOSFET Operational Amplifiers – LF155 and TL082.					
Suggested Activities: Design and simulate a BJT differential amplifier with an active current-mirror load, and analyze its differential gain, common-mode gain, and CMRR.					
Unit II	Applications of Operational Amplifiers	9			
Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.					
Suggested Activities: Design and simulate basic op-amp applications such as voltage follower, adder, subtractor, integrator, and differentiator circuits.					
Unit III	Analog Multiplier and PLL	9			
Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing and clock synchronization.					
Suggested Activities: Design and simulate a PLL using IC 565.					
Unit IV	Analog to Digital And Digital to Analog Converters	9			
Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters, Sigma – Delta converters.					
Suggested Activities: Design and simulate a successive-approximation A/D converter, and observe the conversion process, quantization levels, resolution.					
Unit V	Waveform Generators and Special Function ICs	9			
Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Low Drop – Out(LDO) Regulators - Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.					
Suggested Activities: Design and simulate a function generator using IC 555 or ICL8038 to generate sine, square, and triangular waveforms, and observe the output waveforms for different frequency and amplitude settings.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					

Text Books:
1. D.Roy Choudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd., 5th Edition, 2018, 2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 4th Edition, Tata Mc Graw-Hill, 2016.
References:
1. Ramakant A. Gayakwad, “OP-AMP and Linear ICs”, 4th Edition, Prentice Hall Pearson Education, 2015. 2. Robert F.Coughlin, Frederick F.Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, 6th Edition, PHI, 2001. 3. S.Salivahanan & V.S. Kanchana Bhaskaran, “Linear Integrated Circuits”, TMH, 2nd Edition, 4th Reprint, 2016. 4. Millman, J. and Halkias, C. C., “Integrated Electronics: Analog and Digital Circuits and Systems”, McGraw-Hill, 2nd Edition, 2017. 5. D. Roy Choudhury and Shail B. Jain, “Linear Integrated Circuits”, New Age International Publishers, 4th Edition, 2010.
E-resources:
1. https://www.ti.com/amplifier-circuit/op-amps/overview.html. 2. https://www.analog.com/en/education.html 3. vlabs.iitkgp.ac.in/aec/exp1/content.html

CO	CO Description	PO	PSO
CO1	Analyze the characteristics and performance of operational amplifiers.	PO1 (3) PO2 (3) PO5 (3)	---
CO2	Design and analyze linear and non-linear op-amp applications.	PO1 (3) PO2 (3)	PSO1(3) PSO2(3)
CO3	Analyze analog multipliers and PLLs and their applications.	PO1 (3) PO2 (3) PO5 (3)	PSO1(3) PSO2(3) PSO3(2)
CO4	Analyze different ADC and DAC architectures and their specifications.	PO1 (3) PO2 (3) PO3 (3)	PSO2(3) PSO3(2)
CO5	Design and analyze waveform generators and special-function ICs.	PO1 (3) PO2 (3) PO3 (3) PO5 (3)	PSO1(3) PSO2(3) PSO3(3)

(1) = Low; (2) = Medium; (3) = High



26EC403	Digital Signal Processing	L	T	P	C
		3	0	0	3
Course objectives: • To learn discrete fourier transform, properties of DFT and its application to linear filtering • To understand the characteristics of digital filters, design digital IIR and FIR filters and apply these filters to filter undesirable signals in various frequency bands • To understand the effects of finite precision representation on digital filters • To understand the fundamental concepts of multi rate signal processing and its applications • To introduce the concepts of adaptive filters and its application to communication engineering					
Unit I	Discrete Fourier Transform				9
Sampling Theorem, concept of frequency in discrete-time signals, summary of analysis & synthesis equations for FT & DTFT, frequency domain sampling, Discrete Fourier transform (DFT) - deriving DFT from DTFT, properties of DFT - periodicity, symmetry, and circular convolution. Linear filtering using DFT. Filtering long data sequences - overlap save and overlap add method. Fast computation of DFT - Radix-2 Decimation-in-time (DIT) Fast Fourier transform (FFT), Decimation-in-frequency (DIF) Fast Fourier transform (FFT). Linear filtering using FFT.					
Suggested Activities: Perform linear convolution of a long input sequence using overlap-save and overlap-add methods, and compare the output with direct linear convolution.					
Unit II	Infinite Impulse Response Filters				9
Characteristics of practical frequency selective filters, characteristics of commonly used analog filters - Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF, BPF, BRFF) - Approximation of derivatives, Impulse invariance method, Bilinear transformation. Frequency transformation in the analog domain. Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations.					
Suggested Activities: Design and simulate Butterworth and Chebyshev IIR filters for LPF, HPF, BPF, and BRFF specifications.					
Unit III	Finite Impulse Response Filters				9
Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form realizations.					
Suggested Activities: Implement and compare FIR filter structures: Realize symmetric and anti-symmetric FIR filters using linear-phase and direct-form structures.					
Unit IV	Finite Word Length Effects				9
Fixed point and floating point number representation - ADC - quantization - truncation and rounding-quantization noise - input / output quantization - coefficient quantization error - product quantization error - overflow error - limit cycle oscillations due to product quantization and summation - scaling to prevent overflow.					
Suggested Activities: Simulate quantization and noise using truncation and rounding.					
Unit V	DSP Applications				9
Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Adaptive Filters: Introduction, Applications of adaptive filtering to equalization-DSP Architecture-Fixed and Floating point principles. Architecture.					
Suggested Activities: Simulate quantization and noise using truncation and rounding.					
TOTAL : 45 PERIODS					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Quiz (10%), Competitive Examinations (20%), Flipped Class (10%), Internal Examinations (40%).					
Text Books:					
1. John G. Proakis and Dimitris G.Manolakis, Digital Signal Processing – Principles, Algorithms and Applications, 4 th Edition, Pearson Education, Prentice Hall, 2007.					
2. A. V. Oppenheim, R.W. Schafer and J.R. Buck, —Discrete-Time Signal Processing”, 8th Indian reprint, Pearson, 2004.					

References:

1. Emmanuel C. Ifeachor & Barrie W. Jervis, "Digital Signal Processing", 2nd Edition, Pearson Education / Prentice Hall, 2002.
2. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata Mc Graw Hill, 2007.
3. D. J. DeFatta, J. G. Lucas and W. S. Hodgkiss, "Digital Signal Processing: A System Design Approach", John Wiley & Sons, 1988.
4. Salivahanan, A. Vallavaraj and C. Gnanapriya, "Digital Signal Processing", McGraw Hill Education, 2nd Edition, 2018.
5. Ashok Ambardar, "Digital Signal Processing: A Modern Introduction", Cengage Learning, 2nd Edition, 2012.

E-Resources:

1. <https://www.nptel.ac.in/courses/117102060>
2. <https://ocw.mit.edu/courses/res-6-008-digital-signal-processing-spring-2011/>
3. <https://www.mathworks.com/help/dsp/index.html>

CO	CO Description	PO	PSO
CO1	Apply DFT for the analysis of digital signals and systems	PO1(3) PO2(3) PO4(2) PO5(3)	PSO1(3) PSO2(2) PSO3(2)
CO2	Design IIR and FIR filters	PO1(3) PO2(3) PO3(3) PO5(3)	PSO1(3) PSO2(3) PSO3(2)
CO3	Characterize the effects of finite precision representation on digital filters	PO1(3) PO2(3) PO4(3) PO5(3)	PSO1(2) PSO2(3) PSO3(2)
CO4	Design multirate filters	PO1(3) PO2(3) PO3(3) PO5(3)	PSO1(3) PSO2(3) PSO3(3)
CO5	Apply adaptive filters appropriately in communication systems	PO1(3) PO2(3) PO3(3) PO5(3)	PSO1(3) PSO2(3) PSO3(3)

(1) = Low; (2) = Medium; (3) = High



26BMC01	Sensors and Measurement Systems	L	T	P	C
		3	0	2	4
Course objectives: Understand measurement systems and sensor characteristics. Study electrical, electronic and MEMS sensors and signal conditioning. Interface sensors with microcontrollers and IoT systems. Develop sensor-based engineering applications.					
Unit I	Measurement Systems	12			
Measurement fundamentals, static and dynamic characteristics, errors in measurements, calibration techniques, standards, primary and secondary standards, analog and digital instrumentation. Suggested Activities: Study and compare the performance of analog and digital measuring instruments using real-time measurement examples.					
Unit II	Electrical and Electronic Sensors	12			
RTD, Thermistor, Strain Gauge, LVDT, Hall Effect sensor, current sensor, voltage sensor, pressure sensor, displacement sensor, temperature sensors and their applications. Suggested Activities: Case study on industrial applications of temperature, pressure and displacement sensors.					
Unit III	Optical and MEMS Sensors	12			
Photodiode, Phototransistor, IR sensor, Ultrasonic sensor, MEMS accelerometer, gyroscope, humidity sensor, gas sensor, proximity sensors and engineering applications. Suggested Activities: Develop a sensor-based object detection or environmental monitoring prototype using optical/MEMS sensors.					
Unit IV	Signal Conditioning and Data Acquisition	12			
Wheatstone bridge, Instrumentation Amplifier, Isolation Amplifier, Active Filters, ADC, DAC, CRO, DSO, Arduino/ESP32 interfacing, data acquisition systems. Suggested Activities: Design and simulate a signal conditioning circuit using simulation software.					
Unit V	Smart Sensors and IoT Applications	12			
Digital sensors, I ² C and SPI communication, wireless sensor networks, IoT sensor nodes, industrial sensors, automotive sensors, AI/ML applications in smart sensing. Suggested Activities: Develop a mini IoT-based smart sensor application using ESP32/Arduino and cloud platform.					
TOTAL:45 PERIODS					
List of Experiments: 1. Determine static characteristics of a measurement system. 2. Calibration of voltmeter and ammeter using standard instruments. 3. Error analysis and uncertainty calculation for electrical measurements. 4. Characteristics of RTD and Thermistor. 5. Displacement measurement using LVDT. 6. Characteristics of Strain Gauge using Wheatstone Bridge. 7. Characteristics of Photodiode and Phototransistor. 8. Distance measurement using Ultrasonic Sensor. 9. Interfacing MEMS accelerometer with Arduino/ESP32. 10. Wheatstone Bridge for resistance measurement. 11. Design and testing of active low-pass filter. 12. ADC interfacing with Arduino/ESP32 and sensor data acquisition. 13. Interfacing digital temperature/humidity sensor using I ² C. 14. IoT-based sensor monitoring using ESP32 and Wi-Fi. 15. Mini project: Smart sensor-based monitoring system.					
TOTAL (Lab.): 15 PERIODS					
TOTAL: 60 PERIODS					



Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%.

Assessment Methodology: Assignments (10%), Quiz (10%), Competitive Examinations (10%), Flipped Class (10%), Practical (20%), Internal Examinations (40%).

Text Books:

1. A.K. Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & Co., 28th Edition, New Delhi.
2. D. Patranabis, Sensors and Transducers, 2nd Edition, PHI Learning Pvt. Ltd., New Delhi.

References:

1. A.K. Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & Co., 4th Edition, New Delhi.
2. E.O. Doebelin and D.N. Manik, Measurement Systems: Application and Design, 5th Edition, McGraw-Hill Education.
3. H.S. Kalsi, Electronic Instrumentation, 4th Edition, McGraw-Hill Education.
4. D. Patranabis, Principles of Industrial Instrumentation, 3rd edition, Tata McGraw-Hill Publishing Company, J.P.
5. Bentley, Principles of Measurement Systems, 4th Edition, Pearson Education.

CO	CO Description	PO	PSO
CO1	Explain measurement systems, characteristics, errors, calibration, standards, and instrumentation.	PO1(3) PO2(2)	PSO1(3) PSO2(2)
CO2	Analyze electrical and electronic sensors and their applications.	PO1(3) PO2(3) PO5(3)	PSO1(3) PSO2(3) PSO3(2)
CO3	Explain optical and MEMS sensors and their engineering applications.	PO1(3) PO2(3) PO5(3)	PSO1(3) PSO2(3) PSO3(2)
CO4	Design signal conditioning and data acquisition systems using suitable electronic circuits and tools.	PO1(3) PO2(3) PO3(3) PO5(3)	PSO1(3) PSO2(3) PSO3(2)
CO5	Develop smart sensor and IoT applications using communication protocols and embedded platforms.	PO1(3) PO2(3) PO3(3) PO5(3)	PSO1(3) PSO2(3) PSO3(3)

(1) = Low; (2) = Medium; (3) = High



26CSC16	Artificial Intelligence and Machine Learning	L	T	P	C
		3	0	2	4
Course objectives: To provide foundational AI/ML knowledge covering core techniques and enable real-world application using modern tools and frameworks.					
Unit I	Introduction To AI				12
Artificial Intelligence: Introduction, Applications, Problem types. Problem formulation, Intelligent Agents: Types, Architectures, and Environments, PEAS framework. Reasoning and Logic: Propositional Logic, First-order Logic, Inference techniques including Forward and Backward Chaining. Suggested Activities: Formulate and solve AI problems such as the 8-puzzle, route-finding, or water-jug problem using suitable state-space representations..					
Unit II	Search Strategies				12
Solving problems by searching, Design issues in search algorithms. Uninformed Search: BFS, DFS. Heuristic Search: Generate-and-Test, Hill Climbing, Best-First Search, A*, Alpha-Beta pruning. Advanced methods: Problem Reduction, AO* Algorithm, Constraint Satisfaction, Means-Ends Analysis. Suggested Activities: Implement a game-playing AI using Minimax with Alpha-Beta pruning and evaluate its performance in games such as Tic-Tac-Toe.					
Unit III	Artificial Neural Networks				12
Introduction to Neural Networks, Activation Functions, Optimization Algorithms: Gradient Descent. Architectures: Perceptrons, Adaline, Multilayer Perceptrons. Training: Backpropagation, Procedures, Network Tuning. Suggested Activities: Develop an Adaline model and study the effect of learning rate and number of iterations on convergence.					
Unit IV	Machine Learning Basics				12
Machine Learning: Basics, Applications. Comparison with Data Mining and Big Data Analytics. Supervised Learning: Naive Bayes, KNN, Decision Trees. Unsupervised Learning: k-means clustering, Introduction to Reinforcement Learning. Suggested Activities: Perform a comparative analysis of ML algorithms based on accuracy, execution time, scalability, and suitability for different real-world applications.					
Unit V	Forecasting, Advanced Learning & Ensemble Methods				12
Forecasting: Non-linear and Logistic Regression, Random Forests, Bayesian Networks, Bias-Variance Tradeoff, Tuning and Model Selection. Clustering: EM Algorithm, Hierarchical Clustering, Post-Clustering Supervised Learning. Kernel Methods: SVM, Soft Margins, Kernel Trick. Ensemble. Methods: Bagging, Boosting, Stacking, AdaBoost, Cross-Validation. Dimensionality Reduction: PCA, LDA, MDS, Feature Selection Techniques. Suggested Activities: Implement feature selection techniques and compare model performance before and after feature selection.					
TOTAL:45 PERIODS					
List of Experiments: 1. Implementation of a simple intelligent agent simulation 2. Solving AI problems using BFS and DFS algorithms 3. Implementing heuristic search strategies (A*, Hill Climbing) 4. Design and train a perceptron for basic classification 5. Building a multi-layer neural network using backpropagation 6. Data preprocessing and feature selection for ML tasks 7. Apply supervised learning algorithms (Naive Bayes, Decision Tree, KNN) 8. Unsupervised learning using k-means and Apriori algorithms 9. Regression techniques and Random Forest model implementation 10. Dimensionality reduction using PCA and LDA with visualization					
TOTAL (Lab.): 15 PERIODS					
TOTAL: 60 PERIODS					

Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%.
Assessment Methodology: Assignments (10%), Quiz (10%), Competitive Examinations (10%), Flipped Class (10%), Practical (20%), Internal Examinations (40%).
Text Books:
1. Saroj Kaushik, Artificial Intelligence, 2nd Edition, Cengage Learning India, New Delhi, 2022. 2. M. N. Murty and V. S. Ananthanarayana V. S., Machine Learning: Theory and Practice, 1st Edition, Universities Press, Hyderabad, 2024.
References:
1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 4th Edition, Pearson, 2021. 2. Tom M. Mitchell, Machine Learning, 1st Edition, McGraw Hill Education, 2017. 3. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning, 1st Edition, MIT Press, 2016. 4. Pattern Recognition and Machine Learning. By Christopher M. Bishop, 1st Edition, Springer, 2006. 5. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 3rd Edition, By Aurélien Geron, O'Reilly Media, 2022.

E-Resources:
1. Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville (MIT Press). 2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Geron (O'Reilly). 3. Think Python by Allen B. Downey (Green Tea Press).

CO	CO Description	PO	PSO
CO1	Explain the fundamental concepts of Artificial Intelligence, intelligent agents, knowledge representation, logic, and inference techniques for solving engineering problems.	PO1(3) PO2(3)	-
CO2	Apply informed and uninformed search algorithms and constraint satisfaction techniques to solve AI-based problem-solving tasks.	PO2(3) PO4(3) PO5(3)	PSO2 (3)
CO3	Analyze and develop Artificial Neural Network models using learning algorithms and optimization techniques for intelligent applications.	PO2(3) PO4(3) PO5(3)	PSO1 (3) PSO2 (3)
CO4	Apply supervised, unsupervised, and reinforcement learning techniques to solve classification, prediction, and clustering problems.	PO2(3) PO4(3) PO5(3)	PSO1 (3) PSO2 (3) PSO3 (3)
CO5	Analyze advanced machine learning algorithms, ensemble learning methods, kernel methods, forecasting models, and dimensionality reduction techniques for real-world AI applications.	PO2(3) PO5(3) PO11(3)	PSO1 (3) PSO2 (3) PSO3 (3)

(1) = Low; (2) = Medium; (3) = High



26EC404	Digital Signal Processing Laboratory	L	T	P	C
		0	0	4	2
Course objectives: • To learn and analyze discrete Fourier transform, properties of DFT and its application to linear filtering • To understand the characteristics of digital filters, design digital IIR and FIR filters and apply these filters to filter undesirable signals in various frequency bands • To implement the effects of finite precision representation on digital filters • To understand the fundamental concepts of multi rate signal processing and its applications • To introduce the concepts of adaptive filters and its application to communication engineering.					
List of Experiments: 1. Generation of elementary Discrete-Time sequences. 2. Linear and Circular convolutions. 3. Auto correlation and Cross Correlation. 4. Frequency Analysis using DFT. 5. Design of FIR filters (LPF/HPF/BPF/BSF) and demonstrates the filtering operation. 6. Design of Butterworth and Chebyshev IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations. 7. Study of architecture of Digital Signal Processor. 8. Perform MAC operation using various addressing modes. 9. Generation of various signals and random noise. 10. Design and demonstration of FIR Filter for Low pass, High pass, Band pass and Band stop filtering. 11. Design and demonstration of Butter worth and Chebyshev IIR Filters for Low pass, High pass, Band pass and Band stop filtering. 12. Implement an Up-sampling and Down-sampling operation in DSP Processor.					
TOTAL : 30 PERIODS					
Tools Required : Matlab / Equivalent Software Package/ DSP Processor Based Implementation					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)					
References: 1. John G. Proakis and Dimitris G.Manolakis, Digital Signal Processing – Principles, Algorithms and Applications, 4th Edition, Pearson Education / Prentice Hall, 2007. 2. A. V. Oppenheim, R.W. Schafer and J.R. Buck, —Discrete-Time Signal Processing”, 8th Indian reprint, Pearson, 2004. 3. Emmanuel C. Ifeachor& Barrie. W. Jervis, “Digital Signal Processing”, 2nd Edition, Pearson Education / Prentice Hall, 2002. 4. Sanjit K. Mitra, “Digital Signal Processing – A Computer Based Approach”,4th Edition, Tata Mc Graw Hill, 2007. 5. S. Salivahanan, A. Vallavaraj and C. Gnanapriya, “Digital Signal Processing”, McGraw Hill Education, 2nd Edition, 2018.					
E-Resources: 1. https://www.nptel.ac.in/courses/117102060 2. https://ocw.mit.edu/courses/res-6-008-digital-signal-processing-spring-2011/ 3. https://www.mathworks.com/help/dsp/index.html					



Task

T1 Analyze discrete-time signals and perform linear/circular convolution, correlation, and DFT-based frequency analysis.

T2 Design and implement FIR and IIR digital filters for different frequency-selective filtering applications.

T3 Study DSP processor architecture and implement MAC operations, signal generation, and noise processing using different addressing modes.

T4 Implement multirate signal processing techniques such as up-sampling and down-sampling using a DSP processor.

CO	Description	PO	PSO
CO1	Generate and analyze fundamental discrete-time signals and sequences using appropriate mathematical and computational techniques.	PO1 (3) PO4 (3) PO5 (3)	PSO1 (3)
CO2	Analyze linear/circular convolution, autocorrelation, cross-correlation, and DFT for discrete-time signal processing applications.	PO1 (3) PO2 (3) PO4 (3)	PSO1 (3) PSO2 (3)
CO3	Design and implement FIR and IIR digital filters.	PO1 (3) PO2 (3) PO4 (3)	PSO1 (3) PSO2 (3)
CO4	Analyze and implement DSP processor architecture, MAC operations, and addressing modes using suitable digital signal processing tools.	PO1 (3) PO2 (3) PO4 (3)	PSO1 (3) PSO2 (3) PSO3 (3)
CO5	Apply sampling-rate conversion techniques, signal/noise generation, modelling, and data analysis to solve practical DSP problems using modern computational tools.	PO1 (3) PO2 (3) PO4 (3) PO5 (3)	PSO1 (3) PSO2 (3) PSO3 (3)

(1) = Low; (2) = Medium; (3) = High



26EC405	Linear Integrated Circuits Laboratory	L	T	P	C
		0	0	4	2
Course objectives: ● To gain hands on experience in designing electronic circuits ● To learn simulation software used in circuit design ● To learn the fundamental principles of amplifier circuits ● To differentiate feedback amplifiers and oscillators. ● To differentiate the operation of various multivibrators					
List of Experiments: Design and Analysis of the following circuits 1. Series and Shunt feedback amplifiers-Frequency response, Input and output impedance. 2. RC Phase shift oscillator and Wien Bridge Oscillator 3. Hartley Oscillator and Colpitts Oscillator 4. RC Integrator and Differentiator circuits using Op-Amp 5. Clippers and Clampers 6. Instrumentation amplifier 7. Active low-pass, High pass & Band pass filters 8. PLL Characteristics and its use as frequency multiplier, clock synchronization 9. R-2R ladder type D-A converter using Op-Amp					
SIMULATION USING SPICE (Using Transistor): 1. Tuned Collector Oscillator 2. Twin -T Oscillator / Wein Bridge Oscillator 3. Double and Stagger tuned Amplifiers 4. Bistable Multivibrator 5. Schmitt Trigger circuit with Predictable hysteresis 6. Analysis of power amplifier					
TOTAL : 30 PERIODS					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)					
References: 1. John G. Proakis and Dimitris G.Manolakis, Digital Signal Processing – Principles, Algorithms and Applications, 4th Edition, Pearson Education / Prentice Hall, 2007. 2. A. V. Oppenheim, R.W. Schafer and J.R. Buck, —Discrete-Time Signal Processing”, 8th Indian Rreprint, Pearson, 2004. 3. Sanjit K. Mitra, “Digital Signal Processing – A Computer Based Approach”, 4th Edition, Tata Mc Graw Hill, 2007. 4. S. Salivahanan, A. Vallavaraj and C. Gnanapriya, “Digital Signal Processing”, McGraw Hill Education, 2nd Edition, 2018.					
E-Resources: 1. https://www.nptel.ac.in/courses/117102060 2. https://ocw.mit.edu/courses/res-6-008-digital-signal-processing-spring-2011/ 3. https://www.mathworks.com/help/dsp/index.html					



CO	CO Description	PO	PSO
CO1	Design and analyze feedback amplifier and oscillator circuits and determine their frequency response and impedance characteristics.	PO1(3) PO2(3) PO5(3)	PSO1(3) PSO2(2) PSO3(2)
CO2	Design and analyze waveform-shaping and signal-conditioning circuits such as integrators, differentiators, clippers, clampers and instrumentation amplifiers.	PO1(3) PO2(3) PO3(3) PO5(3)	PSO1(3) PSO2(3) PSO3(2)
CO3	Design and analyze active filters, PLL-based circuits and R-2R ladder D-A converters using appropriate electronic design techniques.	PO1(3) PO2(3) PO4(3) PO5(3)	PSO1(2) PSO2(3) PSO3(2)
CO4	Simulate and analyze transistor-based electronic circuits using SPICE and interpret their performance characteristics.	PO1(3) PO2(3) PO3(3) PO5(3)	PSO1(3) PSO2(3) PSO3(3)
CO5	Analyze and evaluate multivibrators, Schmitt triggers, tuned amplifiers and power amplifiers for practical electronic applications.	PO1(3) PO2(3) PO3(3) PO5(3)	PSO1(3) PSO2(2) PSO3(2)

(1) = Low; (2) = Medium; (3) = High



26SDC02	Professional and Corporate Communication Skills	L	T	P	C
		0	0	2	-
Course Objectives: • To develop effective verbal and professional communication skills. • To enhance grammar, vocabulary, reading and listening abilities. • To demonstrate effective speaking, presentation and group discussion skills. • To prepare students for corporate communication and workplace interactions. • To develop professional skills required for interviews, placements and corporate environments.					
List of Activities 1. Professional Communication Fundamentals and Workplace Etiquette 2. Verbal Ability, Grammar and Vocabulary Enhancement 3. Reading Comprehension and Critical Verbal Reasoning 4. Listening Skills and Effective Workplace Conversations 5. Professional Speaking, Pronunciation and Presentation Skills 6. Group Discussion, Team Communication and Negotiation Skills 7. Corporate Email, Business Writing and Digital Communication 8. Resume Writing, Self-Introduction and Personal Branding 9. Interview Skills, Corporate Etiquette and Workplace Interaction 10. Mock Corporate Communication, Presentation and Placement Simulation					
TOTAL : 30 PERIODS					
Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%					
Assessment Methodology: Observation and Record (20%), Practical (30%), Internal Examinations (50%)					
References: 1. Meenakshi Raman & Sangeeta Sharma – Technical Communication: Principles and Practice, Oxford University Press. 2. M. Ashraf Rizvi – Effective Technical Communication, McGraw Hill. 3. Rajendra Pal & H. S. Korlahalli – Essentials of Business Communication, Sultan Chand. - Norman Lewis – Word Power Made Easy, Penguin. 4. John Seely – The Oxford Guide to Writing and Speaking, Oxford University Press. 5. Michael Swan – Practical English Usage, Oxford University Press.					
E-resources: 1. https://nptel.ac.in/courses/112107291					

CO	CO Description	PO	PSO
CO1	Apply verbal and professional communication techniques in workplace situations.	PO1 (3)	PSO1 (3)
CO2	Demonstrate effective reading, listening, speaking and presentation skills.	PO2 (1) PO3 (3)	PSO1 (3) PSO2 (2)
CO3	Construct professional emails, business documents and other forms of corporate communication.	PO1 (3) PO3 (3)	PSO1 (3) PSO2 (3)
CO4	Demonstrate effective participation in group discussions, interviews and professional interactions.	PO3 (3) PO5 (3)	PSO1 (3) PSO2 (3)
CO5	Develop professional communication profiles through resume preparation, personal branding and placement-oriented activities.	PO1 (3) PO2 (2) PO3 (3)	PSO1 (3) PSO2 (3)

(1) = Low; (2) = Medium; (3) = High



MANDATORY COURSES

26MCC01	Disaster Management and Safety Awareness	L	T	P	C
		1	0	0	-
Course Objectives: To provide students with fundamental knowledge of natural and man-made disasters, disaster preparedness, risk reduction, emergency response, industrial safety and personal/community safety, enabling them to respond effectively during emergency situations					
Unit I	Fundamentals of Disaster Management				3
Disaster, hazard, vulnerability and risk; types of disasters; disaster management cycle; prevention, mitigation, preparedness, response and recovery; disaster risk reduction and early warning systems.					
Unit II	Natural Disasters				3
Earthquakes, tsunamis, floods, landslides, cyclones, thunderstorms, droughts and heat waves; causes and impacts; preparedness, mitigation, evacuation and emergency response.					
Unit III	Industrial and Man-Made Disasters				3
Industrial hazards and accidents; fire and explosion; chemical leakage; electrical and machinery hazards; biological and transportation disasters; personal protective equipment; hazard identification and risk assessment.					
Unit IV	Emergency Response and First Aid				3
Emergency action and evacuation plans; fire prevention and fire extinguishers; basic first aid; bleeding, burns, fractures, electric shock and heat-related emergencies; basic CPR awareness; emergency communication and rescue procedures.					
Unit V	Safety and Community Resilience				3
Occupational, laboratory, workshop, road and electrical safety; disaster recovery and rehabilitation; community resilience; role of government agencies, NGOs and volunteers; disaster risk mapping, safety audit, emergency drills and institutional disaster management planning.					
TOTAL : 15 PERIODS					
Text Books:					
1. R. B. Singh, Disaster Management, Rawat Publications, Jaipur, 2015 2. S. K. Singh, Disaster Management, A.K. Publications, New Delhi, 2017.					
References:					
1. M. M. S. Maheshwari, Disaster Management, Pointer Publishers, Jaipur, 2011. 2. B. K. Khanna, All You Wanted to Know About Disasters, New India Publishing Agency, New Delhi, 2005. 3. National Disaster Management Authority (NDMA), National Disaster Management Guidelines, Government of India. 4. Ministry of Home Affairs, National Disaster Management Plan, Government of India. 5. S. K. Sharma, Disaster Management and Preparedness, CBS Publishers & Distributors, New Delhi.					

CO	CO Description	PO	PSO
CO1	Explain the concepts, types and phases of disaster management.	PO9 (2) PO11 (2)	PSO3 (3)
CO2	Identify disaster hazards, vulnerabilities and associated risks.	PO7 (3) PO9 (2)	PSO3 (3)
CO3	Apply appropriate preparedness and mitigation measures for different disasters.	PO9 (2) PO11 (2)	PSO3 (3)
CO4	Demonstrate basic emergency response, first aid, fire safety and evacuation procedures.	PO9 (3) PO10 (2)	PSO3 (3)
CO5	Develop awareness of industrial, occupational, environmental and community safety practices	PO9 (3) PO11 (3)	PSO3 (3)

(1) = Low; (2) = Medium; (3) = High



26MCC02	Gender Sensitization and Inclusive Society	L	T	P	C
		1	0	0	-
Course Objectives: - To create awareness about gender equality, equity, diversity and social inclusion. - To understand gender roles, stereotypes, discrimination and constitutional values. - To familiarize students with gender-based violence, safety measures and relevant legal provisions. - To promote respectful behaviour, empathy and equal opportunities in educational and professional environments.					
Unit I	Gender Concepts and Social Awareness				3
Gender, sex and gender identity; gender roles and stereotypes; gender equality and equity; socialization and discrimination; importance of gender sensitivity.					
Unit II	Gender and Constitutional Values				3
Fundamental rights and duties; equality and non-discrimination; constitutional provisions for gender equality; dignity, freedom and social justice; relevant laws for protection against discrimination and harassment.					
Unit III	Gender-Based Violence and Safety				3
Types of gender-based violence; domestic violence, sexual harassment and cyber harassment; prevention and reporting mechanisms; workplace and institutional safety; role of Internal Complaints Committee (ICC).					
Unit IV	Inclusive Education and Workplace				3
Inclusive education; equal opportunities; diversity and inclusion; accessibility; respectful communication; prevention of bias and discrimination in educational institutions and workplaces.					
Unit V	Building an Inclusive Society				3
Role of students and professionals in promoting equality; empathy and responsible behaviour; gender-sensitive leadership; community awareness; case studies, group discussions and awareness activities.					
TOTAL : 15 PERIODS					
Text Books:					
1. A. S. Altekar, The Position of Women in Hindu Civilization, Motilal Banarsidass, New Delhi.					
2. B. R. Ambedkar, Annihilation of Caste, Navayana Publishing.					
References:					
1. United Nations, Gender Equality and Women’s Empowerment, UN Publications.					
2. Government of India, The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013.					
3. National Commission for Women, Handbook on Sexual Harassment of Women at Workplace, Government of India.					
4. UGC, Policy on Prevention, Prohibition and Redressal of Sexual Harassment of Women Employees and Students in Higher Educational Institutions.					
5. UNESCO, Gender Equality and Education, UNESCO Publications.					

CO	CO Description	PO	PSO
CO1	Explain the concepts of gender, gender equality, equity and social inclusion.	PO9 (2) PO11 (2)	PSO3 (3)
CO2	Identify gender stereotypes, discrimination and inequalities in society.	PO7 (3) PO9 (2)	PSO3 (3)
CO3	Understand constitutional provisions and legal mechanisms related to gender equality and safety.	PO9 (2) PO11 (2)	PSO3 (3)
CO4	Demonstrate respectful and inclusive behaviour in academic and workplace environments.	PO9 (3) PO10 (2)	PSO3 (3)
CO5	Promote gender-sensitive practices and contribute to building an equitable and inclusive society.	PO9 (3) PO11 (3)	PSO3 (3)

(1) = Low; (2) = Medium; (3) = High



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