KPR Institute of Engineering and Technology

Learn Beyond

(Autonomous, Affiliated to Anna University)

CURRICULUM AND SYLLABI

REGULATIONS – 2025 (REVISED)

Department of
Electronics and Communication Engineering

CONTROLLED COPY

I. Vision and Mission of the Institute

Vision

To become a premier institute of academic excellence by imparting technical, intellectual and professional skills to students for meeting the diverse needs of industry, society, the nation and the world at large

Mission

- Commitment to offer value-based education and enhancement of practical skills
- Continuous assessment of teaching and learning processes through scholarly activities
- Enriching research and innovation activities in collaboration with industry and institutes of repute
- Ensuring the academic processes to uphold culture, ethics and social responsibilities

II. Vision and Mission of the Department

Vision

To be a centre of excellence for education, research and development in the field of Electronics and Communication Engineering to meet the growing needs of the society

Mission

The mission of the department is to

- Develop competencies in emerging technologies through skill based education collaborating with industries of repute
- Provide conducive environment for research and innovation to cater to the needs of the society
- Inculcate professionalism, ethical values and lifelong learning

III. Program Educational Objectives (PEOs)

The Program Educational Objectives (PEOs) of the ELECTRONICS AND COMMUNICATION ENGINEERING (EC) represent major accomplishments that the graduates are expected to achieve after three to five years of graduation.

PEO1: Apply principles of Electronics and Communication Engineering to provide solutions to the emerging problems in the society

PEO2: Embrace technological challenges through skill upgradation or higher education or research

PEO3: Exhibit leadership qualities with professional and ethical values

IV. Program Outcomes (POs)

Graduates of the ELECTRONICS AND COMMUNICATION ENGINEERING will be able to

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

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

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

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

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

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

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

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

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

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

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

Knowledge and Attitude Profile (WK)

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

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

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

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

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

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

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

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

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

V. Program Specific Outcomes (PSOs)

Graduates of the ELECTRONICS AND COMMUNICATION ENGINEERING will be able to

PSO1: Design and develop intelligent systems using embedded controllers, Internet of Things and network security protocols

PSO2: Design, fabricate and test modern antennas for communication systems

VI. PEO / PO Mapping

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Following three levels of correlation should be used:

1: Low

2: Medium

3: High

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
PEO 1	3	3	3	3	3	2	2	2	2	2	2	3	3
PEO 2	3	3	3	3	3	2	1	2	1	2	2	3	3
PEO 3	-	-	-	-	-	-	3	3	3	3	3	1	1

VII. Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Sem	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
I	Professional Communication - I	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Multivariable Calculus and Applications	✓	✓	-	-	-	-	-	-	-	-	-	-	-
	Engineering Physics	✓	✓	✓	-	✓	-	-	✓	✓	-	-	-	-
	C Programming	✓	✓	✓	✓	✓	-	-	-	-	-	✓	-	-
	Introduction to Electrical And Electronics Engineering	✓	✓	✓	-	-	-	-	-	-	-	-	-	-
	Makerspace	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-
	C Programming Laboratory	✓	✓	✓	✓	-	-	-	-	-	-	✓	-	-
	Induction Program													
	Universal Human Values	-	-	-	-	-	✓	✓	✓	-	-	✓	-	-
	தமிழர் மரபு / Heritage of Tamils	-	-	-	-	-	-	✓	✓	-	✓	-	-	-
	Environmental Governance and Sustainability	✓	✓	-	-	-	✓	✓	-	✓	-	✓	-	-
	Professional Skill Development - I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-
II	Professional Communication - II	-	-	-	-	-	-	-	✓	✓	-	✓	-	-
	Linear Algebra and Complex Variables	✓	✓	-	-	✓	-	-	-	✓	-	✓	-	-
	Material Science for Electronics Engineering	✓	✓	✓	-	-	-	-	-	-	-	-	✓	✓
	Engineering Chemistry	✓	✓	✓	-	✓	-	-	✓	✓	-	✓	-	-
	Python Programming	✓	✓	✓	✓	✓	-	-	-	-	-	✓	-	-
	Circuit Analysis	✓	✓	✓	-	-	-	-	-	-	-	-	-	-
	Electronic Devices and Circuits	✓	✓	✓	✓	✓	-	-	✓	✓	-	✓	✓	-
	Python Programming Laboratory	✓	✓	✓	✓	-	-	-	-	-	-	✓	-	-
	Design Thinking	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓	-	-
	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	-	-	-	-	-	-	✓	✓	-	✓	-	-	-
	Professional Skill Development - II	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-
III	Probability and Statistics	✓	✓	-	-	✓	-	-	-	-	-	-	-	-
	Signals and Systems	✓	✓	✓	-	-	-	-	-	-	-	✓	-	-
	Analog Electronics	✓	✓	✓	-	-	-	-	-	-	-	✓	✓	-

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Sem	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
	Digital System Design	✓	✓	✓	-	-	-	-	-	-	-	✓	✓	-
	Linear Integrated Circuits	✓	✓	✓	-	-	-	-	✓	✓	-	✓	✓	-
	Data Structures and Algorithms	✓	✓	✓	✓	✓	-	-	-	-	-	-	-	-
	Analog Electronics Laboratory	✓	✓	✓	✓	✓	-	✓	✓	✓	-	✓	✓	-
	Digital System Design Laboratory	✓	✓	✓	✓	-	-	✓	✓	✓	-	✓	✓	-
	Essence of Indian Traditional Knowledge	-	✓	-	✓	-	-	✓	-	-	-	-	-	-
	Professional Skill Development - III	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-
IV	Analog and Digital Communication	✓	✓	✓	-	-	-	-	-	-	-	✓	-	✓
	Electromagnetic Fields and Transmission Lines	✓	✓	✓	-	-	-	-	-	-	-	✓	-	✓
	Microprocessors and Microcontrollers	✓	✓	✓	✓	✓	-	-	✓	✓	-	✓	✓	-
	Object Oriented Programming Using Java	✓	✓	✓	✓	-	-	-	-	-	-	✓	-	-
	Digital Signal Processing	✓	✓	✓	✓	✓	-	-	✓	✓	-	✓	-	-
	Analog and Digital Communication Laboratory	✓	✓	✓	✓	✓	-	✓	✓	✓	-	✓	-	✓
	Object Oriented Programming Using Java Laboratory	✓	✓	✓	✓	-	-	-	-	-	-	✓	-	-
	Indian Constitution	-	-	-	-	-	✓	✓	✓	-	-	-	-	-
	Professional Skill Development - IV	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-

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Coimbatore

ELECTRONICS AND COMMUNICATION ENGINEERING

Regulations 2025

For the students admitted from 2025 onwards

CHOICE BASED CREDIT SYSTEM

CURRICULUM FOR I - VIII SEMESTERS

SEMESTER I

No	Course Code	Title	Category	Type	L	T	P	J	C
1	U25REN101	Professional Communication - I	HSMC	TwL	2	-	2	-	3
2	U25RMA101	Multivariable Calculus and Applications	BSC	T	3	1	-	-	4
3	U25RPH01	Engineering Physics	BSC	TwL	2	-	2	-	3
4	U25RCSG01	C Programming	ESC	T	3	-	-	-	3
5	U25RECG01	Introduction to Electrical And Electronics Engineering	ESC	T	3	-	-	-	3
6	U25RGE01	Makerspace	ESC	L	-	-	4	-	2
7	U25RCSG03	C Programming Laboratory	ESC	L	-	-	2	-	1
Total									**19**
MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)									
8	U25RMNC01	Induction Program	MNC	MNC	3 Weeks				-
9	U25RMCC01	Universal Human Values	MCC	MCC	3	-	-	-	3
10	U25RMCC02	தமிழர் மரபு / Heritage of Tamils	MCC	Tamil Courses	1	-	-	-	1
11	U25RMCC04	Environmental Governance and Sustainability	MCC	MCC	2	-	-	-	2
12	U25RMCC06	Professional Skill Development - I	MCC	MCC	15 Hours				1
Total									**7**

SEMESTER II

No	Course Code	Title	Category	Type	L	T	P	J	C
1	U25REN201	Professional Communication - II	HSMC	TwL	2	-	2	-	3
2	U25RMA202	Linear Algebra and Complex Variables	BSC	TwL	3	-	2	-	4
3	U25RPH04	Material Science for Electronics Engineering $	BSC	T	2	-	-	-	2
4	U25RCY01	Engineering Chemistry	BSC	TwL	2	-	2	-	3
5	U25RCSG04	Python Programming	ESC	T	3	-	-	-	3
6	U25REC201	Circuit Analysis	PCC	T	3	1	-	-	4
7	U25RECG02	Electronic Devices and Circuits	PCC	TwL	3	-	2	-	4
8	U25RCSG06	Python Programming Laboratory	ESC	L	-	-	2	-	1
Total									**24**
MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)									
9	U25RMCC03	Design Thinking	MCC	MCC	1	-	2	-	2
10	U25RMCC05	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	MCC	Tamil Courses	1	-	-	-	1

No	Course Code	Title	Category	Type	L	T	P	J	C
11	U25RMCC07	Professional Skill Development - II	MCC	MCC	15 Hours				1
Total									4

$ - For Non-Biology Students

SEMESTER III

No	Course Code	Title	Category	Type	L	T	P	J	C
1	U25MA302	Probability and Statistics	BSC	TwL	2	-	2	-	3
2	U25EC301	Signals and Systems	PCC	T	3	-	-	-	3
3	U25EC302	Analog Electronics	PCC	T	3	-	-	-	3
4	U25ECG02	Digital System Design	PCC	T	3	-	-	-	3
5	U25EC303	Linear Integrated Circuits	PCC	TwL	2	-	2	-	3
6	U25ADG02	Data Structures and Algorithms	PCC	TwL	3	-	2	-	4
7	U25EC304	Analog Electronics Laboratory	PCC	L	-	-	2	2	2
8	U25ECG03	Digital System Design Laboratory	PCC	L	-	-	2	-	1
Total									22
MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)									
9	U25MNC02	Essence of Indian Traditional Knowledge	MNC	MNC	1	-	-	-	-
10	U25RMCC08	Professional Skill Development - III	MCC	MCC	15 Hours				1
Total									1

SEMESTER IV

No	Course Code	Title	Category	Type	L	T	P	J	C
1	U25EC401	Analog and Digital Communication	PCC	T	3	-	-	-	3
2	U25EC402	Electromagnetic Fields and Transmission Lines	PCC	T	3	-	-	-	3
3	U25ECG04	Microprocessors and Microcontrollers	PCC	TwL	3	-	2	-	4
4	U25CSG11	Object Oriented Programming Using Java	PCC	T	3	-	-	-	3
5	U25EC403	Digital Signal Processing	PCC	TwL	3	-	2	-	4
6	U25EC404	Analog and Digital Communication Laboratory	PCC	L	-	-	2	-	1
7	U25CSG13	Object Oriented Programming Using Java Laboratory	PCC	L	-	-	2	-	1
8	-	Open Elective I	OEC	T	1	-	4	-	3
					3	-	-	-	
					2	-	2	-	
Total									22
MANDATORY CREDIT COURSES (MCC - Non CGPA) / MANDATORY NON-CREDIT COURSES (MNC)									
9	U25MNC03	Indian Constitution	MNC	MNC	1	-	-	-	-
10	U25RMCC09	Professional Skill Development - IV	MCC	MCC	15 Hours				1
Total									1

T - Theory, **L** - Laboratory, **TwL** - Theory with Laboratory, **TwP** - Theory with Project

SEMESTER I

		Category: HSMC				
U25REN101	Professional Communication - I (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	L	T	P	J	C
		2	0	2	0	3

QP PATTERN: C

COURSE OBJECTIVES:

- To develop professional communication skills for academic, technical and workplace environments
- To enhance the listening skills and facilitate effective pronunciation
- To enable students to communicate confidently in individual and team-based situations

COURSE OUTCOMES:

CO 1:	Use appropriate vocabulary and grammatical structures in professional communication	**Understand**
CO 2:	Communicate confidently in academic, social and workplace situations	**Apply**
CO 3:	Develop reading and writing skills for technical and professional purposes	**Apply**
CO 4:	Infer and present information using appropriate communication strategies	**Analyze**
CO 5:	Demonstrate effective listening, presentation, and teamwork skills in professional contexts	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 2	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 3	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 4	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 5	-	-	-	-	-	-	-	2	3	-	1	-	-

SYLLABUS:

UNIT I: FOUNDATIONS OF PROFESSIONAL COMMUNICATION **6 + 6**

Verbal, Non-verbal and Digital Communication - Word chain - Professional Etiquette - Self-Introduction and Elevator Pitch - Growth Mindset and Workplace Communication - Cross-cultural Communication - Professional Terminology - AI-assisted Communication Tools

UNIT II: PROFESSIONAL READING AND WRITING **6 + 6**

Reading Technical Articles - Error correction - Manuals and SOPs - Infographics and Data - Email Etiquette - Email Writing - AI-assisted Writing Tools - Ethical Use of AI - Verbal Analogy

UNIT III: LISTENING AND INTERPERSONAL COMMUNICATION **6 + 6**

Listening Barriers - Note-taking Techniques - Listening for Problem Solving - Team Communication - Conflict Resolution - Workplace Discussions - Idioms and Phrases

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UNIT IV: DIGITAL COMMUNICATION AND PRESENTATION SKILLS **6 + 6**

Storytelling Techniques - Discourse markers, linkers and cohesive devices - Data Presentation - Presentation Anxiety Management - Digital Presentation Platforms - Branding - Commonly Confused Words

UNIT V: EMPLOYABILITY AND PROFESSIONALISM **6 + 6**

Prefixes, Suffixes and Root Words - LinkedIn Profile - Interview Skills - Group Discussion Strategies - Art of Persuasion - Entrepreneurial Communication - AI in Future Workplace

LIST OF EXPERIMENTS

1. Self-Introduction
2. Group Presentation
3. Listening to TED Talks
4. Listening to Documentaries
5. Digital Profiling

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. Ashraf Rizvi, Effective Technical Communication, 3rd Edition, McGraw-Hill Education, 2023
2. Meenakshi Raman & Sangeeta Sharma, Technical Communication: Principles and Practice, 4th Edition, Oxford University Press, 2022
3. Sanjay Kumar & Pushp Lata, Communication Skills, 3rd Edition, Oxford University Press, New Delhi, 2018

REFERENCES:

1. Stephen E. Lucas, The Art of Public Speaking, 14th Edition, McGraw Hill Education, New York, 2023
2. Dale Carnegie, The Quick and Easy Way to Effective Speaking, Updated Edition, Simon & Schuster, New York, 2019
3. Matt Abrahams, Think Faster, Talk Smarter: How to Speak Successfully When You're Put on the Spot, Simon & Schuster, New York, 2024

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SEMESTER I

		Category: BSC				
U25RMA101	Multivariable Calculus and Applications (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	L	T	P	J	C
		3	1	0	0	4

QP PATTERN: A

COURSE OBJECTIVES:

- To provide a comprehensive knowledge of multivariable calculus, including, partial derivatives integral calculus, and vector calculus
- For constructing more convenient for students to apply their calculus knowledge to their various fields of study
- To develop skills in solving first and second order linear differential equations for engineering applications

COURSE OUTCOMES:

CO 1:	Explain the concepts of multivariable differential calculus, estimate the extreme values and Taylor's formula of two variable functions	**Understand**
CO 2:	Apply integral calculus to evaluate double integrals over various regions and compute area and volume using double integration	**Apply**
CO 3:	Apply vector calculus to compute directional derivative, divergence, curl, Green's, Stokes' and Gauss divergence theorems	**Apply**
CO 4:	Solve first order ordinary differential equations, model physical phenomena, determine appropriate methods for solving them, and interpret the results	**Apply**
CO 5:	Formulate second-order differential equations, solve the equations, and interpret the solutions for physical models	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO 2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO 4	3	2	-	-	-	-	-	-	-	-	-	-	-
CO 5	3	2	-	-	-	-	-	-	-	-	-	-	-

SYLLABUS:

UNIT I: DIFFERENTIAL CALCULUS **9 + 3**

Functions of two variables – Partial derivatives – Total derivatives – Taylor's formula for functions of two variables – Extreme Values

UNIT II: INTEGRAL CALCULUS **9 + 3**

UNIT II Double integrals – Over rectangles – Over general regions – Fubini's theorem (statement only), Area and Volume by double integration – Reversing the order of integration

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UNIT III: VECTOR CALCULUS **9 + 3**

Differentiation in vector field – Gradient of a scalar field – Directional derivative – Divergence of a vector field – Curl of a vector field – Integration in vector field – Line integrals – Work– circulation and flux – Path independence – Conservative fields – Green's – Gauss divergence and Stoke's theorems

UNIT IV: FIRST ORDER LINEAR ORDINARY DIFFERENTIAL EQUATIONS **9 + 3**

Basic concepts of ordinary differential equations – Separable and exact differential equations – Integrating factors and first-order linear differential equations – Mathematical modelling of real-world problems

UNIT V: SECOND ORDER LINEAR DIFFERENTIAL EQUATIONS **9 + 3**

Homogeneous linear equations of second order – linearity principle – second order homogeneous equations with constant coefficients – Euler–Cauchy equation – Non-homogeneous linear second order-solution by variation of parameters

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** 15 Periods **Practical:** - Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. Thomas G. B. and Finney R. L., "Calculus and Analytic Geometry", Pearson Education, New Delhi, 2012
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India Pvt Ltd, New Delhi, 2012

REFERENCES:

1. Wylie C. R. and Barrett L. C., "Advanced Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2013
2. Peter V.O Neil, "Advanced Engineering Mathematics", Cengage, New Delhi, 2010
3. Michael D. G, "Foundations of Applied Mathematics", Dover Publications, INC, New York, 2013
4. Gilbert Strang, "Calculus", Wellesley Cambridge Press, USA, 2017

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SEMESTER I & II

U25RPH01	Engineering Physics (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: BSC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the fundamental mechanical and thermal properties of solids and fluids for real-world engineering applications
- To explore advanced concepts in ultrasonic waves and their applications in imaging, testing, and sensing technologies
- To gain insights into semiconductor physics and photonics for their role in modern electronic and optical systems

COURSE OUTCOMES:

CO 1: Apply the stress-strain behavior concepts in engineering materials and structures **Apply**

CO 2: Apply principles of heat transfer and fluid mechanics to evaluate thermal systems and engineering applications **Apply**

CO 3: Demonstrate the operation of ultrasonic wave generation and detection techniques for industrial and biomedical applications **Apply**

CO 4: Analyze the electrical properties and carrier transport mechanisms in semiconductors and semiconductor devices **Apply**

CO 5: Demonstrate the principles of lasers and optical fibers in communication, sensing, and biomedical applications **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	-	1	-	-	1	1	-	-	-	-
CO 2	3	2	1	-	1	-	-	1	1	-	-	-	-
CO 3	3	2	1	-	1	-	-	1	1	-	-	-	-
CO 4	3	2	1	-	1	-	-	1	1	-	-	-	-
CO 5	3	2	1	-	1	-	-	1	1	-	-	-	-

SYLLABUS:

UNIT I: MECHANICAL PROPERTIES OF SOLIDS **6 + 6**

Modulus of Elasticity – Stress-strain diagram – Poisson's ratio – Elastic and plastic deformation – Stress-strain behaviour in metals, polymers and ceramics – Bending Moment – Cantilever – Applications (GIRDERS, MEMS)

UNIT II: FUNDAMENTALS OF HEAT TRANSFER AND FLUIDS **6 + 6**

Heat transfer – Thermal expansion – Heat conductivity – Lee's Disc method – Surface tension – Viscosity – Coefficient of viscosity using Poiseuille's flow experiment – Solar water heater – Microwave oven – Heat exchangers – Radiators – Cooling towers

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UNIT III: ULTRASONICS AND ITS APPLICATIONS **6 + 6**

Properties of Ultrasonic waves – Production of ultrasonic waves – Piezoelectric Oscillator – Magnetostriction Oscillator – Velocity measurement of Ultrasonic waves – SONAR – Non-Destructive Testing – Ultrasound imaging – Ultrasonic scanning methods

UNIT IV: SEMICONDUCTOR PHYSICS **6 + 6**

Properties – Direct and Indirect bandgap-semiconductor – Intrinsic and extrinsic Semiconductors – Carrier concentration in n-type semiconductor – P-type semiconductor – Carrier Transport in Semiconductor – Hall effect – Ohmic contacts – Schottky diode

UNIT V: PHOTONICS **6 + 6**

Interaction of Radiation with Matter – Laser Characteristics – Population Inversion – CO2 laser – Semiconductor Diode Laser – Laser applications – Total Internal Reflection – Structure and working principle of Optical fibre – Fiber optic Endoscopy – Fiber optic sensors

LIST OF EXPERIMENTS

1. Determine the moduli of elasticity of the given beams and evaluate them for different structural applications. (High/ Medium/Low modulus)
2. Evaluate the shear moduli of the different materials and rank them for suitable applications with reference to their strength
3. Select the most effective thermal insulation material from mica, cardboard, and glass for optimal heat protection
4. Determine the Viscosity of Liquids Using Poiseuille's Method and Identify the Fastest-Flowing Liquid
5. Measure the speed of ultrasound in liquids and calculate their compressibility for different hydraulic purposes
6. Categorize the specified semiconducting materials according to their energy bandgap values
7. Determine a semiconducting material's Hall coefficient and identify its type
8. Determination of wavelength of given laser and the particle size of the given samples using diffraction method
9. Use an optical fiber to measure its light-gathering capacity and calculate the propagation angle
10. Calculate the surface tension of different liquids and examine how surfactants affect it
11. Determination of wavelength of various spectral lines by using spectrometer and grating
12. Determination of velocity of light passing through glass medium using spectrometer

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. M.N. Avadhanulu, P.G. Kshirsagar, and T.V.S. Arun Murthy, "A Textbook of Engineering Physics", 11th edition, S. Chand Publishing, New Delhi, 2022
2. R.K. Gaur and S.L. Gupta, "Engineering Physics", 8th edition, Dhanpat Rai Publications, New Delhi, 2017

REFERENCES:

1. Harald Ibach and Hans Luth, "Solid State Physics: An Introduction", 4th edition, Springer Publications, 2020
2. Charles Kittel, revised by David Pines (Editor) "Introduction to Solid State Physics", 9th edition, Wiley & Sons, US, 2020
3. H.K. Malik and A.K. Singh "Engineering Physics" Publisher: McGraw Hill Education India, 2022
4. https://onlinecourses.nptel.ac.in/noc20_cy17/preview

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SEMESTER I

U25RCSG01	C Programming (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: ESC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To enable students to understand the fundamentals of problem-solving and C programming, including algorithms, flowcharts, pseudocode, and the structure of a C program
- To develop programming skills using input/output operations, control structures, arrays, strings, functions, pointers, and dynamic memory allocation
- To introduce user-defined data types such as structures and unions for handling complex data effectively
- To familiarize students with file handling concepts and develop C-based solutions for real-world applications

COURSE OUTCOMES:

CO 1:	Use fundamental programming concepts and problem-solving techniques to develop basic C programs	**Apply**
CO 2:	Develop C programs using input/output functions, operators, decision-making, and iterative control structures	**Apply**
CO 3:	Implement arrays and string handling concepts to solve data processing and real-world applications	**Apply**
CO 4:	Develop modular and efficient programs using functions, recursion, pointers, and dynamic memory allocation techniques	**Apply**
CO 5:	Implement structures, unions, and file operations to organize and process data in C programs	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	1	-	-	-	-	-	-	-	-	-
CO 2	3	2	1	1	-	-	-	-	-	-	2	-	-
CO 3	3	2	1	1	-	-	-	-	-	-	2	-	-
CO 4	3	2	1	1	-	-	-	-	-	-	2	-	-
CO 5	3	2	1	1	1	-	-	-	-	-	2	-	-

SYLLABUS:

UNIT I: PROBLEM SOLVING APPROACHES AND C PROGRAMMING BASICS **10**

Problem Solving Techniques: Problem Statement and Analysis – Problem Modelling – Identifying Input and Output Requirements – Algorithms – Flowcharts – Pseudocode for Solving Basic Scientific and Business Problems. Introduction to C: Characteristics of C – Structure of a C Program – Compiling and Executing C Program – Pre-processor Directives – Tokens – Character Set – Keywords – Identifiers – Constants – Variables – Operators – Data Types – Typecasting – Input/Output Statements in C

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UNIT II: DECISION CONTROL AND LOOPING STATEMENTS 8

Conditional Statements: if Statement – if-else Statement – Nested if Statements – else-if Ladder – switch Statement. Looping Statements: while Loop – do-while Loop – for Loop – Nested Loops. Jump Statements: break Statement – continue Statement – goto Statement

UNIT III: ARRAYS AND STRINGS 9

Arrays: Declaration and Initialization – Accessing and Manipulating Array Elements – One-Dimensional Arrays – Two-Dimensional Arrays – Applications of Arrays. Strings: Declaration and Initialization of Strings – String Handling Functions – String Arrays

UNIT IV: FUNCTIONS AND POINTERS 9

Functions: Definition – Function Call – Function Prototype – Return Statement – Types of Functions – Recursive Functions – Command Line Arguments. Pointers: Declaration and Initialization – Pointer Arithmetic – Passing Arguments by Value and by Reference – Pointer to Pointer – Pointers and Arrays. Dynamic Memory Allocation: malloc(), calloc(), realloc(), free()

UNIT V: USER-DEFINED DATA TYPES AND FILE MANAGEMENT 9

Structures: Declaration and Initialization – Accessing Structure Members – Arrays of Structures – Nested Structures – Pointer to Structures. Unions – Storage Classes. Files: File Access Methods – File Modes – File Operations – File Pointers – Binary File Operations

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Reema Thareja, "Computer Fundamentals and Programming in C", 3rd Edition, Oxford University Press, 2023
2. Brian W. Kernighan and Dennis Ritchie, "The C Programming Language", 2nd Edition, Pearson,2015

REFERENCES:

1. Paolo Ferragina and Fabrizio Luccio, "Computational Thinking First Algorithms", Then Code",1st Edition, Springer International Publishing, 2018
2. Paul Deitel and Harvey Deitel, "C How to Program", 7th Edition, Pearson Publication
3. Juneja, B. L and Anita Seth, "Programming in C",1st Edition, Cengage Learning India Pvt. Ltd.,2011
4. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", 1st Edition, Oxford University Press, 2009

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SEMESTER I

		Category: ESC				
U25RECG01	Introduction to Electrical And Electronics Engineering (Common to EC, EV)	L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To learn the basic concepts of electric circuits
- To acquire the knowledge on constructional details of DC and AC machines
- To understand the working of measuring instruments and consumer electronic gadgets

COURSE OUTCOMES:

CO 1:	Outline the fundamental concepts of electric circuits	**Understand**
CO 2:	Compare the principles of various DC machines	**Analyze**
CO 3:	Analyze the performance of various AC machines	**Analyze**
CO 4:	Select the appropriate instruments to measure electrical parameters	**Apply**
CO 5:	Illustrate the working principles of consumer electronic gadgets	**Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO 2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO 3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO 4	3	2	1	-	-	-	-	-	-	-	-	-	-
CO 5	2	1	-	-	-	-	-	-	-	-	-	-	-

SYLLABUS:

UNIT I: FUNDAMENTALS OF ELECTRIC CIRCUITS 9

Basic terminology: Voltage, current, power, electromotive force – Resistors, capacitors and inductors: Types, characteristics and energy storage – AC and DC fundamentals – Three phase power supply – Line and phase voltages – Star and Delta connections

UNIT II: DC MACHINES 9

Construction – Operating principle – Types – Applications of DC generator and motor

UNIT III: AC MACHINES 9

Construction – Principle of operation – Types – Applications of transformers – Single and three phase induction motor – Stepper motor – Servo motor

UNIT IV: MEASURING INSTRUMENTS 9

Voltmeter – Ammeter – Wattmeter – Digital multimeter – Megger – CRO – Digital Storage Oscilloscope – Energy meter – Spectrum Analyzer

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UNIT V: CONSUMER ELECTRONICS 9

Microphone – Loud speaker – Digital cameras – Smart TV – Washing machine – Microwave oven – Mobile phones

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. S.Salivahnan, R.Rengaraj, G R Venkatakrishnan., "Basic Electrical, Electronics and Measurement Engineering", 1st edition, Tata McGraw Hill Publishing Company Ltd, 2018
2. A.K.Sawhney, "A course in Electrical and Electronic Measurements and Instrumentation"' 2nd edition, Dhanpat Rai & Sons, 2005

REFERENCES:

1. Bhattacharya S.K., "Electrical Machines", 4th edition, McGraw-Hill Education, New Delhi, 2017
2. Mitchel E Schultz, "Basic Electronics", 10th edition, McGraw Hill Publishers, 2017
3. Bali S P, "Consumer Electronics", 1st edition, Pearson Education Asia Pvt. Ltd., 2008

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SEMESTER I & II

U25RGE01	Makerspace (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: ESC				
		L	T	P	J	C
		0	0	4	0	2

QP PATTERN: A

COURSE OBJECTIVES:

- Apply fundamental fabrication, electrical, electronics, programming, and digital manufacturing techniques for engineering applications
- Develop practical skills in prototyping, automation, robotics, and emerging technologies through experiential learning activities
- Design and construct interdisciplinary engineering prototypes by integrating concepts from multiple engineering domains

COURSE OUTCOMES:

CO 1:	Fabricate simple components using basic mechanical engineering tools and additive manufacturing	**Apply**
CO 2:	Carry out electrical wiring installations applying safety measures in domestic applications	**Apply**
CO 3:	Interface electronic devices to develop functional engineering solutions	**Apply**
CO 4:	Illustrate the role of automation and artificial intelligence in engineering applications	**Apply**
CO 5:	Develop interdisciplinary engineering prototype addressing specific problems through teamwork and innovation	**Create**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	-	-	3	-	-	3	2	-	2	-	-
CO 2	3	2	-	-	3	-	-	3	2	-	2	-	-
CO 3	3	2	-	-	3	-	-	3	2	-	2	-	-
CO 4	2	-	-	-	3	-	-	-	-	-	2	-	-
CO 5	3	3	2	1	3	2	2	3	3	2	2	-	-

LIST OF EXPERIMENTS

MODULE 1: FABRICATION AND MAKING SKILLS (10 Hours)

1. Welding procedure, selection & safety Measures - Hands-on session for preparing base material and joining of steel materials using arc welding
2. Study on basic pipe connections with different joining components.
3. Demo on laser cutting of acrylic boards and wire arc welding

MODULE 2: DIGITAL DESIGN AND RAPID PROTOTYPING (10 Hours)

4. 3D Modelling of simple components using software's
5. Fabrication of simple components / parts using 3D printers
6. Demonstration of assembly modelling of components

MODULE 3: AUTOMATION AND ROBOTICS (8 Hours)

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7. Demonstration on mechatronics components/systems
8. Demonstration on basic robotics system
9. Demonstration on automobiles, performance measures
10. Demonstration on programmable logic control circuit

MODULE 4: ELECTRICAL PRACTICES (10 Hours)

11. Study on basic electrical installation tools, equipment and safety measures
12. Basic electrical wiring and connections such as soldering, fuses, earthing, miniature circuit breakers and switch wiring
13. Hands-on session of electrical connections for lightings, fans, calling bells etc
14. Hands-on session of electrical connections for motors and uninterruptible power supply

MODULE 5: ELECTRONICS AND EMBEDDED SYSTEMS (8 Hours)

15. Electronic components, equipment and safety measures
16. Interfacing of sensors and actuator with microcontrollers (Arduino)
17. Integration of electronic circuits with IoT system
18. Interfacing of components with printed circuit board

MODULE 6: ARTIFICIAL INTELLIGENCE (4 Hours)

19. Demonstration on artificial intelligence technologies
20. Demonstration on AR/VR technologies

MODULE 7: INTERDISCIPLINARY PROTOTYPE CHALLENGE (10 Hours)

21. Students work in teams to develop and demonstrate an interdisciplinary product/prototype for the problem identified

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** 60 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. Mikell P. Groover, "Fundamentals of Modern Manufacturing: Materials, Processes and Systems", 7th Edition, Wiley, 2020
2. Simon Monk, "Programming Arduino: Getting Started with Sketches", 3rd Edition, McGraw-Hill Education, 2022
3. Richard H. Barnett, "Introduction to Mechatronics and Measurement Systems", 6th Edition, McGraw-Hill Education, 2023
4. Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things", Apress, 2016

REFERENCES:

1. Arduino Documentation – https://www.arduino.cc
2. Tinkercad Learning Portal – https://www.tinkercad.com
3. FreeCAD Documentation – https://www.freecad.org
4. Ultimaker Cura Resources – https://ultimaker.com/software/ultimaker-cura
5. ESP32 Documentation – https://docs.espressif.com

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SEMESTER I

U25RCSG03	C Programming Laboratory (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: ESC				
		L	T	P	J	C
		0	0	2	0	1

QP PATTERN: A

COURSE OBJECTIVES:

- To provide hands-on experience in problem solving and structured programming using the C programming language
- To develop programming skills using control structures, arrays, strings, functions, pointers, and dynamic memory management techniques
- To enable students to design and implement applications using user-defined data types and file handling concepts for real-world problems

COURSE OUTCOMES:

CO 1:	Demonstrate problem-solving techniques, algorithms, flowcharts, and basic C programming constructs in program development	**Apply**
CO 2:	Develop C programs using input/output operations, decision-making statements, and iterative constructs	**Apply**
CO 3:	Demonstrate the use of arrays and strings for data processing and manipulation	**Apply**
CO 4:	Develop modular applications using functions, recursion, pointers, and dynamic memory management techniques	**Apply**
CO 5:	Develop applications using structures, unions, storage classes, and file handling operations for data management	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	1	-	-	-	-	-	-	1	-	-
CO 2	3	2	2	1	-	-	-	-	-	-	1	-	-
CO 3	3	2	2	1	-	-	-	-	-	-	1	-	-
CO 4	3	2	2	1	-	-	-	-	-	-	1	-	-
CO 5	3	2	2	1	-	-	-	-	-	-	1	-	-

LIST OF EXPERIMENTS

1. Design and implementation of algorithms, flowcharts, and pseudo code for basic problem-solving applications
2. Development of C programs demonstrating data types, operators, and formatted input/output operations
3. Implementation of decision-making applications using conditional statements and switch-case constructs
4. Development of iterative applications using looping and loop control statements
5. Design and implementation of console-based applications for real-world mathematical and logical problem solving
6. Implementation of one-dimensional array operations for searching, sorting, and statistical analysis
7. Development of matrix manipulation applications using two-dimensional arrays
8. Design and implementation of string processing applications using standard string handling functions
9. Development of modular applications using user-defined functions and recursive techniques

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10. Implementation of applications demonstrating parameter passing mechanisms using call by value and call by reference
11. Development of applications using pointers, pointer arithmetic, and array-pointer relationships
12. Implementation of dynamic memory management applications using malloc(), calloc(), realloc(), and free()
13. Design and implementation of applications using structures, nested structures, unions, and storage classes
14. Development of file processing applications using text and binary file operations in C
15. Implementation of command-line and console-based applications integrating functions, pointers, structures, and file management concepts for real-world use cases

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 30 Periods

REFERENCES:

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson Education, 2015
2. Reema Thareja, "Computer Fundamentals and Programming in C", 3rd Edition, Oxford University Press, 2023
3. Yashavant Kanetkar, "Let Us C", 17th Edition, BPB Publications, 2023
4. Byron Gottfried, "Programming with C", 4th Edition, Schaum's Outline Series, McGraw Hill Education

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SEMESTER I

		Category: MNC				
U25RMNC01	Induction Program (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	L	T	P	J	C
		3 Weeks				0

GUIDELINES:

Students come with diverse thoughts, backgrounds and preparations. It is important to assist them adjust in the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Keeping the above thought in mind AICTE proposes a 3-week induction program for the UG students entering the institution before the commencement of normal classes which will start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, set a healthy daily routine, create bonding in the batch as well as between faculty, develop awareness, sensitivity and understanding of the self, society at large, and nature The following are the activities under the induction program in which the student should be fully and actively engaged throughout the entire duration of the program. Physical Activity: To inculcate team spirit, competitiveness, group cohesion and bonding as well as physical & mental health, physical activities like team sports, yoga, physical exercises should be conducted daily during early morning & evening. Activities like gardening may also be encouraged. Creative Arts: Every student should choose one skill related to arts /visual arts/ performing arts like painting, sculpture, pottery, music, dance etc. to develop a sense of aesthetics and also to enhance creativity The student should pursue it daily for the duration of the program. Universal Human Values: Universal Human Values module will help the student to explore oneself and experience the joy of learning, stand up to peer pressure, take decisions with courage, create awareness about the relationship with colleagues and supporting staff in the hostel and department, etc. Literary: Literary activity would encompass reading, writing and possibly, debating, enacting a play etc. Proficiency Modules: To establish the command over skills like English, a computer familiarity etc. these modules can be taught earlier so that when norm

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 0 Periods

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SEMESTER I

		Category: MCC				
U25RMCC01	Universal Human Values (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the significance of universal human values and their role in complementing technical, intellectual, and professional skills for holistic development.
- To apply a holistic perspective in addressing personal, societal, professional, and environmental challenges through ethical and value-based approaches.
- To demonstrate responsible citizenship, professional ethics, mutual respect, and sustainable practices that contribute positively to society, industry, and the environment.

COURSE OUTCOMES:

CO 1:	Explain the significance of Universal Human Values and self-exploration in developing a holistic perspective, enabling students to harmonize technical competence with ethical responsibility and value-based living.	**Understand**
CO 2:	Differentiate the needs of the Self and the Body, and apply self-exploration to develop healthy habits, value-based decision-making, and holistic well-being.	**Understand**
CO 3:	Explain the concepts of natural acceptance, competence, and respect, and apply them to foster harmonious relationships, resolve social conflicts, promote value education for children, and develop holistic perspectives for societal development.	**Understand**
CO 4:	Demonstrate an understanding of the interconnectedness of existence and integrate holistic perspectives into academic, professional, and societal contexts.	**Apply**
CO 5:	Apply human values and professional knowledge to promote sustainable development, family harmony, societal well-being, and responsible participation in nature.	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	3	3	-	-	-	3	-	-
CO 2	-	-	-	-	-	3	3	3	-	-	3	-	-
CO 3	-	-	-	-	-	3	3	-	-	-	3	-	-
CO 4	-	-	-	-	-	3	3	-	-	-	3	-	-
CO 5	-	-	-	-	-	3	3	3	-	-	3	-	-

SYLLABUS:

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UNIT I: INTRODUCTION TO VALUE EDUCATION 9

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) – Understanding Value Education – Self-exploration as the Process for Value Education – Continuous Happiness and Prosperity – the Basic Human Aspirations – Happiness and Prosperity: Current Scenario – Method to Fulfil the Basic Human Aspirations. Self-Exploration Activity Topics: Sharing about Oneself – Exploring Human Consciousness

UNIT II: HARMONY IN THE HUMAN BEING 9

Understanding Human being as the Co-existence of the Self and the Body – Distinguishing between the Needs of the Self and the Body – The Body as an Instrument of the Self – Understanding Harmony in the Self – Harmony of the Self with the Body – Programme to ensure self-regulation and Health. Self-Exploration Activity Topics: Exploring the difference of Needs of Self and Body – Exploring Sources of Imagination in the Self – Exploring Harmony of Self with the Body

UNIT III: HARMONY IN THE FAMILY AND SOCIETY 9

Harmony in the Family – the Basic Unit of Human Interaction – 'Trust': the Foundational Value in Relationship – 'Respect': as the Right Evaluation – Other Feelings, Justice in Human-to-Human Relationship – Understanding Harmony in the Society – Vision for the Universal Human Order. Self-Exploration Activity Topics: Exploring the Feeling of Trust – Exploring the Feeling of Respect – Exploring Systems to fulfil Human Goal

UNIT IV: HARMONY IN THE NATURE/EXISTENCE 9

Understanding Harmony in the Nature – Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders – Realizing Existence as Co-existence at All Levels – The Holistic Perception of Harmony in Existence. Self-Exploration Activity Topics: Exploring the Four Orders of Nature – Exploring Co-existence in Existence

UNIT V: HARMONY ON PROFESSIONAL ETHICS : HOLISTIC UNDERSTANDING 9

Natural Acceptance of Human Values – Definitiveness of (Ethical) Human Conduct – A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order – Competence in Professional Ethics – Holistic Technologies, Production Systems and Management Models: Typical Case Studies – Strategies for Transition towards Value-based Life and Profession. Self-Exploration Activity Topics: Exploring Natural Acceptance – Exploring Ethical Human Conduct – Exploring Humanistic Models in Education – Exploring Steps of Transition towards Universal Human Order

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. R R Gaur, R. Asthana, G P Bagaria, "A Foundation course in Human Values and Professional Ethics", 3rd Edition, Excel Books, New Delhi, 2024. ISBN 978-93-87034- 47-1
2. Prof. K. V. Subba Raju, "Success Secrets for Engineering Students", Smart Student Publications, 3rd Edition, 2013.
3. R R Gaur, R Asthana, G P Bagaria, "Teachers Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCES:

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1. Ivan IIlich, "Energy & Equity", The Trinity Press, Worcester, and HarperCollins, USA, 1974.
2. E. F. Schumancher, "Small is Beautiful: a study of economics as if people mattered.", Blond & Briggs, Britain, 1973.
3. A Nagraj, "Jeevan Vidya ek Parichay", Divya Path Sansthan, Amarkantak, 1998.

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SEMESTER I

U25RMCC02	தமிழர் மரபு / Heritage of Tamils (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

QP PATTERN: A

COURSE OBJECTIVES:

- Learn the extensive literature of classical Tamil
- Review the fine arts heritage of Tamil culture
- Realize the contribution of Tamils in Indian freedom struggle

COURSE OUTCOMES:

CO 1: Understand the extensive literature of Tamil and its classical nature — Understand

CO 2: Understand the heritage of sculpture, painting and musical instruments of ancient people — Understand

CO 3: Review on folk and martial arts of Tamil people — Understand

CO 4: Realization of Thinai concepts, trade and victory of Chozha dynasty — Understand

CO 5: Understand the contribution of Tamils in Indian freedom struggle, Self-esteem movement and siddha medicine — Understand

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 2	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 3	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 4	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 5	-	-	-	-	-	-	3	3	-	2	-	-	-

SYLLABUS:

UNIT I: LANGUAGE AND LITERATURE 3

Language Families in India - Dravidian Languages – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature – Management Principles in Thirukural – Tamil Epics and Impact of Buddhism & Jainism in Tamil Land – Bakthi Literature Azhwars and Nayanmars – Forms of minor Poetry – Development of Modern literature in Tamil – Contribution of Bharathiyar and Bharathidhasan

UNIT II: HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Hero stone to modern sculpture – Bronze icons – Tribes and their handicrafts – Art of temple car making – Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments – Mridhangam, Parai, Veenai, Yazh and Nadhaswaram – Role of Temples in Social and Economic Life of Tamils

UNIT III: FOLK AND MARTIAL ARTS 3

Tattooing, basket weaving,Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance – Sports and Games of Tamils

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UNIT IV: THINAI CONCEPT OF TAMILS **3**

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram Concept of Tamils – Education and Literacy during Sangam Age – Ancient Cities and Ports of Sangam Age – Export and Import during Sangam Age – Overseas Conquest of Cholas

UNIT V: CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE **3**

Contribution of Tamils to Indian Freedom Struggle – The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement – Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 15 Periods

TEXTBOOKS:

1. Jayanthi Ravikrishna K, Heritage of Tamils, Sri Krishna publications, First Edition, 2023
2. S. Priyadharshini, Heritage of Tamils, V. K. Publications

REFERENCES:

1. தமிழக வரலாறும் மக்களும் பண்பாடும் - கே. கே. பிள்ளை, உலகத் தமிழாராய்ச்சி நிறுவனம் (International Institute of Tamil Studies), C.P.T கேம்பஸ், சென்னை.
2. கணினித் தமிழ் - மு0னவர். இல. சுந்தரம், விகடன் பிரசுரம், அண்ணொ சொ0ல, .சன்0ன, திசம்பர் 2016
3. கீழடி - 0வ0க நதிக்க0ரயில் சங்ககொல நகர நொகரிகம், .தொல்லியல் து0றை .வளியீடு, தமிழ்நொடு அரசு, .சன்0ன, ஆறைாம் பதிப்பு 2020
4. Social Life of Tamils, Dr. K. K. Pillay, A joint publication of TNTB & ESC and RMRL (in print) University of Madras, Chennai, Second Edition 1975
5. The Contributions of the Tamils to Indian Culture, Dr.M.Valarmathi, International Institute of Tamil Studies, C.I.T Campus, Tharamani, Chennai, First Edition 1995

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SEMESTER I & II

		Category: MCC				
U25RMCC04	Environmental Governance and Sustainability (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	L	T	P	J	C
		2	0	0	0	2

QP PATTERN: A

COURSE OBJECTIVES:

- To provide basic concepts of ecosystem, biodiversity, atmospheric and hydrological processes
- To inculcate knowledge on the lithosphere, waste management practices, environmental laws and disaster management strategies
- To apply the principles of sustainable living and green technologies in alignment with the UN Sustainable Development Goals

COURSE OUTCOMES:

CO 1: Explain the role of biodiversity conservation and wildlife protection in addressing environmental issues **Understand**

CO 2: Apply pollution control methods, environmental laws, and water management practices for environmental protection **Apply**

CO 3: Implement sustainable waste management practices for efficient resource utilization **Apply**

CO 4: Explain the role of disaster management, governance, and IT tools in environmental and health sustainability **Understand**

CO 5: Employ sustainable practices and national environmental initiatives for sustainable development **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	3	2	-	1	-	1	-	-
CO 2	2	1	-	-	-	3	2	-	1	-	1	-	-
CO 3	2	1	-	-	-	3	2	-	1	-	1	-	-
CO 4	2	1	-	-	-	3	2	-	1	-	1	-	-
CO 5	3	1	-	-	-	3	2	-	1	-	1	-	-

SYLLABUS:

UNIT I: ENVIRONMENT AND BIODIVERSITY 6

Scope of Environmental Science – Ecology – Ecosystem – Classification, structure, productivity – Energy flow and nutrient cycles – Nitrogen cycle – Ecological succession – Biodiversity – Types and values of biodiversity – Biodiversity at Global, National and Local Levels – Bio-geographical Classification of India – India as a Mega-diversity Nation – Red Data Book – Hotspots of Indian Biodiversity – Endangered and endemic species – Conservation of biodiversity

Self - Learning & Case Studies – Species conservation projects in India – Species Reintroduction – National Biodiversity Action Plan 2015 – Role of International Union for Conservation of Nature (IUCN)

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UNIT II: ATOMSPHERE AND HYDROSPEHERE 6

Atmosphere – Structure and composition – Earth's Albedo – Carbon cycle and oxygen cycle – Air Quality Standards – Air Pollution – Sources, effects and control measures – Indian Environmental Laws – Air Act 1981. Hydrosphere – Hydrosphere – Hydrological Cycle, Water Quality Parameters, Water Pollution – Sources, effects, and control measures - Water conservation – Rainwater harvesting, Dams, and watershed Management – Wastewater treatment, Ocean acidification, Blue economy, Water Act, 1974 and Environment Protection Act, 1986

Self - Learning & Case Studies – Clean Development Mechanism (CDM) – Greenhouse Gas Protocol – ISO 14064 – Jal Shakti Abhiyan – Implementation of CNG in NCT of Delhi – Taj Trapezium Case – Narmada River – Sardar Sarovar Project

UNIT III: LITHOSPHERE AND SOLID WASTE MANAGEMENT 6

Lithosphere – Structure of the lithosphere – Continental drift – Forest resources – Deforestation – Causes and effects – Agriculture – Effects of modern agriculture – Soil Pollution – Causes, effects and control measures. Solid Waste Management – Solid Waste – Sources, classification, and effects , Waste reduction strategies – Circular Economy and 5R Principles, Solid waste treatment, Disposal techniques, Refuse-Derived Fuel and Waste-to-Energy technologies,Biomedical, E-Waste and Hazardous waste management, Resource recovery – Environmental Standards and Waste Management Regulations (ISO 14001 and Waste Rules)

Self - Learning & Case Studies – Solid Waste Management rules, 2024 – Plastic Waste Management Rules (PWMR) – Degradation of Soil in Rajasthan – Indore's Waste Management System

UNIT IV: GLOBAL ISSUES, HUMAN WELFARE AND ROLE OF TECHNOLOGY 6

EIA- Concepts, stages – Land clearing projects – Environmental and social Impacts, Resettlement and Rehabilitation – Concepts and challenges – Disaster management – Floods, Landslides, Disaster management cycle and mitigation – Environmental Governance, Global Governance and Fundamental Human Rights – Importance. Human Population – Population growth, explosion and its challenges – Trends and variation among nations – Role of IT – Remote sensing, GIS and Google earth engine – Disease tracking and prediction using big data and AI (e.g., COVID-19 apps)

Self - Learning & Case Studies – Mission Amrit Sarovar – Beti Bachao Beti Padhao mission – Kerala Flood (2018) – Sterlite Copper Plant Case – Thoothukudi

UNIT V: SUSTAINABLE DEVELOPMENT AND GREEN PRACTICES 6

Sustainable Development – Concept, significance of sustainability – UN Sustainable Development Goals (UN SDGs) – Sustainability assessment – Carbon footprint, accounting, Carbon Neutrality – Net Zero Emissions – Carrying Capacity of the Earth – Carbon Sequestration and Carbon Capture – Blue Carbon and Green Carbon. Green Practices – Sustainable Agriculture – Green Energy – Biofuels, Green Hydrogen, Solar, wind and biomass Energy – Sustainable Transport – Electric Vehicles (EVs)

Self - Learning & Case Studies – National Solar Mission, Green India Mission – Ambikapur, Chhattisgarh – Zero Waste Model – Delhi Metro – Energy Efficiency and Sustainable Transport

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 30 Periods

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TEXTBOOKS:

1. E. Bharucha, "Environmental Studies for Undergraduate Courses", 2nd edition, Hyderabad, University Press (India) Pvt. Ltd, 2005
2. R. Rajagopalan, "Environmental Studies: From Crisis to Cure", 3rd edition, New Delhi, Oxford University Press, 2016
3. R. R. Hiremath, "Sustainable Development", 1st edition, New Delhi, Himalaya Publishing House, 2008

REFERENCES:

1. Anubha Kaushik and C.P. Kaushik, "Environmental Studies" 6th edition, New Age International Publishers, New Delhi, 2018
2. Benny Joseph, "Environmental Studies", 3rd edition, New Delhi, McGraw Hill Education, 2017
3. M. Anji Reddy, "Textbook of Environmental Science and Technology", 3rd edition,BS Publications, 2019
4. R. B. Singh, "Disaster Management", 1st edition, New Delhi, Rawat Publications, 2006
5. .V. Desai, "Environment and Sustainable Development" 1st edition, Mumbai, Himalaya Publishing House, 2009

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SEMESTER I

U25RMCC06	Professional Skill Development - I (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: MCC				
		L	T	P	J	C
		15 Hours				1

COURSE OUTCOMES:

CO 1: Demonstrate technical skill competency through attainment of industry-relevant certifications, participation in competitions, internships, and project-based learning activities — **Apply**

CO 2: Apply research, innovation, and problem-solving skills to develop impactful solutions through projects, publications, patents, and higher education preparation — **Apply**

CO 3: Exhibit leadership, ethical responsibility, community engagement, and professional digital presence to enhance career readiness and lifelong learning — **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	1	3	1	-	-	2	2	-	-	-
CO 2	3	2	2	1	2	2	-	-	1	1	-	-	-
CO 3	3	2	2	1	-	2	2	3	3	3	2	-	-

GUIDLINES:

- Certifications and Skill Credentials - Free awareness certs, NPTEL/Coursera, Associate-level, Professional-level, Expert-level
- Competitions, Hackathons, and Technical Challenges - Online, institution, state, national, international competitions and hackathons, Kaggle medals
- GATE Preparation and Performance - Study plan, mock tests, registration, appearing, score percentile
- Academic, Industry, and Innovation Projects - Mini-projects, intermediate projects, industry-grade deployed projects, funded or published projects
- Internships and Industrial Training - Virtual, on-site short, core role, CoE on-campus, PPO, PPO converted to offer
- Research Publications, Patents, Intellectual Property - Reading journals, survey papers, conference papers, Scopus/WoS, Q1/Q2 journals, patents from provisional to granted
- Leadership, Community, Digital Presence - Club membership, event roles, office bearer, president, outreach, LinkedIn, GitHub, portfolio, Google Scholar

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 0 Periods

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SEMESTER II

		Category: HSMC				
		L	T	P	J	C
U25REN201	Professional Communication - II (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	2	0	2	0	3

QP PATTERN: C

COURSE OBJECTIVES:

- To strengthen advanced communication and interpersonal skills required for academic and professional success
- To integrate AI-enabled communication tools for content creation, presentations and professional documentation
- To prepare students for modern workplace communication in global and digital environments

COURSE OUTCOMES:

CO 1:	Apply advanced verbal, written and digital communication strategies in professional contexts	**Apply**
CO 2:	Analyze technical information and produce effective workplace documents	**Analyze**
CO 3:	Demonstrate negotiation, leadership and collaborative communication skills	**Understand**
CO 4:	Deliver impactful technical presentations and communicate innovative ideas effectively	**Apply**
CO 5:	Utilize AI-assisted communication tools ethically for professional growth and workplace productivity	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 2	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 3	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 4	-	-	-	-	-	-	-	2	3	-	1	-	-
CO 5	-	-	-	-	-	-	-	2	3	-	1	-	-

SYLLABUS:

UNIT I: TECHNICAL WRITING AND DOCUMENTATION **6 + 6**

Technical Reports - Proposal Writing - Meeting Agenda and Minutes - Technical Instructions and Process Description - AI-assisted Technical Documentation - Technical Vocabulary

UNIT II: COGNITIVE PROFESSIONALISM **6 + 6**

Critical Thinking Strategies - Problem-solving Communication - Case Study - Brainstorming Techniques - Collaborative Decision Making - One-word Substitutions

UNIT III: CAREER PLANNING **6 + 6**

Self-Assessment Techniques - SWOT Analysis - Goal Setting - AI-assisted Documentation - Digital Content Writing - Collocations

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UNIT IV: CORPORATE COMMUNICATION AND NETWORKING **6 + 6**

Public Speaking - Welcome Address - Vote of Thanks - Anchoring and Event Hosting - Audience Engagement - Cloze tests - Discourse markers - linkers and cohesive devices

UNIT V: CRITICAL THINKING AND COLLABORATIVE PROBLEM SOLVING **6 + 6**

Problem-solving Techniques - Mind Mapping - Negotiation Skills - Book Review / Film Review - Podcast and Media Analysis - Critical Reading - Group Discussion

LIST OF EXPERIMENTS

1. Public Speaking
2. Group Discussion
3. Case Study
4. Blog Writing
5. Mind Mapping

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. Ashraf Rizvi, Effective Technical Communication, 3rd Edition, McGraw Hill Education, 2023
2. Meenakshi Raman & Sangeeta Sharma, Technical Communication: Principles and Practice, 4th Edition, Oxford University Press, 2023
3. Sanjay Kumar & Pushp Lata, Communication Skills, 3rd Edition, Oxford University Press, New Delhi, 2018

REFERENCES:

1. Stephen E. Lucas, The Art of Public Speaking, 14th Edition, McGraw Hill Education, New York, 2023
2. Dale Carnegie, The Quick and Easy Way to Effective Speaking, Updated Edition, Simon & Schuster, New York, 2019
3. Matt Abrahams, Think Faster, Talk Smarter: How to Speak Successfully When You're Put on the Spot, Simon & Schuster, New York, 2024

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SEMESTER II

		Category: BSC				
U25RMA202	Linear Algebra and Complex Variables (Common to BM, EC, EV)	L	T	P	J	C
		3	0	2	0	4

QP PATTERN: A

COURSE OBJECTIVES:

- To introduce the concepts of linear algebra and complex analysis relevant to engineering systems
- To impart in-depth theoretical concepts of matrix methods and complex techniques in solving engineering problems
- To develop analytical skills for modeling and analyzing engineering systems using linear algebra and complex variables

COURSE OUTCOMES:

CO 1:	Apply matrix operations and eigenvalue analysis to engineering systems	**Apply**
CO 2:	Apply the vector spaces and linear transformations in engineering contexts	**Apply**
CO 3:	Apply Gaussian elimination, Gauss–Jordan elimination and LU decomposition methods in solving systems of equations	**Apply**
CO 4:	Utilize complex variables and analytic functions in solving engineering problems	**Apply**
CO 5:	Apply complex integration and residue techniques in mathematical analysis	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	-	-	2	-	-	-	1	-	1	-	-
CO 2	3	2	-	-	2	-	-	-	1	-	1	-	-
CO 3	3	2	-	-	2	-	-	-	1	-	1	-	-
CO 4	3	2	-	-	2	-	-	-	1	-	1	-	-
CO 5	3	2	-	-	2	-	-	-	1	-	1	-	-

SYLLABUS:

UNIT I: SYSTEMS OF LINEAR EQUATIONS **9 + 6**

Systems of linear equations – Gaussian elimination method – Gauss–Jordan elimination method – LU decomposition method – Consistency of linear systems and rank of a matrix

UNIT II: VECTOR SPACES **9 + 6**

Definition and examples of vector spaces – Subspaces – Linear independence – Basis and dimension of vector spaces – Linear transformations and matrix representation

UNIT III: EIGENVALUES AND EIGENVECTORS **9 + 6**

Eigenvalues and eigenvectors – Characteristic equation – Diagonalization of matrices – Cayley–Hamilton theorem – Applications of eigenvalues and eigenvectors

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UNIT IV: COMPLEX VARIABLES AND FUNCTIONS **9 + 6**

Complex numbers – Functions of a complex variable – Analytic functions – Cauchy–Riemann equations – Bilinear Transformation – Conformal mapping– Harmonic functions

UNIT V: COMPLEX INTEGRATION **9 + 6**

Complex integration – Cauchy's Integral theorem – Cauchy's Integral formula – Singular points – Classification of Singularities (Removable, Pole, Essential) – Laurent's series expansion – Residues and Cauchy's-Residue theorem

LIST OF EXPERIMENTS

1. Systems of Linear Equations – Solve systems of linear equations using Gauss–Jordan method – Implement LU decomposition method
2. Vector Space Computations – Determine linear independence and basis of vectors – Compute dimension and rank of matrices
3. Eigenvalue Analysis – Compute eigenvalues and eigenvectors of matrices – Perform diagonalization of matrix
4. Complex Variables and Functions – Verify Cauchy–Riemann equations for analytic functions – Bi-linear transformation for complex functions
5. Complex Integration – Expand functions using Laurent series – Compute residue integrals for complex functions

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 75 Periods

TEXTBOOKS:

1. Howard Anton, Chris Rorres, Anton Haul "Elementary Linear Algebra", Wiley India, New Delhi, 2019
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt Ltd, New Delhi, 2018

REFERENCES:

1. David C. Lay, Linear Algebra and Its Applications, 5th Edition, Pearson Education, 2015
2. Gilbert Strang, Introduction to Linear Algebra, 5th Edition, Wellesley Cambridge Press, 2016
3. Dennis G. Zill and Patrick D. Shanahan, A First Course in Complex Analysis with Applications, 3rd Edition, Jones & Bartlett Learning, 2011
4. James Ward Brown and Ruel V. Churchill, Complex Variables and Applications, 9th Edition, McGraw-Hill Education, 2013

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Learn Beyond

SEMESTER II

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		Category: BSC				
U25RPH04	Material Science for Electronics Engineering	L	T	P	J	C
		2	0	0	0	2

QP PATTERN: A

COURSE OBJECTIVES:

- To provide fundamental knowledge of engineering materials and their electrical, thermal, optical, and dielectric properties for electronic and communication applications
- To introduce emerging functional materials, nanoelectronic devices, and sensor materials used in modern technologies such as IoT, robotics, and flexible electronics
- To familiarize students with advanced materials and their applications in chip technology, antennas, medical electronics, and next-generation nanoelectronic systems

COURSE OUTCOMES:

CO 1:	Select suitable engineering materials based on their properties for electronic and communication devices	**Apply**
CO 2:	Utilize the properties of optoelectronic and emerging materials in flexible electronics and power device applications	**Apply**
CO 3:	Apply the concepts of transistors, charge transport, spintronics, and nanoelectronic systems in chip technologies	**Apply**
CO 4:	Identify appropriate sensor materials for temperature, pressure, motion and light sensing applications in robotics, IoT and automation systems	**Apply**
CO 5:	Apply the principles of advanced functional materials in nanoelectronics, antennas, and medical electronic applications	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	1	-	-	-	-	-	-	-	-	-	1	-
CO 2	3	1	-	-	-	-	-	-	-	-	-	1	-
CO 3	3	2	1	-	-	-	-	-	-	-	-	1	-
CO 4	3	2	1	-	-	-	-	-	-	-	-	1	-
CO 5	3	2	1	-	-	-	-	-	-	-	-	-	1

SYLLABUS:

UNIT I: CLASSIFICATION OF MATERIALS 6

Conductors, semiconductors, and insulators – Material Categories: ceramics, polymers, and composites – Electrical, dielectric, thermal, and optical properties for communication devices – Material selection for ICs, PCBs, antennas, sensors, and high – Frequency components

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UNIT II: OPTOELECTRONIC AND EMERGING MATERIALS 6

TCO – NLO – LED – Photodetectors (Si, InGaAs) – Emerging Materials & Applications – 2D materials (graphene, TMDCs) for flexible electronics – Wide-bandgap semiconductors (SiC, GaN) for power devices

UNIT III: TRANSISTOR AND CHIPS 6

Overview of transistors – Charge transport and electronic band structures – Semiconductor doping, charge hopping, excitation, and quantum tunnelling – Spintronics fundamentals and spin-based devices in chip technology – Nano electronic systems – Tunnel FETs

UNIT IV: MATERIALS FOR SENSORS AND APPLICATIONS 6

Piezoelectric materials – Pyroelectric materials – Electroactive polymers – Magneto-resistive and shape memory alloys – Applications of sensors in temperature, pressure, motion, and light detection in robotics – IoT and automation

UNIT V: ADVANCED FUNCTIONAL MATERIALS 6

0D, 1D, 2D materials and its application in nano electronics – Materials for Antennas – High-conductivity metals and composites for traditional designs – Flexible conductive polymers – Biomaterials – biocompatibility, polymers nanocomposites used in medical electronics

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 30 Periods

TEXTBOOKS:

1. William D. Callister, Jr, David G. Rethwisch, "Materials Science and Engineering An Introduction", 10th edition,Wiley, 2017
2. Balasubramanian K, "Smart Materials and Sensors for Industrial Applications", IK International, 2016

REFERENCES:

1. R. P. Rana, S. K. Arya, "Electronic Materials and Processes", 5th edition, S. K. Kataria & Sons, New Delhi, 2020
2. V. K. Khanna, "Nanoelectronics: Devices and Circuits", 1st edition, McGraw Hill Education, New Delhi, 2020
3. D. K. Bhattacharya, "Sensors and Transducers", 2nd edition, New Age International, 2020
4. D. K. Bhattacharya, "Biomaterials and Medical Electronics", 1st edition, New Age International, 2023
5. https://nptel.ac.in/courses/117102056
6. https://nptel.ac.in/courses/112106302

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Learn Beyond

SEMESTER I & II

U25RCY01	Engineering Chemistry (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: BSC				
		L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To introduce the fundamentals, properties, industrial applications of polymeric materials and advanced energy storage devices
- To impart knowledge about corrosion prevention, surface treatment methods and nanomaterials
- To provide a basic understanding of semiconductor materials, microelectronics, quantum, computational chemistry and their applications

COURSE OUTCOMES:

CO 1:	Apply the concepts of polymer materials and their properties in solving industrial and technological challenges	**Apply**
CO 2:	Interpret the performance of batteries, solar cells, and supercapacitors for their effective energy storage applications	**Apply**
CO 3:	Utilize suitable corrosion prevention methods, surface treatment techniques and nanomaterials for industrial requirements	**Apply**
CO 4:	Apply suitable semiconductor materials, microfabrication processes and display technologies for specific applications	**Apply**
CO 5:	Utilize quantum chemistry principles and AI-assisted techniques to model, visualize, and predict material properties	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	-	1	-	-	1	1	-	1	-	-
CO 2	3	2	1	-	1	-	-	1	1	-	1	-	-
CO 3	3	2	1	-	1	-	-	1	1	-	1	-	-
CO 4	3	2	1	-	1	-	-	1	1	-	1	-	-
CO 5	3	2	1	-	1	-	-	1	1	-	1	-	-

SYLLABUS:

UNIT I: POLYMERIC MATERIALS **6 + 6**

Polymers – Introduction – Compounding – Compression, Injection – Smart Polymers – Temperature responsive (PNIPAM), pH responsive (PAA), Light responsive (Azobenzene), 3D Printable (PLA), flexible and wearable polymers (PDMS – E-skin, RFID) – Conductive Polymers (PEDOT) – Synthesis, working and applications – Biopolymers – Classification, PEG, Alginate Hydrogel – Synthesis and applications

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UNIT II: ENERGY CONVERSION AND STORAGE **6 + 6**

Batteries – Classification, $LiFePO_4$ – Construction, working and applications – Fuel Cells – Proton Exchange Membrane(PEM), Solid Oxide Fuel Cells (SOFC) – Green Hydrogen – Classification, production method, electrolysis – Organic photovoltaics – P3HT and PCBM – Working and applications – Solar Cells – Dye-Sensitized Solar Cells (DSSC), Supercapacitors – Electrostatic Double Layer– Working and application

UNIT III: CORROSION AND NANO SCIENCE **6 + 6**

Types of corrosion – Factors influencing corrosion – Cathodic protection, Coatings – Galvanization, Epoxy, Polyurethane, Enamel, Superhydrophobic coatings – Process and applications. Surface treatments – Carburizing, Nitriding, Cyaniding – Process and applications. Nanomaterials – Introduction, 0D (Quantum dots), 1D (nanowire, nanorods and carbon nanotubes) 2D nanomaterials (MoS2), Size effects and quantum confinement, Synthesis – Laser ablation and Chemical Vapour Deposition (CVD), Various applications of nanomaterials

UNIT IV: SEMICONDUCTOR AND DISPLAY TECHNOLOGY **6 + 6**

Semiconductors – Perfluoropentacene, GaN – Characteristics and applications, Neuromorphic Materials – Phase-Change Memory and Memristors – Working and applications – Liquid Crystal Displays, OLED, QLED – Working and applications – Wafer Manufacturing – Purification – Czochralski and Float Zone methods – Photolithography and microfabrication

UNIT V: QUANTUM AND COMPUTATIONAL CHEMISTRY **6 + 6**

Quantum Chemistry – Basics, quantum numbers, shapes of atomic orbitals, Molecular Orbital Theory – (H_2, O_2, N_2), Schrödinger equation (Derivation) – Qubits and Quantum Memory, Computational Chemistry – Molecular modeling – Basic Computational Methods – Software tools – iGemdock, Chem draw, Molview, Jmol – Introduction to AI and its role in the field of Chemistry

LIST OF EXPERIMENTS

1. Estimate the viscosity of a given polymer solution using an Ostwald viscometer and determine molecular weight of the given polymer
2. Synthesis of a polymer (Bakelite / polyaniline (PANI) and assess the physical properties of the polymer
3. Potentiometric determination and comparative study of EMF in different solutions
4. Determine maximum wavelength of absorption of a given solution to verify Beer's Law and to find unknown concentration of the given sample by Spectrophotometry / Colorimetry
5. Determination of corrosion rate of Iron and its prevention by electroplating / electroless plating
6. Synthesis of ZnO / TiO_2 / Ag nanoparticles and study of their photocatalytic degradation of Methylene Blue dye
7. Recovery of Copper from waste Printed Circuit Boards (PCBs) and quantitative determination of copper content
8. Measurement of electrical conductivity of solutions using a conductometric Sensor
9. Perform molecular docking using freely available online software to investigate the binding affinity a ligand with the protein
10. Construct the 2D structure of a given compound and generate its 3D molecular model using computational tools for visualization and structural analysis

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. Wiley India Pvt. Ltd., "Engineering Chemistry", 2nd edition, Wiley India Pvt. Ltd., New Delhi, 2013
2. S.S. Dara and S.S. Umare, "A Textbook of Engineering Chemistry", 12th edition, Chand Publishing, New Delhi, 2024

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3. R.V. Gadag and A. Nityananda Shetty, "Engineering Chemistry", 3rd edition, I.K. International Publishing House, New Delhi, 2014

REFERENCES:

1. Fred W Billmeyer, "Textbook of Polymer Science", 4th edition, John Wiley & Sons, New York, 1999
2. Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen and Jack E. Lemons, "Biomaterials Science: An Introduction to Materials in Medicine", 4th edition, Academic Press, London, 2020
3. Kirby W Beard, Linden's "Handbook of Batteries", 5th edition, McGraw Hill, New York, 2019
4. John Larminie and Andrew Dicks, "Fuel Cell Systems Explained", 3rd edition, John Wiley & Sons, Chichester, 2012
5. Fontana M. G., "Corrosion Engineering", 3rd edition, McGraw-Hill Book Company, New York, 1986
6. V. Raghavan, "Materials Science and Engineering: A First Course", 6th edition, Prentice Hall of India, New Delhi, 2015
7. M.F. Ashby and D.R.H. Jones, "Engineering Materials" 2: An Introduction to Microstructures, Processing and Design, 4th edition, Elsevier, UK, 2012
8. Ira N Levine, "Quantum Chemistry", 7th edition, Pearson, Boston, 2013

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SEMESTER II

U25RCSG04	Python Programming (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: ESC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To introduce the fundamental concepts of Python programming, including syntax, data types, operators, and input/output operations
- To develop problem-solving skills through the use of control structures, functions, recursion, and modular programming techniques
- To provide proficiency in Python collections, file handling, exception handling, and program organization using modules and packages
- To familiarize students with basic object-oriented programming concepts and the use of Python libraries for data analysis applications

COURSE OUTCOMES:

CO 1:	Use Python programming fundamentals, data types, operators, input/output operations, and debugging techniques to develop basic programs	**Apply**
CO 2:	Solve computational problems using conditional statements, iterative statements, functions, and recursion in Python	**Apply**
CO 3:	Implement string processing and Python collections such as lists, tuples, sets, and dictionaries to solve computational problems	**Apply**
CO 4:	Choose suitable modules, file handling, and exception handling mechanisms for Python applications	**Apply**
CO 5:	Demonstrate object-oriented programming concepts and NumPy and Pandas features for basic data analysis applications	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	1	-	-	-	-	-	-	-	-	-
CO 2	3	3	2	1	-	-	-	-	-	-	2	-	-
CO 3	3	3	2	1	-	-	-	-	-	-	2	-	-
CO 4	3	2	2	1	-	-	-	-	-	-	2	-	-
CO 5	3	2	2	1	1	-	-	-	-	-	2	-	-

SYLLABUS:

UNIT I: PYTHON FUNDAMENTALS 9

Introduction to Python – Features and Applications of Python – Installing Python – Python Interpreter – Script and Interactive Modes – Identifiers and Keywords – Variables – Data Types – Type Conversion – Operators and Expressions – Input and Output Operations – Comments and Documentation – Error Types – Testing and Debugging Basics

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UNIT II: CONTROL STRUCTURES AND FUNCTIONS 9

Conditional Statements – Nested Conditional Statements – Iterative Statements: while Loop and for Loop – Loop Control Statements – Functions – Function Definition and Invocation – Function Arguments and Return Values – Scope of Variables – Recursive Functions – Applications of Functions in Problem Solving

UNIT III: STRINGS AND PYTHON COLLECTIONS 9

Strings and String Operations – Lists and List Operations – List Comprehensions – Tuples and Tuple Operations – Sets and Set Operations – Dictionaries and Dictionary Operations – Packing and Unpacking

UNIT IV: FILE HANDLING, MODULES AND EXCEPTION HANDLING 9

Modules and Packages – Importing Modules – Built-in Functions – File Handling – Opening and Closing Files – Reading and Writing Files – File Methods – Exception Handling – try, except, else and finally Blocks – User Defined Exceptions

UNIT V: OBJECT-ORIENTED PROGRAMMING AND DATA ANALYSIS 9

Classes and Objects – Creating Classes and Objects – Constructors – Instance Variables and Methods – Introduction to NumPy – Creating Arrays – Array Operations – Indexing and Slicing – Introduction to Pandas – Series and DataFrames – Reading and Displaying Data – Simple Data Analysis Applications.

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Reema Thareja, "Python programming: Using problem solving approach", 1st Edition, Oxford Press, 2017
2. William McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, 2nd Edition, Shroff/O'Reilly Publication, 2017

REFERENCES:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
2. Ashok Namdev Kamthane and Amit Ashok Kamthane, "Programming and Problem Solving with Python", 2nd Edition, McGrawHill Education, 2018
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", 1st Edition, Pearson India Education Services Pvt. Ltd., 2016

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SEMESTER II

U25REC201	Circuit Analysis	Category: PCC				
		L	T	P	J	C
		3	1	0	0	4

QP PATTERN: A

COURSE OBJECTIVES:

- To learn the basic concepts and different methods of circuit analysis
- To understand the concept of network theorems and transient response
- To study the basic concepts of resonance circuits and two port network parameters

COURSE OUTCOMES:

CO 1:	Solve the given circuits using mesh current, node voltage methods and network topology	**Apply**
CO 2:	Apply network theorems to solve complex networks	**Apply**
CO 3:	Analyze the transient and steady state response of RL, RC and RLC circuits	**Analyze**
CO 4:	Interpret the behavior of resonance and coupled circuits	**Understand**
CO 5:	Determine the two port network parameters and their relationship	**Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	-	-	-	-	-	-	-	-	-	-
CO 2	3	2	1	-	-	-	-	-	-	-	-	-	-
CO 3	3	3	2	-	-	-	-	-	-	-	-	-	-
CO 4	2	1	-	-	-	-	-	-	-	-	-	-	-
CO 5	2	1	-	-	-	-	-	-	-	-	-	-	-

SYLLABUS:

UNIT I: FUNDAMENTALS OF CIRCUITS AND NETWORK TOPOLOGY **9 + 3**

Introduction – Mesh current and node voltage methods of analysis for DC circuits – Network terminology – Incidence and reduced incidence matrices – Trees – Cutsets – Fundamental cutsets and Tie sets

UNIT II: NETWORK THEOREMS **9 + 3**

Network theorems for DC circuits – Superposition theorem, Thevenin's theorem, Norton's theorem, reciprocity theorem, maximum power transfer theorem, Millman's theorem

UNIT III: TRANSIENT ANALYSIS **9 + 3**

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

UNIT IV: RESONANCE AND COUPLED CIRCUITS **9 + 3**

Series and Parallel resonance – Variation of impedance and current with frequency, bandwidth, Q-factor, selectivity – Coupled circuits – Self-inductance, mutual inductance, dot rule, coefficient of coupling

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UNIT V: NETWORK PARAMETERS **9 + 3**

Network parameters – Z-parameters, Y-parameters, transmission (ABCD) parameters, hybrid parameters – Parameter conversions, Interconnection of two-port networks – Symmetry and Reciprocity

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** 15 Periods **Practical:** - Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. William H. Hayt, Jr. Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", 8th edition, McGraw Hill, 2018
2. Joseph Edminister and Mahmood Nahvi, "Electric Circuits", Schaum's Outline Series, 5th edition,Tata McGraw Hill, New Delhi, 2018

REFERENCES:

1. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", 6th edition, McGraw Hill, 2019
2. A.Bruce Carlson, "Circuits: Engineering Concepts and Analysis of Linear Electric Circuits", 2nd edition, 2017
3. Sudhakar.A and Shyammohan S Palli, "Circuits and Networks: Analysis and Synthesis", 5th edition, McGraw Hill, 2015
4. Allan H.Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", 5th edition, Cengage Learning, 2013

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SEMESTER I & II

U25RECG02	Electronic Devices and Circuits (Common to EC, EV)	Category: PCC				
		L	T	P	J	C
		3	0	2	0	4

QP PATTERN: A

COURSE OBJECTIVES:

- To learn the fundamentals of semiconductor devices
- To familiarize the application of diode and transistor
- To analyze the performance of transistor amplifier

COURSE OUTCOMES:

CO 1:	Explain the fundamentals of semiconductor devices	**Understand**
CO 2:	Construct electronic circuits using the PN junction diode for various applications	**Apply**
CO 3:	Demonstrate the input and output characteristics of BJT and JFET	**Apply**
CO 4:	Apply suitable biasing methods for amplifier	**Apply**
CO 5:	Analyze the frequency response of CE amplifier	**Analyze**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	-	-	-	1	1	-
CO 2	3	2	1	1	1	-	-	2	2	-	1	1	-
CO 3	3	2	1	1	1	-	-	2	2	-	1	1	-
CO 4	3	2	1	1	-	-	-	2	2	-	1	1	-
CO 5	3	3	2	2	1	-	-	2	2	-	1	1	-

SYLLABUS:

UNIT I: SEMICONDUCTOR FUNDAMENTALS **9 + 6**

Introduction to semiconductors – Energy band theory – Carrier concentration in intrinsic and extrinsic semiconductors – Law of mass-action – Conductivity of semiconductors – Drift and diffusion current – Temperature effects – PN junction diode – Zener diode – Carrier lifetime

UNIT II: DIODES AND ITS APPLICATIONS **9 + 6**

Rectifiers – Half wave and full wave rectifier circuits – L,C ,LC and CLC filters – Voltage regulators – Positive and Negative Clippers – Clampers – LED, Photodiode

UNIT III: BJT AND FET **9 + 6**

Construction and operation of NPN and PNP Transistors – CE, CB and CC configurations – Input and output characteristics – Early effect – JFET construction, operation and characteristics – Enhancement and depletion MOSFETs – Characteristics of MOSFET

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UNIT IV: BIASING AND COMPENSATION TECHNIQUES **9 + 6**

DC and AC load line – Bias stabilization – Fixed bias, Collector to base bias, voltage divider bias –Stability factor – Bias compensation using diode, thermistor and sensistor

UNIT V: FREQUENCY ANALYSIS OF BJT AMPLIFIERS **9 + 6**

h-parameter model –re model – Hybrid π model – Small signal analysis of CE amplifier – Fre-quency response – Miller effect – High frequency analysis of CE amplifier

LIST OF EXPERIMENTS

1. VI characteristics of PN diode and Zener diode
2. Applications of PN diode and Zener diode
3. Characteristics of BJT and JFET
4. Frequency response of CE and CS amplifiers using simulation tool
5. Design of wave shaping circuits using simulation tool
6. Design of DC regulator power supply using simulation tool
7. Characteristics of MOSFET using simulation tool

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 75 Periods

TEXTBOOKS:

1. Donald A Neaman, "Semiconductor Physics and Devices", 4th edition, Tata McGraw–Hill Inc. 2012
2. S. Salivahanan, N.Sureshkumar, A. Vallavaraj, "Electronic Devices and Circuits", 3rd edition, Tata McGraw–Hill Inc., 2010

REFERENCES:

1. Yang, "Fundamentals of Semiconductor devices", 1st edition, McGraw Hill International, 2017
2. Jacob Millman, Christos C Halkias, Satyabrata Jit, "Electronic Devices and Circuits", 4th edition, McGraw Hill India, 2015
3. Robert Boylestad and Louis Nashelsky, "Electron Devices and Circuit Theory", 11th edition, Pearson Prentice Hall, 2014
4. R.S.Sedha, "A Text Book of Applied Electronics", 3rd edition, S. Chand Publications, 2006

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SEMESTER II

U25RCSG06	Python Programming Laboratory (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: ESC				
		L	T	P	J	C
		0	0	2	0	1

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the fundamental concepts of Python programming and problem-solving using Python language constructs
- To apply control structures, functions, strings, and Python collections for developing efficient applications
- To develop modular applications using file handling, exception handling, modules, and packages.
- To implement basic object-oriented programming concepts and utilize Python libraries for data analysis applications

COURSE OUTCOMES:

CO 1:	Implement Python programs using basic language constructs, data types, operators, and input/output operations	**Apply**
CO 2:	Develop Python programs using decision-making statements, looping constructs, functions, and recursion	**Apply**
CO 3:	Implement applications using strings, lists, tuples, sets, and dictionaries for data processing and problem solving	**Apply**
CO 4:	Develop modular applications using file handling, exception handling, modules, and packages	**Apply**
CO 5:	Design applications using basic object-oriented programming concepts and Python libraries such as NumPy and Pandas	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	1	-	-	-	-	-	-	-	-	-
CO 2	3	2	1	1	-	-	-	-	-	-	-	-	-
CO 3	3	2	1	1	-	-	-	-	-	-	1	-	-
CO 4	3	2	1	1	-	-	-	-	-	-	1	-	-
CO 5	3	2	1	1	-	-	-	-	-	-	1	-	-

LIST OF EXPERIMENTS

1. Development of Python programs demonstrating variables, data types, operators, and input/output operations
2. Implementation of applications using conditional statements and nested conditional constructs
3. Development of iterative applications using for loops, while loops, and loop control statements
4. Design and implementation of console-based applications for mathematical and logical problem solving
5. Development of applications using user-defined functions and recursive functions
6. Implementation of string processing applications using Python string operations and methods
7. Development of applications using lists, tuples, sets, and dictionaries
8. Implementation of applications using list comprehensions and collection-based problem solving
9. Development of modular applications using built-in and user-defined modules
10. Implementation of file handling applications for reading, writing, and appending data

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11. Development of robust applications using exception handling and user-defined exceptions
12. Design and implementation of applications using classes, objects, constructors, and instance methods
13. Development of applications demonstrating inheritance and method overriding
14. Implementation of numerical computing applications using NumPy arrays and array operations
15. Development of simple data analysis applications using Pandas Series and DataFrames

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 30 Periods

REFERENCES:

1. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd Edition, O'Reilly Media, 2016
2. Ashok Namdev Kamthane and Amit Ashok Kamthane, Programming and Problem Solving with Python, 2nd Edition, McGraw Hill Education, 2018

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SEMESTER I & II

U25RMCC03	Design Thinking (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: MCC				
		L	T	P	J	C
		1	0	2	0	2

QP PATTERN: A

COURSE OBJECTIVES:

- To Understand the basics of Design Thinking, its principles, processes, and tools used
- To empathize with stakeholders and frame problems using structured tools and techniques
- To generate ideas and present solutions effectively using design tools

COURSE OUTCOMES:

CO 1:	Explain purpose and features of design thinking process	**Understand**
CO 2:	Use required tools to empathize with the stockholders to identify the problem	**Apply**
CO 3:	Comment the identified problem elaborately and clearly	**Apply**
CO 4:	Develop a conceptual solution for a societal problem	**Apply**
CO 5:	Present the identified solution to all the stakeholders	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	1	1	-	1	1	2	-	-
CO 2	2	1	-	-	-	1	1	-	1	1	2	-	-
CO 3	2	1	1	-	-	1	1	3	1	1	2	-	-
CO 4	3	3	2	-	-	1	1	3	1	1	2	-	-
CO 5	3	2	-	-	-	1	1	3	3	1	2	-	-

SYLLABUS:

UNIT I: FUNDAMENTALS OF DESIGN THINKING **5 + 10**

Introduction to Design Thinking: Definition, relevance, and applications – Design The Thinking – Personal Visualization, The Wheel of Life, and Balancing Priorities – Understanding and appreciating the concept of 'Design' – The 3 Laws of Design Thinking

UNIT II: THE EMPHATHIZE AND DEFINE STAGE **5 + 10**

Understanding Stakeholders – Role of Empathy in Design Thinking – Tools: Persona, Journey Mapping, Stakeholder Mapping, CATWOE, Cartographic Perspective (L0), and Empathy Map – Case Study. Problem Framing and Reframing – Role of a Design Thinker – Tools: Five Whys, Anti-Pattern, Problem Paraphrasing, Introduction to LORD Skillset – Case Study

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UNIT III: THE DIVERGENCE AND CONVERGENCE AND COMMUNICATION STAGE **5 + 10**

Ideation through Divergent and Convergent Thinking – Tools: Brainstorming, 10gm – 100gm–1000gm. Presenting Design Outcomes – Tools: 4Cs Framework – Case Study

LIST OF EXPERIMENTS

1. Design a solution for a societal problem that can be in line with sustainable development, thrust areas, industrial problems etc. under various themes like Health & Wellness: MedTech, Biotech, and HealthTech Agriculture & Rural: Agriculture, FoodTech, and Rural Development Green Energy: Renewable/Sustainable Energy and Clean and Green Technology Advanced Tech: Blockchain and Cyber Security, Robotics and Drones, and Space Technology Smart Infrastructure: Smart Automation, Smart Education, Smart Vehicles, Transportation and Logistics Daily Utility & Leisure: Fitness and Sports, Tourism, Disaster Management, Games, and Toys Sustainability & Smart Cities: waste-to-wealth, disaster management, or digital twin models for resource management

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Tim Brown, "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", 1st edition, New York, HarperCollins Publishers Ltd, New York, 2018
2. Idris Mootee, "Design Thinking for Strategic Innovation", 1st edition, John Wiley & Sons Inc, 2013

REFERENCES:

1. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press, 2009
2. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011
3. Liedtka , Andrew King, Kevin Bennett , Book – "Solving Problems with Design Thinking – Ten Stories of What Works", Columbia Business School Publishing, 2013
4. Maurício Vianna, Ysmar Vianna, Isabel K. Adler, Brenda Lucena, Beatriz Russo, "Design thinking: Business Innovation", MJV Press, 2011
5. Burgelman, Christensen, and Wheelwright, "Strategic Management of Technology and Innovation", 5th Edition, McGraw Hill Publications, 2017

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SEMESTER II

U25RMCC05	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: MCC				
		L	T	P	J	C
		1	0	0	0	1

QP PATTERN: A

COURSE OBJECTIVES:

- To learn weaving, ceramic and construction technology of Tamils
- To understand the agriculture, irrigation and manufacturing technology of Tamils
- To realize the development of scientific Tamil and Tamil computing

COURSE OUTCOMES:

CO 1:	Understand the weaving and ceramic technology of ancient Tamil people nature	**Understand**
CO 2:	Understand the construction technology, building materials in Sangam period and case studies	**Understand**
CO 3:	Infer the metal process, coin and beads manufacturing with relevant archeological evidence	**Understand**
CO 4:	Realize the agriculture methods, irrigation technology and pearl diving	**Understand**
CO 5:	Apply the knowledge of scientific Tamil and Tamil computing	**Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 2	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 3	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 4	-	-	-	-	-	-	3	3	-	2	-	-	-
CO 5	-	-	-	-	-	-	3	3	-	2	-	-	-

SYLLABUS:

UNIT I: WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries

UNIT II: DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram – Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places – Temples of Nayaka Period – Type study (Madurai Meenakshi Temple) – Thirumalai Nayakar Mahal – Chetti Nadu Houses, Indo-Saracenic architecture at Madras during British Period

UNIT III: MANUFACTURING TECHNOLOGY 3

Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel, Copper and gold – Coins as source of history – Minting of Coins – Bead-making industries – Stone beads – Glass beads – Terracotta beads – Shell beads/ bone beats – Archeological evidences – Gem stone types described in Silappathikaram

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UNIT IV: AGRICULTURE AND IRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society

UNIT V: SCIENTIFIC TAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil – The role of journals in the development of scientific Tamil – Scientific Tamil vocabulary – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project

CONTACT PERIODS:

Lecture: 15 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 15 Periods

TEXTBOOKS:

1. Tamils and Technology, K. Jayanthi Ravikrishna, Sri Krishna publications, Mahalakshmi Nagar, Velappanchavadi, First Edition 2023
2. Tamils and Technology, S. Priyadharshini, V. K. Publications

REFERENCES:

1. The Contributions of the Tamils to Indian Culture, Dr. M. Valarmathi, International Institute of Tamil Studies, C.I.T Campus, Tharamani, Chennai, First Edition 1995
2. Studies in the History of India with Special Reference to Tamil Nadu, Dr. K. K. Pillay, 1979

SEMESTER II

U25RMCC07	Professional Skill Development - II (Common to AD, AM, BM, CB, CE, CH, CS, EC, EE, EV, IT, ME, MI, SC)	Category: MCC				
		L	T	P	J	C
		15 Hours				1

COURSE OUTCOMES:

CO 1: Demonstrate technical skill competency through attainment of industry-relevant certifications, participation in competitions, internships, and project-based learning activities — **Apply**

CO 2: Apply research, innovation, and problem-solving skills to develop impactful solutions through projects, publications, patents, and higher education preparation — **Apply**

CO 3: Exhibit leadership, ethical responsibility, community engagement, and professional digital presence to enhance career readiness and lifelong learning — **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	-	3	1	-	-	2	2	-	-	-
CO 2	2	3	3	3	2	2	-	-	1	1	-	-	-
CO 3	-	-	3	-	-	2	2	3	3	3	2	-	-

GUIDLINES:

- Certifications and Skill Credentials - Free awareness certs, NPTEL/Coursera, Associate-level, Professional-level, Expert-level
- Competitions, Hackathons, and Technical Challenges - Online, institution, state, national, international competitions and hackathons, Kaggle medals
- GATE Preparation and Performance - Study plan, mock tests, registration, appearing, score percentile
- Academic, Industry, and Innovation Projects - Mini-projects, intermediate projects, industry-grade deployed projects, funded or published projects
- Internships and Industrial Training - Virtual, on-site short, core role, CoE on-campus, PPO, PPO converted to offer
- Research Publications, Patents, Intellectual Property - Reading journals, survey papers, conference papers, Scopus/WoS, Q1/Q2 journals, patents from provisional to granted
- Leadership, Community, Digital Presence - Club membership, event roles, office bearer, president, outreach, LinkedIn, GitHub, portfolio, Google Scholar

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 0 Periods

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Learn Beyond

SEMESTER III

		Category: BSC				
U25MA302	Probability and Statistics (Common to BM, CE, CH, EC, EE, ME, MI)	L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

PRE-REQUISITES:

- U25MA101 - Calculus and Differential Equations / U25RMA101 - Multivariable Calculus and Applications

COURSE OBJECTIVES:

- To introduce the fundamental concepts of probability and statistics relevant to engineering
- To facilitate with students, use their understanding of statistical methods for data analysis and inference in their areas of study
- To develop probabilistic models to handle uncertainty and charts to check for quality control in engineering systems

COURSE OUTCOMES:

CO 1: Explain the fundamental concepts of probability and examine discrete probability distributions — **Understand**

CO 2: Apply suitable continuous distributions, such as uniform, exponential and normal to interpret and analyse statistical data — **Apply**

CO 3: Calculate and evaluate covariance and correlation to examine the relationship between two random variables using pairs of random variables — **Apply**

CO 4: Determine the estimation theory of parameters, testing of hypotheses for means and apply the Chi-square test for attribute independence — **Apply**

CO 5: Perform analysis of variances to compare the means of multiple samples and apply control charts to check for quality control — **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	1	-	-	-	-	-	-	-	-
CO 2	3	2	-	-	2	-	-	-	-	-	-	-	-
CO 3	3	2	-	-	2	-	-	-	-	-	-	-	-
CO 4	3	2	-	-	2	-	-	-	-	-	-	-	-
CO 5	3	2	-	-	2	-	-	-	-	-	-	-	-

SYLLABUS:

UNIT I: ONE-DIMENSIONAL DISCRETE RANDOM VARIABLES — **6 + 6**

Probability – Conditional probability, independence – Baye's theorem – Discrete random variables, probability mass functions – Cumulative distribution functions – Mean and variance – Binomial, Poisson and geometric distributions

UNIT II: ONE-DIMENSIONAL CONTINUOUS RANDOM VARIABLES — **6 + 6**

Continuous random variables – Probability density functions – Cumulative distribution functions – Mean and variance – Uniform, exponential, normal distributions

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UNIT III: TWO-DIMENSIONAL PROBABILITY DISTRIBUTIONS **6 + 6**

Two dimensional discrete and continuous random variables – Marginal probability distributions – Independence – Covariance – Correlation

UNIT IV: INFERENTIAL STATISTICS **6 + 6**

Estimation - Point estimation – Interval estimation – Hypothesis testing – Hypotheses concerning means – Large, small samples - Chi square test for independence of attributes

UNIT V: ANOVA AND STATISTICAL QUALITY CONTROL **6 + 6**

Analysis of variance – Completely randomized designs – Randomized block designs – Control charts for measurements ($\bar{X}$, R charts) – Control charts for attributes (p, np)

LIST OF EXPERIMENTS

1. One-Dimensional Discrete Random Variables – Mean and Variance of discrete RVs. – Discrete Probability distributions
2. One-Dimensional Continuous Random Variables – Mean and Variance of Continuous RVs. – Continuous Probability distributions
3. Two- Dimensional Probability Distributions – Marginal Probability distributions – Covariance and Correlation
4. Inferential Statistics – Estimation theory – Testing of hypotheses
5. ANOVA and SQC – Analysis of Variance. – Control charts ($\bar{X}$, R, p, np)

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. Douglas C. Montgomery and George C. Runger, "Applied Statistics and Probability for Engineers", Wiley, 2018
2. Richard A. Johnson, "Miller & Freund's Probability and Statistics for Engineers", Pearson Education, New Delhi, 2017

REFERENCES:

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, "Probability & Statistics for Engineers & Scientists, Pearson Education, New Delhi, 2016
2. Jay L. Devore, "Probability and Statistics for Engineering and the Sciences", Cengage Learning, NewDelhi 2020
3. Sheldon M Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Academic press, USA, 2020
4. Robert V. Hogg, Elliot Tanis and Dale Zimmerman, "Probability and Statistical Inference", Pearson Education, USA, 2014

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SEMESTER III

		Category: PCC				
U25EC301	Signals and Systems	L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the basic properties of signals and systems
- To apply various transforms to continuous time and discrete time signals
- To apply Laplace transform to LTI continuous time systems and Z transform to LTI discrete time systems

COURSE OUTCOMES:

CO 1:	Classify continuous-time and discrete-time signals and systems based on their fundamental properties	**Understand**
CO 2:	Compute Fourier series, Fourier and Laplace transforms of continuous time signals	**Apply**
CO 3:	Analyze linear time-invariant continuous-time systems using convolution and Laplace transform to obtain system responses	**Analyze**
CO 4:	Determine Fourier transform and Z-transform of discrete time signals	**Apply**
CO 5:	Examine linear time-invariant discrete-time systems using convolution and Z-transform to determine system responses	**Analyze**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	-	-	-	1	-	-
CO 2	3	2	1	-	-	-	-	-	-	-	1	-	-
CO 3	3	3	2	-	-	-	-	-	-	-	1	-	-
CO 4	3	2	1	-	-	-	-	-	-	-	1	-	-
CO 5	3	3	2	-	-	-	-	-	-	-	1	-	-

SYLLABUS:

UNIT I: CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Introduction – Standard signals – Operations on signal – Classification of continuous time (CT) and discrete time (DT) signals – Periodic and aperiodic signal, odd and even signal, energy and power signal, deterministic and random signal, causal and non-casual signal – Classification of CT and DT systems – Linear and non-linear, static and dynamic, time variant and time invariant, causal and non-causal, stable and unstable

UNIT II: REPRESENTATION OF CONTINUOUS TIME SIGNALS 9

Fourier series representation – Trigonometric Fourier series – Exponential Fourier Series- Continuous time Fourier transform (CTFT) – Properties – Inverse continuous time Fourier transform – Laplace transform – properties – Inverse Laplace transform

UNIT III: LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS 9

Introduction to LTI-CT system – Convolution integral – Properties – CT system analysis using Laplace transform – Impulse and step response – Interconnection of CT systems

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UNIT IV: REPRESENTATION OF DISCRETE TIME SIGNALS **9**

Baseband signal sampling – Applications – Discrete time Fourier transform (DTFT) – Properties – Frequency response – Z transform – Properties – Inverse Z transform

UNIT V: LINEAR TIME INVARIANT DISCRETE TIME SYSTEMS **9**

Introduction to LTI-DT system – Pole-zero plot – Stability – Convolution sum – Properties – DT system analysis using Z transform – Impulse and step response – Interconnection of DT systems

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", 2nd edition, Pearson, 2015
2. Simon Haykin, Barry Van Veen, "Signals and Systems", 2nd Edition, Wiley, 2002
3. John Alan Stuller, "An Introduction to Signals and Systems", Thomson, 2007

REFERENCES:

1. Michael J. Roberts, "Fundamentals of Signals and Systems", 2nd edition, Tata McGraw Hill, 2018
2. R.E. Zeimer, W.H. Tranter and R.D. Fannin, "Signals and Systems – Continuous and Discrete", 4th edition, Pearson, 2014
3. H P Hsu, "Signals and Systems", 3rd edition, Tata McGraw Hill, 2014
4. B.P. Lathi,"Principles of Linear Systems and Signals", 2nd edition, Oxford, 2009

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SEMESTER III

		Category: PCC				
U25EC302	Analog Electronics	L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

PRE-REQUISITES:

- U25EC202 - Electronic Devices and Circuits / U25RECG02 - Electronic Devices and Circuits

COURSE OBJECTIVES:

- To learn the fundamentals of multistage amplifiers
- To understand the operation of tuned and power amplifiers
- To study the effects of feedback concept

COURSE OUTCOMES:

CO 1:	Design high gain amplifiers using the concepts of differential and multistage amplifiers	**Apply**
CO 2:	Implement PMOS and NMOS current mirror circuits to generate stable bias currents	**Apply**
CO 3:	Explain the fundamentals of tuned amplifiers and power amplifiers	**Understand**
CO 4:	Apply negative feedback techniques to improve the performance of an amplifier	**Apply**
CO 5:	Analyze the performance of various sinusoidal and non-sinusoidal oscillators	**Analyze**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	-	-	-	-	-	-	-	1	1	-
CO 2	3	2	1	-	-	-	-	-	-	-	1	1	-
CO 3	2	1	-	-	-	-	-	-	-	-	1	1	-
CO 4	3	2	1	-	-	-	-	-	-	-	1	1	-
CO 5	3	3	2	-	-	-	-	-	-	-	1	1	-

SYLLABUS:

UNIT I: HIGH GAIN BJT AMPLIFIERS 9

Differential amplifier – DC transfer characteristics and CMRR – Darlington amplifier – Bootstrap technique – Small signal analysis of cascade and cascode configurations – Multistage frequency effect

UNIT II: MOSFET AMPLIFIERS 9

Low frequency and High frequency analysis of MOSFET amplifier – Current mirror – Current sources – PMOS and NMOS current sources, Cascode current source, Wilson current source – Amplifiers with resistive load, active load and depletion load

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UNIT III: TUNED AMPLIFIERS AND POWER AMPLIFIERS **9**

Single tuned capacitive coupled amplifier, quality factor of a tank circuit, gain and bandwidth – Stagger tuned amplifier – Power amplifiers – classification – Class A power amplifier – Class B power amplifier – Push pull and complementary symmetry configuration – Class AB power amplifier

UNIT IV: FEEDBACK AMPLIFIERS **9**

General feedback structure – Effects of negative feedback – Feedback topologies – Feedback amplifier types and analysis – Voltage-series, voltage-shunt, current-series and current-shunt

UNIT V: OSCILLATORS **9**

Classification of oscillator, Barkhausen criterion – General form of an oscillator, Analysis of LC oscillators – Hartley, Colpitts – Crystal oscillator – Multivibrators – Astable multivibrator – Monostable multivibrator – Bistable multivibrators – UJT relaxation oscillator

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Jacob Millman, Christos C Halkias and Satyabrata Jit, "Electronic Devices and Circuits", 4th edition, McGraw Hill Education India, 2015
2. Donald A Neamen, "Electronic Circuits Analysis and Design", 4th edition, McGraw Hill Education India, 2014

REFERENCES:

1. Adel S. Sedra and Kenneth C. Smith, "Microelectronic Circuits Theory and Applications", 7th edition, Oxford University Press India, 2018
2. David A. Bell, "Electronic Devices and Circuits", 5th edition, Oxford University Press India, 2014
3. Dr.R.S.Sedha, " A Textbook of Applied Electronics", Revised Edition, S.Chand Publishing, 2018
4. Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 10th edition, Pearson Education / PHI, 2008
5. A. Anand Kumar, "Pulse and Digital Circuits", 2nd Edition, PHI Learning, 2008

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SEMESTER III

		Category: PCC				
U25ECG02	Digital System Design (Common to BM, EC)	L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the fundamentals of digital logic circuits
- To design the combinational logic circuits
- To design the synchronous and asynchronous sequential circuits

COURSE OUTCOMES:

CO 1:	Solve Boolean expressions and realize using universal gates	Apply
CO 2:	Design combinational circuits and implement using logic gates	Apply
CO 3:	Develop synchronous sequential circuits using flip-flops	Apply
CO 4:	Design hazard-free asynchronous sequential circuits	Apply
CO 5:	Implement logic functions using programmable memory devices	Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	-	-	-	-	-	-	-	1	1	-
CO 2	3	2	1	-	-	-	-	-	-	-	1	1	-
CO 3	3	2	1	-	-	-	-	-	-	-	1	1	-
CO 4	3	2	1	-	-	-	-	-	-	-	1	1	-
CO 5	3	2	1	-	-	-	-	-	-	-	1	1	-

SYLLABUS:

UNIT I: BOOLEAN THEOREMS AND LOGIC REDUCTION 9

Number system – Complements – Boolean theorems – Codes – Logic gates – NAND and NOR realization– Representation of boolean expression – SOP, POS, canonical form – Simplification of logic functions using K-map, Quine McCluskey method

UNIT II: COMBINATIONAL LOGIC DESIGN 9

Adder-1 Bit adder/subtractor, parallel adder, 2's complement adder/subtractor – Implementation of combinational circuits – Multiplexers,demultiplexers, decoders, encoders – Code converters - Magnitude Comparator – Parity generator and checker

UNIT III: SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Latches and flip-flops – Conversion of flip-flops – Analysis and design of clocked sequential circuits counters – UP/DOWN/ MOD Counter – Shift-registers – Ring and Johnson counter – Finite State Machines design – Mealy and Moore machine – Sequence detector design

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UNIT IV: ASYNCHRONOUS SEQUENTIAL CIRCUITS **9**

Analysis and design of Asynchronous circuit design – Fundamental mode and Pulse mode – Race Conditions – Hazards in Asynchronous Circuits – Hazard-free logic design

UNIT V: LOGIC FAMILIES AND MEMORY DEVICES **9**

Overview of Logic Families – Propagation Delay, Fan-in, Fan-out, Noise Margin – Programmable Logic Devices – Realization of logic functions using PROM, PLA, PAL

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. M.Morris Mano, Michael D Ciletti, "Digital Design", 6th edition, Pearson, 2018
2. Charles H. Roth, Jr, Larry L. Kinney" Fundamentals of logic design",7th edition, Kluwer Academic Publishers,2014

REFERENCES:

1. Thomas L.Floyd, "Digital Fundamentals", 11th edition, Prentice Hall, 2015
2. S. Salivahanan and S. Arivazhagan, "Digital Circuits and Design", 5th Edition, Oxford University Press, India, 2018
3. Ronald J Tocci, Neal S Widmer, Gregory L Moss, "Digital Systems Principles and Applications", 10th edition, Pearson, 2009
4. D. Donald Givone, "Digital Principles and Design", 4th edition, Tata McGraw Hill, 2008

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SEMESTER III

		Category: PCC				
U25EC303	Linear Integrated Circuits	L	T	P	J	C
		2	0	2	0	3

QP PATTERN: A

PRE-REQUISITES:

- U25EC202 - Electronic Devices and Circuits / U25RECG02 - Electronic Devices and Circuits

COURSE OBJECTIVES:

- To study the characteristics of operational amplifier
- To learn different applications of op-amp and timers
- To understand the operation of A/D and D/A converters

COURSE OUTCOMES:

CO 1: Explain the DC and AC characteristics of operational amplifier — **Understand**

CO 2: Implement operational amplifier circuits to perform amplification, signal conditioning, and filtering applications — **Apply**

CO 3: Design waveform generators and voltage regulator — **Apply**

CO 4: Construct IC 555 timer based circuits to generate pulse signals and pulse width modulation — **Apply**

CO 5: Examine the performance of different ADC and DAC conversion techniques — **Analyze**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	2	2	-	1	1	-
CO 2	3	2	1	-	-	-	-	2	2	-	1	1	-
CO 3	3	2	1	-	-	-	-	2	2	-	1	1	-
CO 4	3	2	1	-	-	-	-	2	2	-	1	1	-
CO 5	3	3	2	-	-	-	-	2	2	-	1	1	-

SYLLABUS:

UNIT I: OPERATIONAL AMPLIFIER CHARACTERISTICS — **6 + 6**

Introduction to op-amp – Op-amp internal circuit – DC characteristics – AC characteristics – Frequency compensation

UNIT II: OPERATIONAL AMPLIFIER APPLICATIONS — **6 + 6**

Inverting and non-inverting amplifier – Adder – Subtractor – Instrumentation amplifier – Integrator – Differentiator – Active filter – LPF and HPF

UNIT III: WAVEFORM GENERATORS AND VOLTAGE REGULATORS — **6 + 6**

Comparator – Triangular wave generator – Sine wave oscillators – RC phase shift oscillator – Wein bridge oscillator – IC voltage regulator – Fixed voltage series regulator – Functional diagram of IC723

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UNIT IV: TIMER AND PHASE LOCKED LOOP **6 + 6**

IC 555 timer – Astable and monostable operation – IC 555 timer Application – Pulse width modulation – Basic principles of PLL – Voltage Controlled Oscillator – PLL applications – Frequency multiplier

UNIT V: D/A AND A/D CONVERTERS **6 + 6**

DAC and ADC specifications – D/A conversion techniques – Weighted resistor, R-2R ladder – A/D conversion techniques – Flash, successive approximation and dual slope converters

LIST OF EXPERIMENTS

1. Design and construct inverting and non-inverting amplifiers using op-amp
2. Design and construct integrator using op-amp
3. Design and construct differentiator using op-amp
4. Design and construct active low-pass filter using op-amp
5. Design and construct active high-pass filter using op-amp
6. Generate a sinusoidal waveform generator using op-amp
7. Design and implement voltage regulator using IC 723/78XX
8. Design and implement multivibrator using IC 555 Timer
9. Construct the D/A converter using op-amp

CONTACT PERIODS:

Lecture: 30 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 60 Periods

TEXTBOOKS:

1. D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", 5th edition, New Age International Pvt. Ltd., 2018
2. Ramakant A. Gayakwad, "Op-amps and Linear Integrated Circuits", 4th edition, PHI, 2015

REFERENCES:

1. S.Salivahanan, V.S. Kanchana Bhaskaran, "Linear Integrated Circuits", 4th reprint, Tata Mc Graw-Hill, 2018
2. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", 4th edi-tion, Tata Mc Graw-Hill, 2016
3. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", 5th edition, Wiley Inter-national, 2012
4. Robert F.Coughlin, Frederick F.Driscoll, "Operational Amplifiers and Linear Integrated Circuits", 6th edition, PHI, 2009

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SEMESTER III

		Category: PCC				
U25ADG02	Data Structures and Algorithms (Common to AD, BM, EC, EE, MI)	L	T	P	J	C
		3	0	2	0	4

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the fundamental concepts of ADT and data structure types
- To learn linear and non linear data structures
- To explore tree and graph data structures

COURSE OUTCOMES:

CO 1:	Implement linear data structures such as lists, stacks and queues using array-based and linked-list-based techniques	Apply
CO 2:	Use searching and sorting techniques to solve real-time data organization problems	Apply
CO 3:	Construct tree-based data structures including binary trees, binary search trees and AVL trees to perform efficient data representation, traversal and manipulation	Apply
CO 4:	Use graph representations and graph algorithms to solve problems involving traversal, shortest paths, topological ordering and minimum spanning trees	Apply
CO 5:	Examine the efficiency of algorithms by determining and comparing their time and space complexity	Analyze

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	1	1	-	-	-	-	-	-	-	-
CO 2	3	2	1	1	1	-	-	-	-	-	-	-	-
CO 3	3	2	1	1	1	-	-	-	-	-	-	-	-
CO 4	3	2	1	1	1	-	-	-	-	-	-	-	-
CO 5	3	3	2	2	-	-	-	-	-	-	-	-	-

SYLLABUS:

UNIT I: LINEAR DATA STRUCTURES – LIST, STACKS, QUEUES **9 + 6**

Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list-based implementation – Singly linked lists – Circularly linked lists – Doubly-linked lists – Applications of linked list: Polynomial ADT, Radix sort, Multilist. Stack ADT – Operations – Applications – Symbol balancing - Evaluating arithmetic expressions – Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue – DeQueue – Applications of queues

UNIT II: SEARCHING, SORTING AND HASHING TECHNIQUES **9 + 6**

Searching: Linear Search—Binary Search. Sorting: Bubble sort-Insertion sort-Selection sort- Merge sort - Quick sort. Hashing – Hash Functions – Separate Chaining – Open Addressing –Rehashing – Extendible Hashing

UNIT III: NON-LINEAR DATA STRUCTURES – TREES **9 + 6**

Tree ADT – Tree traversals – Binary Tree ADT – Expression trees – Binary search tree ADT –AVL Trees

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UNIT IV: NON-LINEAR DATA STRUCTURES - GRAPHS **9 + 6**

Introduction to Graph – Types of graph-Representation of graphs – Graph traversal: Breadth-first traversal – Depth-first traversal – Topological ordering –Dijkstra's algorithm- Minimum spanning tree algorithms – Prims algorithm - Kruskal's Algorithm

UNIT V: ALGORITHM ANALYSIS **9 + 6**

Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non recursive algorithms.

LIST OF EXPERIMENTS

1. A small library stores the list of newly arrived books in an array-based structure. The librarian wants to maintain the order of arrival. Given the arrival sequence: "AI Basics", "Data Science", "Python 101", "Algorithms", "Machine Learning", Insert them into an array-based List ADT. A book "Cyber Security" arrives and must be inserted at position 3. Later, "Python 101" is removed as it's damaged. Design the array-based List ADT operations to update the list and display the final order.
2. A hospital needs to maintain a waiting list of patients dynamically as patients arrive and get treated. Insert patients: John, Priya, Abdul, Meera in order. A senior citizen "Ravi" should be added after Priya. "Abdul" leaves before consultation. Using Linked List ADT, show how the list changes after each operation.
3. An airport check-in counter processes passengers using a circular queue system. Passengers arriving in order: P1, P2, P3, P4, P5. The queue size is 4 due to staff shortage. • Enqueue all passengers in order and show how overflow occurs. Two passengers are processed (dequeued). P6 and P7 arrive. Simulate these operations using array-based circular queue and show rear/front updates.
4. A bank uses a linked-list–based queue for serving customers. Customers: A, B, C arrive. Then D arrives. B and C are served. Implement the queue operations and show the dynamic linked list changes.
5. A sports event records running times of participants. The unsorted times are 15.2, 12.8, 20.5, 11.6, 19.3. The coach wants to sort the times to shortlist top performers. Apply Bubble Sort and Insertion Sort separately to sort the timings. Show the status of the list after each pass for both algorithms.
6. An online store wants to quickly sort product prices for discount analysis. Prices are 499, 199, 999, 350, 150, 750. Use Quick Sort (first element as pivot) and show partition steps. Use Merge Sort and show the splitting and merging stages.
7. A college stores roll numbers of students in a system. For a particular exam, the roll numbers are sorted [101, 115, 130, 145, 152, 170, 185]. • Apply Binary Search and show mid calculations for each iteration. Compare it with how Linear Search would behave for the same case. A teacher wants to find whether roll number 152 is present.
8. A company stores employee IDs in a hash table of size 10. Employee IDs: [1001, 1123, 1198, 1455, 1677]. Apply open addressing and closed addressing hashing techniques and show the optimal one.
9. A university stores student scores in a BST for quick rank retrieval. Scores: [75, 60, 90, 45, 65, 85, 95]. Construct the BST. Apply inorder, preorder, and postorder traversal. Later, student scores 45, 65 and 75need removal due to correction. Show the tree after each deletion and state the rule used.
10. A delivery company wants to find the fastest delivery route between warehouses in a city. Given a weighted graph (distances between warehouses): A → B : 4 A → C : 2 B → D : 5 C → B : 1 C → D : 8 D → E : 6 Apply Dijkstra's algorithm starting from A and determine: Shortest path from A to all other warehouses. Distance table update for each step.
11. A telecom company wants to lay cables between cities at minimum cost. The network between cities is modeled as a weighted graph. Apply Prim's algorithm to find the Minimum Spanning Tree and list the edges selected at each step, growing MST, total cost.
12. A power grid network wants to connect electricity stations with minimal wiring cost. The weighted edges between stations are provided. Apply Kruskal's algorithm by sorting edges by weight.

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CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 75 Periods

TEXTBOOKS:

1. Reema Thareja, "Data Structures and Algorithms", 1st edition, Oxford University Press, 2025
2. Ellis Horowitz, Sartaj Sahni,Susan Anderson Freed, "Fundamentals of Data Structures in C", 2nd Edition, Techno Series, 2024

REFERENCES:

1. R. Venkatesan, S. Lovelyn Rose, "Data Structures", 2nd Edition, Wiley, 2019
2. Seymour Lipschutz, "Data Structures", 2nd Edition, McGraw Hill Education, 2017
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D.Ullman, "The Design and Analysis of Computer Algorithms", 1 st Edition, Pearson Education Asia, 2013

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SEMESTER III

		Category: PCC				
U25EC304	Analog Electronics Laboratory	L	T	P	J	C
		0	0	2	2	2

QP PATTERN: A

PRE-REQUISITES:

- U25EC202 - Electronic Devices and Circuits / U25RECG02 - Electronic Devices and Circuits

COURSE OBJECTIVES:

- To design and analyze BJT and MOSFET amplifier circuits
- To analyze and apply feedback amplifier circuits
- To design oscillator, multivibrator, and current mirror circuits

COURSE OUTCOMES:

CO 1:	Apply fundamental concepts of semiconductor devices and analog circuit theory to analyze and design amplifier and oscillator circuits	**Apply**
CO 2:	Build analog amplifier and oscillator circuits to meet specified performance requirements	**Apply**
CO 3:	Examine the system performance against theoretical values using experimental or simulation methods	**Analyze**
CO 4:	Demonstrate individual competency or effective teamwork in designing and implementing the experimental results	**Apply**
CO 5:	Apply ethical standards and present experimental results effectively	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	1	-	-	-	-	-	-	1	1	-
CO 2	3	2	1	1	-	-	-	-	-	-	1	1	-
CO 3	3	3	2	2	2	-	-	2	2	-	1	1	-
CO 4	-	-	-	-	-	-	-	2	-	-	1	1	-
CO 5	-	-	-	-	-	-	2	2	2	-	1	1	-

LIST OF EXPERIMENTS

1. Develop and evaluate Common Emitter amplifier configurations to analyze gain, bandwidth, impedance, and distortion characteristics using SPICE for the given specifications
2. Design and implement Low Pass, High Pass, and Band Pass filters for the given specifications to verify frequency response, gain, roll-off, and attenuation characteristics
3. Construct and evaluate a differential amplifier to measure differential gain and common-mode rejection performance
4. Design and construct a CMOS Common-Source Amplifier using discrete MOSFETs for the given specifications to investigate mid-band gain, bandwidth, and bias stability
5. Implement and evaluate a tuned amplifier to examine resonance behavior, selectivity, and frequency response characteristics

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6. Develop and implement open-loop and closed-loop amplifier configurations to demonstrate gain stabilization and bandwidth improvement
7. Construct and implement a Hartley oscillator for the given specifications to examine frequency stability and sustained sinusoidal oscillations
8. Develop and construct a Colpitts oscillator to analyze oscillation conditions and frequency stability
9. Design and develop a multistage amplifier for the given specifications to assess overall gain, bandwidth, and gain-bandwidth trade-offs
10. Implement and evaluate an astable multivibrator to verify square-wave generation and timing accuracy
11. Design and evaluate an audio amplifier for the given specifications to ensure faithful signal reproduction across the audio band

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** 30 Periods **Total:** 60 Periods

REFERENCES:

1. Jacob Millman, Christos C Halkias and Satyabrata Jit, "Electronic Devices and Circuits", 4th edition, McGraw Hill Education India, 2015

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SEMESTER III

U25ECG03	Digital System Design Laboratory (Common to BM, EC)	Category: PCC				
		L	T	P	J	C
		0	0	2	0	1

QP PATTERN: A

COURSE OBJECTIVES:

- To familiarize students with the fundamental concepts of digital logic, combinational circuits, and sequential circuits
- To enable students to design and implement combinational and sequential digital circuits using fundamental logic gates and digital design principles
- To provide hands-on experience in applying digital design techniques to real-time case studies and practical system implementations

COURSE OUTCOMES:

CO 1:	Apply the fundamental concepts of digital logic to construct and verify basic logic circuits	**Apply**
CO 2:	Analyze the design requirements and implement combinational and sequential circuits	**Analyze**
CO 3:	Examine the behavior of digital circuits through implementation and verification	**Analyze**
CO 4:	Demonstrate individual competency or effective teamwork in designing and implementing the experimental results	**Apply**
CO 5:	Apply ethical standards and present experimental results effectively	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	1	-	-	-	-	-	-	1	1	-
CO 2	3	3	2	2	-	-	-	-	-	-	1	1	-
CO 3	3	3	2	2	-	-	-	2	2	-	1	1	-
CO 4	-	-	-	-	-	-	-	2	-	-	1	1	-
CO 5	-	-	-	-	-	-	2	2	2	-	1	1	-

LIST OF EXPERIMENTS

1. Verify the logical functions of gates
2. Implementation of combinational logic design using MUX IC's
3. Design and implementation of various data path elements (Adder/Subtractor)
4. Design a circuit to convert one code into another using basic logic gates
5. Design and implement a 4-bit even parity generator and checker
6. Verify the logical functions of flip-flop
7. Design and implementation of synchronous sequential circuit (Counters/ Shift registers)
8. Design and implementation of asynchronous mod counters
9. Design a Mealy/Moore sequence detector for detecting the given sequence

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 30 Periods

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REFERENCES:

1. M.Morris Mano, Michael D Ciletti, "Digital Design", 6th edition, Pearson, 2018

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SEMESTER III

		Category: MNC				
U25MNC02	Essence of Indian Traditional Knowledge (Common to all programmes)	L	T	P	J	C
		1	0	0	0	0

QP PATTERN: A

COURSE OBJECTIVES:

- Understand the Concept of culture in ancient, medieval and modern period.
- Know the need and importance of Indian languages and Literature.
- Understand the various religion and philosophy in various periods.

COURSE OUTCOMES:

CO 1:	Understand Philosophy of Indian culture	**Understand**
CO 2:	Distinguish the Indian languages and literature.	**Understand**
CO 3:	Learn the philosophy of ancient, medieval and modern Indian	**Remember**
CO 4:	Acquire the information about the fine arts in India	**Apply**
CO 5:	Know the contribution of scientists different eras	**Understand**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	2	-	1	-	-	3	-	-	-	-	-	-
CO 2	-	2	-	1	-	-	3	-	-	-	-	-	-
CO 3	-	2	-	1	-	-	3	-	-	-	-	-	-
CO 4	-	2	-	-	-	-	-	-	-	-	-	-	-
CO 5	-	2	-	1	-	-	3	-	-	-	-	-	-

SYLLABUS:

UNIT I: INTRODUCTION TO CULTURE 5

Culture, Civilization, Culture and heritage, General characteristics of culture, Importance of culture inhuman literature, Indian culture, Ancient India, Medieval India, Modern India

UNIT II: INDIAN LANGUAGES AND LITERATURE 5

Indian Languages and Literature-I: The role of Sanskrit, Significance of scriptures to current society, Indian philosophies, other Sanskrit literature, Literature of south India Indian Languages and Literature-II: Northern Indian Languages & literature, Temples and Temple types, Sculptors 's specialties, Temples Individualities Festivals and hopes

UNIT III: RELIGION AND PHILOSOPHY 5

Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (Selected Movements only)

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UNIT IV: ARTS, SCIENCE, TECHNOLOGY& ENGINEERING IN INDIA 5

Indian painting, Handicrafts, Music, Divisions of Indian classical music, Modern Indian music, Dance and drama, Indian architecture (ancient, medieval and modern), Science and technology in India, Development of science in different periods, Sushruta and Charaka, sages of South India, herbal treatments, Surgery methods of healers, Yoga and pranayama practices, Herbal usages and medication-making methods.

UNIT V: EDUCATION SYSTEM IN INDIA 5

Education in ancient, Medieval and modern India, Aims of education, subjects, languages, science and scientists of Ancient India, Medieval India and Modern India

CONTACT PERIODS:

Lecture: 25 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 25 Periods

TEXTBOOKS:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375, 2005.
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN: 978-8187276333, 2007.

REFERENCES:

1. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989.
2. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN: 9788120810990, 2014.
3. S. Narain, "Examinations in Ancient India", Arya Book Depot, 1993.
4. NCERT, "Position Paper on Arts, Music, Dance and Theatre", 2000.
5. B. Kumar Mohanta & Vipin Kumar Singh, "Traditional Knowledge System and Technology in India", 2012.

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SEMESTER III

U25RMCC08	Professional Skill Development - III (Common to all programmes)	Category: MCC				
		L	T	P	J	C
		15 Hours				1

COURSE OUTCOMES:

CO 1: Demonstrate technical skill competency through attainment of industry-relevant certifications, participation in competitions, internships, and project-based learning activities **Apply**

CO 2: Apply research, innovation, and problem-solving skills to develop impactful solutions through projects, publications, patents, and higher education preparation **Apply**

CO 3: Exhibit leadership, ethical responsibility, community engagement, and professional digital presence to enhance career readiness and lifelong learning **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	-	3	1	-	-	2	2	-	-	-
CO 2	2	3	3	2	2	2	-	-	1	1	-	-	-
CO 3	-	-	3	-	-	2	2	3	3	3	2	-	-

GUIDLINES:

- Certifications and Skill Credentials - Free awareness certs, NPTEL/Coursera, Associate-level, Professional-level, Expert-level
- Competitions, Hackathons, and Technical Challenges - Online, institution, state, national, international competitions and hackathons, Kaggle medals
- GATE Preparation and Performance - Study plan, mock tests, registration, appearing, score percentile
- Academic, Industry, and Innovation Projects - Mini-projects, intermediate projects, industry-grade deployed projects, funded or published projects
- Internships and Industrial Training - Virtual, on-site short, core role, CoE on-campus, PPO, PPO converted to offer
- Research Publications, Patents, Intellectual Property - Reading journals, survey papers, conference papers, Scopus/WoS, Q1/Q2 journals, patents from provisional to granted
- Leadership, Community, Digital Presence - Club membership, event roles, office bearer, president, outreach, LinkedIn, GitHub, portfolio, Google Scholar

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 0 Periods

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SEMESTER IV

		Category: PCC				
U25EC401	Analog and Digital Communication	L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

PRE-REQUISITES:

- U25EC202 - Electronic Devices and Circuits / U25RECG02 - Electronic Devices and Circuits

COURSE OBJECTIVES:

- To understand the fundamentals of analog modulation systems
- To learn information theory concepts and digital modulation techniques
- To apply error control coding for reliable communication

COURSE OUTCOMES:

CO 1: Explain the concept of amplitude modulation schemes, power relations and the noise performance of DSB-SC — **Understand**

CO 2: Illustrate the principle of angle modulation schemes and the noise performance in FM system — **Understand**

CO 3: Analyze various source encoding techniques, waveform coding methods, effects of ISI and its remedial measures in baseband transmission — **Analyze**

CO 4: Compare the performance of various digital modulation schemes — **Analyze**

CO 5: Apply suitable error control coding technique for error detection and correction — **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	-	-	-	1	-	2
CO 2	2	1	-	-	-	-	-	-	-	-	1	-	2
CO 3	3	3	2	-	-	-	-	-	-	-	1	-	2
CO 4	2	1	-	-	-	-	-	-	-	-	1	-	2
CO 5	3	2	1	-	-	-	-	-	-	-	1	-	2

SYLLABUS:

UNIT I: AMPLITUDE MODULATION — 9

Elements of communication system – Need for modulation – Classification of amplitude modulation – Time and frequency representations, power relations – Generation and detection of DSB-SC – AM transmitter– Superheterodyne receiver – Noise performance in DSB-SC system

UNIT II: ANGLE MODULATION — 9

Time representation of frequency and phase modulations – Narrowband FM and wideband FM – Direct and Indirect methods of FM generation – FM Discriminator – FM transmitter and receiver – Noise performance in FM system – Pre-emphasis and de-emphasis

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UNIT III: INFORMATION THEORY AND WAVEFORM CODING **9**

Discrete memoryless source – Entropy – Source encoding techniques – Sampling and quantization – PCM – Delta modulation and adaptive delta modulation – Introduction to line coding techniques – Inter-symbol interference – Eye pattern – Correlation receiver – Matched filter

UNIT IV: DIGITAL MODULATION TECHNIQUES **9**

Geometric representation of signals – Classification of digital modulation schemes – Generation, detection, PSD and BER of Coherent BPSK, BFSK , QPSK and QAM – Carrier synchronization

UNIT V: ERROR CONTROL CODING **9**

Channel coding theorem – Linear block codes – Hamming codes – Cyclic codes – Convolutional codes – Viterbi decoding

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. B.P. Lathi and Zhi Ding, "Modern Digital and Analog Communication Systems", 5th Edition, Oxford University Press, 2022
2. Simon Haykin, "Communication Systems", 5th Edition, Wiley, 2021

REFERENCES:

1. John G. Proakis and Masoud Salehi, "Fundamentals of Communication Systems", 3rd Edition, Pearson Education, 2022
2. George Kennedy, Bernard Davis, and S. R. M. Prasanna, "Electronic Communication Systems", 5th Edition, McGraw Hill, 2020
3. Taub and Schilling, "Principles of Communication Systems", 5th Edition, McGraw Hill, 2021
4. B. Sklar, "Digital Communications: Fundamentals and Applications", 3rd Edition, Pearson Education, 2022

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SEMESTER IV

		Category: PCC				
U25EC402	Electromagnetic Fields and Transmission Lines	L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the fundamental concepts of electric and magnetic fields in free space and materials and their relationship through Maxwell's equations
- To study electromagnetic wave equations in different media and waveguides
- To analyze transmission line characteristics and solve impedance matching problems

COURSE OUTCOMES:

CO 1:	Illustrate the basic theorems of static electric field and magnetic field	Understand
CO 2:	Apply the boundary conditions of dielectric and magnetic materials under various time varying conditions for electromagnetic wave propagation	Apply
CO 3:	Examine the wave behavior in rectangular and cylindrical waveguides	Analyze
CO 4:	Explain the characteristics of transmission lines and standing wave at high frequencies	Understand
CO 5:	Apply impedance matching techniques in high-frequency transmission lines	Apply

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	2	1	-	-	-	-	-	-	-	-	1	-	1
CO 2	3	2	1	-	-	-	-	-	-	-	1	-	1
CO 3	3	3	2	-	-	-	-	-	-	-	1	-	1
CO 4	2	1	-	-	-	-	-	-	-	-	1	-	1
CO 5	3	2	1	-	-	-	-	-	-	-	1	-	1

SYLLABUS:

UNIT I: STATIC ELECTRIC AND MAGNETIC FIELD 9

Basics of Vector Algebra – Divergence theorem – Stokes theorem – Gauss's law – Applications of Gauss's law – Electric potential – Electric dipole – Electrostatic energy and energy density – Magnetic field intensity for a straight wire – Ampere's circuital law and its applications

UNIT II: BOUNDARY CONDITIONS AND MAXWELL'S EQUATIONS 9

Continuity equation – Boundary conditions for electric field – Poisson and Laplace equation – Polarization – Magnetic boundary conditions – Maxwell's Equations – Wave equation and their solutions – Poynting theorem

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UNIT III: WAVEGUIDES 9

General wave behaviours – Transverse electric waves, transverse magnetic waves, transverse electromagnetic waves – TM, TE and TEM waves between parallel plates – TM, TE, and TEM waves in rectangular wave guides

UNIT IV: TRANSMISSION LINES 9

General solution of transmission lines – The infinite line – High frequency transmission lines – Line of zero dissipation – Voltage and current equations – Input and transfer impedance – Open and short circuit impedance – Standing waves – VSWR

UNIT V: IMPEDANCE MATCHING IN HIGH FREQUENCY LINES 9

Impedance matching – Quarter wave transformer – Impedance matching by stubs – Single stub matching – Double stub matching – Smith chart and its applications

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. John.D.Ryder, "Networks, Lines and Fields", 2nd edition, Pearson Education, 2016
2. Matthew.N.O.Sadiku and S.V.Kulkarni, "Principles of Electromagnetics", 6th edition, Oxford, 2015
3. John D Kraus, "Antennas and Wave Propagation", 4th edition, Mc Graw Hill, 2017

REFERENCES:

1. W.H.Hayt, J.A.Buck, M.Jaleel Akhtar, "Engineering Electromagnetics", 9th edition Mc-Graw-Hill, 2018
2. David.J.Griffiths, "Introduction of Electrodynamics", 4th edition, Pearson Education, 2013
3. David.K.Cheng, "Field and Wave Electromagnetics", 2nd edition, Pearson Education, 2013
4. G.S.N Raju, "Electromagnetic Field Theory and Transmission Lines", 1st edition, Pearson Education, 2006

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Learn Beyond

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SEMESTER IV

U25ECG04	Microprocessors and Microcontrollers (Common to EC, EE)	Category: PCC				
		L	T	P	J	C
		3	0	2	0	4

QP PATTERN: A

PRE-REQUISITES:

- U25ECG02 - Digital System Design / U25EE304 - Digital Logic Design

COURSE OBJECTIVES:

- To understand the architecture and functioning of 8085 microprocessors and the 8051, PIC microcontrollers
- To write program in assembly language and embedded C
- To comprehend and implement interfacing techniques for memory, I/O devices, and peripheral components with microcontroller

COURSE OUTCOMES:

CO 1:	Develop assembly language programs to implement ALU operations using 8085 microprocessor	**Apply**
CO 2:	Use timer and serial communication of the 8051 microcontroller for simple applications	**Apply**
CO 3:	Implement control structures, functions and I/O port operations using embedded C	**Apply**
CO 4:	Build real-time applications using the 8051 microcontroller	**Apply**
CO 5:	Design PIC-based interfacing applications using communication protocols	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	1	-	-	-	2	2	-	1	3	-
CO 2	3	2	1	1	-	-	-	2	2	-	1	3	-
CO 3	3	2	1	1	2	-	-	2	2	-	1	3	-
CO 4	3	2	1	1	2	-	-	2	2	-	1	3	-
CO 5	3	2	1	1	2	-	-	2	2	-	1	3	-

SYLLABUS:

UNIT I: 8085 MICROPROCESSORS **9 + 6**

Architecture – Signals – Addressing modes – Instruction sets – Assembly language programming – Timing diagrams – Interrupts and interrupt service routines

UNIT II: 8051 MICROCONTROLLER **9 + 6**

Harvard architecture – 8051 microcontroller – Internal architecture – Signals – Special Function Registers (SFR) – I/O Pins Ports and Circuits – Instruction set – Timers-Modes, Registers and Timer Programming – Serial Communication – Registers, RS232 standards and programming – Interrupts Programming

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UNIT III: EMBEDDED C PROGRAMMING **9 + 6**

Introduction to Embedded C – Structure of an Embedded C Program – Data Types and Variables – Operators and Logic Operations – Decision Making and Looping Statements – Functions in Embedded C – Time Delay Generation – Input/Output Port Programming – Bit Manipulation and Register Access

UNIT IV: 8051 MICROCONTROLLER INTERFACING **9 + 6**

Interfacing of Simple I/O Systems – Switches, LEDs and Buzzers – Interfacing Character and Graphical LCD Displays – Interfacing External ADC and DAC – Stepper Motor Interfacing – DC motor speed control system – Relays

UNIT V: PIC18 MICROCONTROLLER **9 + 6**

Overview of PIC family – Architecture – Memory Organization and Special Function Registers – Signals – Interrupt structure – Development Tools-MPLAB X IDE and XC8 Compiler – Embedded C Programming for PIC – I2C and SPI protocol

LIST OF EXPERIMENTS

1. Perform basic arithmetic and logic operations using 8085 microprocessor
2. Interface display modules with an 8051 microcontroller for control applications using Embedded C
3. Implement real time clock in an 8051 microcontroller using Embedded C
4. Design and implement a robotic arm control system using a stepper motor with an 8051 microcontroller using Embedded C
5. Interface a DAC with an 8051 microcontroller for waveform generation using Embedded C
6. Design a switch-controlled LED indicator system using digital I/O ports in a PIC microcontroller using MPLAB
7. Implement communication protocols (USART/SPI/I2C) in a PIC microcontroller using MPLAB

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 75 Periods

TEXTBOOKS:

1. Krishna Kant, "Microprocessor and Microcontrollers Architecture, Programming and System Design using 8085, 8086, 8051, 8096", 2nd edition, Prentice Hall of India, 2014
2. Mazidi Muhammed Ali, Mazidi Janice Gillispie, "The 8051 Microcontrollers and Embedded Systems", 2nd edition, Pearson Education India, 2012
3. Mazidi, M. A., McKinlay, R. D., and Causey, D., "PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18", 2nd Edition, Pearson Education, 2008. Reprint 2016

REFERENCES:

1. Soumitra Kumar Mandal,"Microprocessors and Microcontrollers Architecture Programming and Interfacing using 8085 8086 & 8051", 1st edition, Tata McGraw Hill, 2011
2. Kenneth Ayala, "The 8051 Microcontrollers",3rd edition, Cengage Learning India, 2007

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SEMESTER III & IV

U25CSG11	Object Oriented Programming Using Java (Common to AD, AM, BM, CB, CS, EC, EE, IT, MI, SC)	Category: PCC				
		L	T	P	J	C
		3	0	0	0	3

QP PATTERN: A

COURSE OBJECTIVES:

- To introduce object-oriented programming concepts and Core Java programming fundamentals
- To develop Java applications using classes, inheritance, polymorphism, interfaces, and exception handling mechanisms
- To provide programming skills in multithreading, collections framework, and file handling using Java APIs
- To enable students to develop modular and reusable Java applications using standard libraries and object-oriented design principles

COURSE OUTCOMES:

CO 1:	Use object-oriented programming concepts and core Java fundamentals to develop simple applications	**Apply**
CO 2:	Implement Java applications using inheritance, polymorphism, abstract classes, interfaces, and packages	**Apply**
CO 3:	Demonstrate exception handling and multithreading concepts in Java programs	**Apply**
CO 4:	Develop Java applications using collections, generics, and related utility classes	**Apply**
CO 5:	Choose suitable file handling, stream processing, and object serialization techniques for Java applications	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	1	-	-	-	-	-	-	-	-	-
CO 2	3	2	2	1	-	-	-	-	-	-	1	-	-
CO 3	3	2	2	2	-	-	-	-	-	-	2	-	-
CO 4	3	2	2	2	-	-	-	-	-	-	2	-	-
CO 5	3	2	2	1	-	-	-	-	-	-	2	-	-

SYLLABUS:

UNIT I: INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING AND JAVA BASICS 9

Procedure-Oriented vs Object-Oriented Java Features and Platform: JVM, JRE, JDK – Java Program Structure & Memory Layout – Classes and Objects – Static and non-static members, static and non-static Methods, Constructors – Access Modifiers, Abstraction and Encapsulation – Scanner and System classes

UNIT II: INHERITANCE AND POLYMORPHISM 9

Inheritance and types – Polymorphism: Method Overloading and Overriding – Abstract Classes and Methods – Interfaces. Java packages : Built in and user defined packages

UNIT III: EXCEPTION HANDLING AND MULTITHREADING 9

Exception Handling: try, catch, throw, throws, finally – Built in exception classes and User defined Exceptions – Multithreading: Thread Lifecycle, Creating Threads, Thread Class and Runnable Interface, Thread Priorities, Synchronization – Inter-thread Communication, Deadlock prevention

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UNIT IV: COLLECTIONS FRAMEWORK AND GENERICS 9

Collections Framework – Generics and Type Safety – Wrapper Classes and Autoboxing/Unboxing – Interfaces and Classes: List, Set, Map, Queue – Implementations: ArrayList, LinkedList, HashSet, TreeSet, HashMap, TreeMap – Iterators – Comparator and Comparable Interfaces

UNIT V: JAVA I/O AND FILES 9

Java I/O Framework – Input and Output Streams – Readers and Writers – File I/O using File, FileReader, FileWriter, BufferedReader, BufferedWriter and Files – Console Input using Scanner and Console – Serialization and Deserialization – Object Streams

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 45 Periods

TEXTBOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, 2018
2. Cay S. Horstmann and Gary Cornell, "Core Java 2, Vol 1, Fundamentals", 11th Edition, Pearson Education, 2020

REFERENCES:

1. J. Nino and F. A. Hosch, "An Introduction to Programming and OO Design using Java", 1st Edition, John Wiley & Sons, 2018
2. Paul Deitel and Harvey Deitel, "Java SE 8 for Programmers", 3rd Edition, Pearson, 2015
3. E. Balagurusamy, "Programming with Java", 6th Edition, McGraw Hill Education, 2019

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SEMESTER IV

U25EC403	Digital Signal Processing	Category: PCC				
		L	T	P	J	C
		3	0	2	0	4

QP PATTERN: A

PRE-REQUISITES:

- U25EC301 - Signals and Systems

COURSE OBJECTIVES:

- To learn various techniques of DFT
- To design IIR and FIR filters using different techniques
- To learn finite word length effects and the applications of digital signal processing

COURSE OUTCOMES:

CO 1:	Apply DFT and FFT algorithms for efficient computation and frequency analysis of discrete signals	**Apply**
CO 2:	Design digital IIR filters using analog prototypes and transformation techniques	**Apply**
CO 3:	Analyze the performance of linear phase FIR filters using Fourier series , frequency sampling, and window methods	**Analyze**
CO 4:	Illustrate the effects of finite word length in DSP systems	**Understand**
CO 5:	Implement DSP applications using TMS3206748 processor	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	-	2	-	-	2	2	-	2	-	-
CO 2	3	2	1	-	2	-	-	2	2	-	2	-	-
CO 3	3	3	2	1	2	-	-	2	2	-	2	-	-
CO 4	2	1	-	-	-	-	-	-	-	-	1	-	-
CO 5	3	2	1	-	2	-	-	2	2	-	2	-	-

SYLLABUS:

UNIT I: DISCRETE FOURIER TRANSFORM **9 + 6**

Introduction to DFT and IDFT – Properties of DFT – Computation of DFT using direct method – Fast computation of DFT using fast Fourier transform (FFT) – Radix-2 decimation-in-time (DIT) and decimation-in-frequency (DIF) algorithms – Filtering long data sequences – Overlap save and overlap add methods

UNIT II: INFINITE IMPULSE RESPONSE FILTERS **9 + 6**

Introduction to filters – Analog filter design – Butterworth and Chebyshev filters – Design of digital IIR filters (LPF, HPF) – Impulse invariance and bilinear transform methods – Structure of IIR filter – Direct form I, direct form II and cascade realizations

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UNIT III: FINITE IMPULSE RESPONSE FILTERS **9 + 6**

Introduction to FIR – Linear phase characteristics – Design of linear phase FIR filters – Fourier series, frequency sampling, windows : Rectangular, Hamming and Hanning – Structure of FIR filter – Direct forms and linear phase realization

UNIT IV: FINITE WORD LENGTH EFFECTS **9 + 6**

Number representation – Fixed point and floating point – Quantization – Truncation and rounding – Types of quantization errors – Estimation of quantization noise power – Input, product and co-efficient quantization methods – Limit cycle oscillations – Dead band effect – Scaling to prevent overflow

UNIT V: DSP APPLICATIONS **9 + 6**

Multirate Signal Processing – Decimation, Interpolation, Sampling rate conversion by a rational factor – Adaptive Filters – Introduction, Applications of adaptive filtering to equalization – DSP processor – TMS320C50, TMS3206748 – Architecture, addressing modes and instruction set

LIST OF EXPERIMENTS

1. Generation of elementary discrete time sequences
2. Convolution and correlation of discrete sequence
3. Discrete Fourier Transform and Fast Fourier Transform
4. Design and implementation of a digital IIR Butterworth and Chebyshev low pass and high pass filter to meet given specifications
5. Design and implementation of Low pass and High pass FIR filter to meet the desired specifications using different window techniques
6. Generation of discrete time signals
7. Linear convolution and circular convolution
8. Implementation of DFT and FFT
9. Up conversion and down conversion for speech signals

CONTACT PERIODS:

Lecture: 45 Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 75 Periods

TEXTBOOKS:

1. John G.Proakis and Dimitris G.Manolakis, "Digital Signal Processing – Principles, Algorithms & Applications", 4th edition, Pearson Education, 2013
2. B.Venkataramani, M.Bhaskar, "Digital Signal Processors : Architecture, Programming and Applications", 2nd edition, Tata Mc Graw Hill, 2011

REFERENCES:

1. A.V.Oppenheim, R.W. Schafer and J.R. Buck, "Discrete-Time Signal Processing", 3rd edition, Pearson Education, 2019
2. Emmanuel C.Ifeachor and Barrie.W.Jervis, "Digital Signal Processing: A Practical Approach", 2nd edition, Pearson Education, 2017
3. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", 4th edition, Tata McGraw Hill, 2017
4. Andreas Antoniou, "Digital Signal Processing: Signals, Systems and Filters", 1st edition, Tata McGraw Hill, 2017

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SEMESTER IV

		Category: PCC				
U25EC404	Analog and Digital Communication Laboratory	L	T	P	J	C
		0	0	2	0	1

QP PATTERN: A

PRE-REQUISITES:

- U25EC202 - Electronic Devices and Circuits / U25RECG02 - Electronic Devices and Circuits

COURSE OBJECTIVES:

- To analyze the performance of analog and digital communication systems, including end-to-end transmission and modulation techniques under ideal and noisy channel conditions
- To evaluate sampling, pulse modulation, digital modulation, and multiplexing techniques using quantitative performance measures such as SNR, bandwidth, spectral efficiency, quantization error, bit error rate and channel capacity
- To perform the line coding, channel coding, and advanced digital communication techniques to ensure reliable transmission, efficient spectrum utilization and effective signal recovery

COURSE OUTCOMES:

CO 1:	Apply fundamental concepts of analog and digital communication to design and analyze communication systems	**Apply**
CO 2:	Analyze the performance of modulation techniques and evaluate parameters such as bandwidth, SNR and spectrum efficiency	**Analyze**
CO 3:	Examine the system performance against theoretical values using experimental or simulation methods	**Analyze**
CO 4:	Demonstrate individual competency or effective teamwork in designing and implementing the experimental results	**Apply**
CO 5:	Apply ethical standards and present experimental results effectively	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	1	2	-	-	-	-	-	1	-	1
CO 2	3	3	2	2	2	-	-	-	-	-	1	-	1
CO 3	3	3	2	2	2	-	-	2	2	-	1	-	1
CO 4	-	-	-	-	-	-	-	2	-	-	1	-	1
CO 5	-	-	-	-	-	-	2	2	2	-	1	-	1

LIST OF EXPERIMENTS

1. Design and Performance Evaluation of an End-to-End Communication System under Noiseless and Noisy Channel Conditions
2. Performance Analysis of AM, FM, and PM under Noisy and Noiseless Conditions with SNR Evaluation and Bandwidth Comparison
3. Analysis of Signal Sampling and Reconstruction: Under-Sampling, Nyquist Sampling, Over-Sampling, and Flat-Top Sampling

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4. Performance Evaluation of PCM, DPCM, DM, and ADM (CVSD): Quantization Error Analysis and Bandwidth Requirement Comparison
5. Verification of Information Theory Concepts and Shannon Channel Capacity Theorem
6. Waveform Analysis and Comparative Study of Pulse Analog Modulation and Digital Modulation Techniques
7. Spectrum Efficiency Analysis of BPSK, QPSK, and QAM: Relationship between Symbol Rate, Bit Rate, and Baud Rate
8. Waveform Generation and Performance Analysis of Line Coding Techniques with Impact on Signal Recovery and Channel Capacity
9. Performance Analysis of Channel Coding Techniques: CRC, Hamming Codes, Linear Block Codes, Convolutional Codes, and LDPC
10. Comparative Study of TDM and TDMA in Multiplexing and Multiple Access Systems

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 30 Periods

REFERENCES:

1. B.P. Lathi and Zhi Ding, Modern Digital and Analog Communication Systems, 5th Edition, Oxford University Press, 2022

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SEMESTER III & IV

U25CSG13	Object Oriented Programming Using Java Laboratory (Common to AD, AM, BM, CB, CS, EC, EE, IT, MI, SC)	Category: PCC				
		L	T	P	J	C
		0	0	2	0	1

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the fundamental concepts of object-oriented programming using Java for developing modular and reusable applications
- To apply inheritance, polymorphism, exception handling, and multithreading concepts in developing robust Java applications
- To develop collection-based and file-processing applications using Java I/O, generics, and collections framework for real-world problem solving

COURSE OUTCOMES:

CO 1:	Implement the fundamental concepts of object-oriented programming, Java program structure, classes, objects, and encapsulation principles	**Apply**
CO 2:	Develop Java applications using inheritance, polymorphism, abstract classes, interfaces, and packages	**Apply**
CO 3:	Implement exception handling and multithreading mechanisms for developing reliable and concurrent applications	**Apply**
CO 4:	Utilize collections framework, generics, and sorting mechanisms for efficient data management and processing	**Apply**
CO 5:	Develop file handling and object persistence applications using Java I/O streams, serialization, and deserialization techniques	**Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	1	1	-	-	-	-	-	-	1	-	-
CO 2	3	2	1	1	-	-	-	-	-	-	1	-	-
CO 3	3	2	1	1	-	-	-	-	-	-	1	-	-
CO 4	3	2	1	1	-	-	-	-	-	-	1	-	-
CO 5	3	2	2	2	-	-	-	-	-	-	2	-	-

LIST OF EXPERIMENTS

1. Design and implementation of Java programs demonstrating classes, objects, constructors, and methods
2. Development of applications illustrating static and non-static members, access modifiers, abstraction, and encapsulation
3. Implementation of console-based applications using Scanner and System classes for input and output processing
4. Design and implementation of applications demonstrating inheritance and its various types
5. Development of applications illustrating compile-time and runtime polymorphism using method overloading and method overriding
6. Implementation of applications using abstract classes, interfaces, and dynamic method dispatch mechanisms
7. Design and development of modular Java applications using built-in and user-defined packages
8. Implementation of robust exception handling mechanisms using built-in and user-defined exceptions

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9. Development of multithreaded applications using Thread class and Runnable interface
10. Design and implementation of synchronized multithreaded applications with inter-thread communication
11. Development of applications demonstrating thread lifecycle management and deadlock prevention techniques
12. Implementation of generic collection-based applications using List, Set, Map, and Queue interfaces
13. Design of applications utilizing Comparator and Comparable interfaces for customized sorting operations
14. Development of file processing applications using Java I/O streams, readers, writers, and buffered streams
15. Implementation of object persistence mechanisms using serialization and deserialization techniques

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** 30 Periods **Project:** - Periods **Total:** 30 Periods

REFERENCES:

1. Herbert Schildt, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, 2018
2. Cay.S.Horstmann and Gary Cornell, "Core Java 2, Vol 1, Fundamentals", 11th Edition, Pearson Education, 2020

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SEMESTER IV

		Category: MNC				
U25MNC03	Indian Constitution (Common to all programmes)	L	T	P	J	C
		1	0	0	0	0

QP PATTERN: A

COURSE OBJECTIVES:

- To understand the evolution and importance of the Constitution.
- To understand salient features of the Indian Constitution and philosophy of Fundamental Rights
- To gain the knowledge about the state government and local level administration

COURSE OUTCOMES:

CO 1: Understand the historical background of the Constitution making and its importance for building a democratic India — **Understand**

CO 2: Understand the value of Fundamental Rights and Duties for becoming a good citizen of India — **Understand**

CO 3: Analyze the powers of the Central Government — **Analyze**

CO 4: Understand the role and responsibilities of State and Local Administration — **Understand**

CO 5: Apply knowledge in strengthening constitutional institutions like Election Commission and UPSC for sustaining democracy — **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	-	-	-	-	-	1	2	3	-	-	-	-	-
CO 2	-	-	-	-	-	1	2	3	-	-	-	-	-
CO 3	-	-	-	-	-	1	2	3	-	-	-	-	-
CO 4	-	-	-	-	-	1	2	3	-	-	-	-	-
CO 5	-	-	-	-	-	1	2	3	-	-	-	-	-

SYLLABUS:

UNIT I: HISTORICAL BACKGROUND OF INDIAN CONSTITUTION — 5

Introduction to Indian Constitution: Constitution Meaning of the term, History of Making of the Indian Constitution, Evolution of the Indian Constitution, Drafting Committee (Composition and Working).

UNIT II: FEATURES OF INDIAN CONSTITUTION — 5

Philosophy and salient features of the Indian Constitution, Citizenship, Fundamental Rights, Duties and their significance, Directive Principles of State Policy, Rights Protective Mechanisms in India; Right to Education Act 2009; Right to Information 2005.

UNIT III: UNION GOVERNMENT — 5

Union Legislature (Parliament), Lok Sabha and Rajya Sabha (with Powers and Functions), Union Executive, President of India (with Powers and Functions), Prime Minister and Council of Ministers (with Powers and Functions), Cabinet and Central Secretariat, Union Judiciary (Supreme Court).

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UNIT IV: STATE GOVERNMENT AND LOCAL ADMINISTRATION **5**

Governor, Chief Minister and Council of Ministers, State Secretariat – Roles and Responsibilities, District Administration, Head, Municipalities – Mayor and Role of Elected Representatives, Panchayati Raj, Zila Panchayat – Roles and Responsibilities, Block Level and Village Level Organizational Hierarchy

UNIT V: CONSTITUTIONAL INSTITUTIONS **5**

Election Commission of India – Powers and Functions, Electoral Process in India, Methods of Constitutional Amendments and their Limitations, Important Constitutional and gist Emergency Provisions. Case Studies.

CONTACT PERIODS:

Lecture: 25 Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 25 Periods

TEXTBOOKS:

1. Durga Das Basu, "Introduction to the Constitution of India", Prentice Hall of India Pvt. Ltd., New Delhi.
2. Subash Kashyap, "Indian Constitution", National Book Trust.

REFERENCES:

1. M. Laxmikanth, "Indian Polity", McGraw Hill Education India, 2013.
2. M. P. Jain, "Indian Constitution Law," 7th Edition, Lexis Nexis, 2014.
3. Raj Kumar, "Ambedkar and Constitution", Commonwealth Publication Pvt. Ltd., New Delhi, 2011

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SEMESTER IV

U25RMCC09	Professional Skill Development - IV (Common to all programmes)	Category: MCC					
		L	T	P	J	C	
		15 Hours				1	

COURSE OUTCOMES:

CO 1: Demonstrate technical skill competency through attainment of industry-relevant certifications, participation in competitions, internships, and project-based learning activities — **Apply**

CO 2: Apply research, innovation, and problem-solving skills to develop impactful solutions through projects, publications, patents, and higher education preparation — **Apply**

CO 3: Exhibit leadership, ethical responsibility, community engagement, and professional digital presence to enhance career readiness and lifelong learning — **Apply**

CO - PO MAPPING:

Particular	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	2	2	-	3	1	-	-	2	2	-	-	-
CO 2	2	3	3	3	2	2	-	-	1	1	-	-	-
CO 3	-	-	3	-	-	2	2	3	3	3	2	-	-

GUIDLINES:

- Certifications and Skill Credentials - Free awareness certs, NPTEL/Coursera, Associate-level, Professional-level, Expert-level
- Competitions, Hackathons, and Technical Challenges - Online, institution, state, national, international competitions and hackathons, Kaggle medals
- GATE Preparation and Performance - Study plan, mock tests, registration, appearing, score percentile
- Academic, Industry, and Innovation Projects - Mini-projects, intermediate projects, industry-grade deployed projects, funded or published projects
- Internships and Industrial Training - Virtual, on-site short, core role, CoE on-campus, PPO, PPO converted to offer
- Research Publications, Patents, Intellectual Property - Reading journals, survey papers, conference papers, Scopus/WoS, Q1/Q2 journals, patents from provisional to granted
- Leadership, Community, Digital Presence - Club membership, event roles, office bearer, president, outreach, LinkedIn, GitHub, portfolio, Google Scholar

CONTACT PERIODS:

Lecture: - Periods **Tutorial:** - Periods **Practical:** - Periods **Project:** - Periods **Total:** 0 Periods

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