JEPPIAAR INSTITUTE OF TECHNOLOGY
(An Autonomous Institution)
"Self-Belief | Self-Discipline | Self-Respect"
Kunnam, Sunguvarchatram, Sriperumbudur – 631 604.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

AUTONOMOUS SYLLABUS

REGULATION 2024

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
AUTONOMOUS CURRICULUM & SYLLABUS R2024
CHOICE BASED CREDIT SYSTEM

Prepared by	Verified by	Approved by
Dr.M.Benisha	HOD/ECE	PRINCIPAL

VISION AND MISSION OF THE INSTITUTION

VISION

- Jeppiaar Institute of Technology aspires to provide technical education in futuristic technologies with the perspective of innovative, industrial, and social applications for the betterment of humanity.

MISSION

- To produce competent and disciplined high-quality professionals with the practical skills necessary to excel as innovative professionals and entrepreneurs for the benefit of society.
- To improve the quality of education through excellence in teaching and learning, research, leadership, and by promoting the principles of scientific analysis, and creative thinking.
- To provide excellent infrastructure, serene, and stimulating environment that is most conducive to learning.
- To strive for productive partnership between the Industry and the Institute for research and development in the emerging fields and creating opportunities for employability.
- To serve the global community by instilling ethics, values, and life skills among the students needed to enrich their lives.

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VISION AND MISSION OF THE DEPARTMENT

VISION

- To enhance and impart futuristic and innovative technological education for the excellence of Electronics and Communication Engineering with new ideas and innovation to meet industrial expectation and social needs with ethical and global awareness reinforced by an efficiency through research platform for the advancement of humanity.

MISSION

- M1: To produce competent and high-quality professional Engineers in the field of Electronics and Communication Engineering for the benefit of the society globally.
- M2: To provide a conducive infrastructure and environment for faculty and students with enhanced laboratories, to create high quality professionals.
- M3: To provide Prerequisite Skills in multidisciplinary areas for the needs of Industries, higher education and research establishments and entrepreneurship.
- M4: To handle Socio Economic Challenges of Society by Imparting Human Values and Ethical Responsibilities. Imparting Human Values and Ethical Responsibilities to handle Socio Economic Challenges of Society.

PROGRAMME EDUCATIONAL OBJECTIVES

- PEO 1: Graduate Engineers will have knowledge and skills required for employment and an advantage platform for lifelong learning process.
- PEO 2: Graduate Engineers will be provided with futuristic education along with the perspective research and application based on global requirements.

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- ❖ PEO 3: Graduate Engineers will have effective communication skills and work in multidisciplinary team.

- ❖ PEO 4: Graduate Engineers will develop entrepreneurship skills and practice the profession with integrity, leadership, ethics and social responsibility.

PROGRAM OUTCOMES

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

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community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

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

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

PROGRAM SPECIFIC OUTCOMES

PSO 1: Ability to develop and utilize novel, compact and power efficient coherent theoretical and practical methodologies in the field of analog and digital electronics.

PSO 2: Ability to implement analog, digital and hybrid communication Protocol to aspect the challenges in the field of Telecommunication and Networking.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

AUTONOMOUS SYLLABUS R2024 (CBCS)

SEMESTER - I										
S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
1	AIP001	Induction Programme	-	-	-	-	0	-	-	-
THEORY										
2	AMA101	Matrices and Calculus	BS	3	1	0	4	40	60	100
3	AEC101	Basic Electrical Engineering	ES	3	0	0	3	40	60	100
4	AEC102	Semiconductor Devices	PC	3	0	0	3	40	60	100
5	ACS102	Python Programming	ES	3	0	0	3	40	60	100
6	AMC101	Employment Enhancement Skills	MC	2	0	0	0	-	-	100
7	AMC102	Professional Ethics and Human Values	MC	1	0	0	0	-	-	100
PRACTICALS										
8	AEC301	Basic Electrical Engineering Laboratory	ES	0	0	4	2	60	40	100
9	ACS301	Python Programming Laboratory	ES	0	0	4	2	60	40	100
10	AHS301	Communication Skills and Technical Writing	HS	0	0	2	1	60	40	100
11	AEEC301	Mini Project - Idea Lab - I	EEC	0	0	2	1	60	40	100
			Total	**15**	**1**	**12**	**19**			

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SEMESTER - II										
S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
THEORY										
1	AMA103	Mathematics for Electronics Engineers	BS	3	1	0	4	40	60	100
2	APH101	Computational Physics	BS	3	0	0	3	40	60	100
3	AAI101	Introduction to Data Science	ES	3	0	0	3	40	60	100
4	AEC104	Electronic Circuits	PC	3	0	0	3	40	60	100
5	AEC105	Digital Electronics	PC	3	0	0	3	40	60	100
6	AHS101	Language Enhancement	HS	1	0	0	1	40	60	100
7	AMC103	Indian Constitution	MC	1	0	0	0	-	-	100
PRACTICALS										
8	AEC303	Electronic Circuits Laboratory	PC	0	0	2	1	60	40	100
9	AEC304	Digital Electronics Laboratory	PC	0	0	2	1	60	40	100
10	APH301	Computational Physics Laboratory	BS	0	0	4	2	60	40	100
11	AMC301	Yoga and Happy Living	MC	0	0	3	0	-	-	100
12	AEEC302	Mini Project - Idea Lab - II	EEC	0	0	2	1	60	40	100
			Total	**17**	**1**	**13**	**22**			

SEMESTER - III										
S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
THEORY										
1	AMA104	Transforms and Partial Differential Equations	BS	3	1	0	4	40	60	100
2	AEC106	Signals and Systems	PC	3	0	0	3	40	60	100
3	AEC107	Electromagnetic Fields	PC	3	0	0	3	40	60	100
4	AEC108	Microprocessor and Microcontroller	PC	3	0	0	3	40	60	100
5	AEC109	Analog and Digital Communication	PC	3	0	0	3	40	60	100

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6	AHS102	Skill Enhancement - I	HS	2	0	0	1	40	60	100
7	AMC104	Environmental Engineering and Sustainability	MC	2	0	0	0	-	-	100
PRACTICALS										
9	AEC305	Microprocessor and Microcontroller Laboratory	PC	0	0	2	1	60	40	100
10	AEC306	Analog and Digital Communication Laboratory	PC	0	0	2	1	60	40	100
11	AEEC303	Mini Project/Professional Practices	EEC	0	0	2	1	60	40	100
			Total	**19**	**1**	**6**	**20**			

SEMESTER - IV

S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
THEORY										
1	AEC110	Embedded Systems and IoT Design	PC	3	0	0	3	40	60	100
2	AEC111	Digital Signal Processing	PC	4	1	0	4	40	60	100
3	AEC112	Control Systems	PC	3	0	0	3	40	60	100
4	AEC113	Linear Integrated Circuits	PC	4	1	0	4	40	60	100
5	AHS103	Skill Enhancement - II	HS	2	0	0	1	40	60	100
PRACTICALS										
6	AEC307	Embedded Systems and IoT Design Laboratory	PC	0	0	4	2	60	40	100
7	AEC308	Digital Signal Processing Laboratory	PC	0	0	4	2	60	40	100
8	AEC309	Linear Integrated Circuits Laboratory	PC	0	0	4	2	60	40	100
9	AEEC304	Mini Project/Professional Practices	EEC	0	0	2	1	60	40	100
			Total	**16**	**2**	**14**	**22**			

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SEMESTER - V										
S.No	Course Code	Course Title	Category	Periods			Credits	CIE	SEE	TOTAL
				L	T	P				
THEORY										
1	ACS110	Computer Networks	PC	3	0	0	3	40	60	100
2	AEC114	VLSI Design	PC	4	1	0	4	40	60	100
3	AEC115	Transmission Lines and RF Systems	PC	4	1	0	4	40	60	100
4		Professional Elective 1	PE	3	0	0	3	40	60	100
5		Professional Elective 2	PE	3	0	0	3	40	60	100
6	AHS104	Skill Enhancement - III	HS	2	0	0	1	40	60	100
PRACTICALS										
7	AEC310	VLSI Design Laboratory	PC	0	0	4	2	60	40	100
8	AEEC305	Mini Project/Professional Practices	EEC	0	0	2	1	60	40	100
			Total	**19**	**2**	**6**	**21**			

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AUTONOMOUS SYLLABUS R2024

CHOICE BASED CREDIT SYSTEM

SEM – I

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AMA101 - MATRICES AND CALCULUS							
Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**BS**	**3**	**1**	**0**	**4**
Preamble	➢ Introduce the matrix techniques and to explain the nature of the matrix. ➢ Provide the necessary basic concepts of a few numerical methods and give procedures for solving numerically different kinds of problems occurring in Engineering and Technology. ➢ Familiarize the students with differential calculus. ➢ Understand techniques of calculus which are applied in the Engineering problems. ➢ Acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications						
Unit 1	**MATRICES**						**9+3**
Matrices - Eigen values and eigenvectors - Diagonalization of matrices using orthogonal transformation – Cayley Hamilton Theorem (without proof) - Quadratic forms - Reduction to canonical form using orthogonal transformation							
Unit 2	**SOLUTION OF LINEAR SYSTEM OF EQUATIONS AND EIGENVALUE PROBLEMS**						**9+3**
Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Gauss Seidel iterative method - Matrix Inversion by Gauss Jordan method - Eigen values of a matrix by Power method – Jacobi method.							
Unit 3	**DIFFERENTIAL CALCULUS**						**9+3**
Limit of a function-Continuity-Derivatives-Differentiation rules (sum, product, quotient, chain rules)-Implicit Differentiation-Logarithmic Differentiation-Applications: Maxima and Minima of functions of one variable							
Unit 4	**INTEGRAL CALCULUS**						**9+3**
Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions – Improper integrals.							
Unit 5	**MULTIPLE INTEGRALS**						**9+3**
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids –Change of variables in double and triple integrals – Applications: Moments and centres of mass, moment of inertia.							
							Total: 60
TEXTBOOKS							
1	Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.						
2	Erwin Kreyszig," Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016						

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3	Grewal. B.S., and Grewal. J.S., Numerical methods in Engineering and Science, Khanna Publishers, 9th Edition, New Delhi, 2001.
REFERENCES	
1	Ramana. B.V., " Higher Engineering Mathematics ", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.
2	N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Demonstrate the matrix techniques in solving the related problems in engineering and technology.	K4
CO2	Apply matrix methods to solve system of linear equations	K3
CO3	Apply differential calculus tools in solving various application problems	K3
CO4	Apply different methods of integration in solving practical problems.	K3
CO5	Evaluate multiple integrals to conduct investigations of complex problems	K5

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO1	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	-	-	-	-	1		1	1
CO2	3	2	1	-	-	-	-	-	-	-	-		1	1
CO3	3	2	3	-	-	-	-	-	-	-	-		1	1
CO4	3	2	3	-	-	-	-	-	-	-	1		-	1
CO5	3	2	3	-	-	-	-	-	-	-	-		1	-

AEC101 - BASIC ELECTRICAL ENGINEERING							
Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**ES**	**3**	**0**	**0**	**3**
Preamble	This course provides the foundation for understanding various aspects of electrical engineering. From the basics of circuit theory to the AC, DC Machines, this subject delves into the heart of electrical systems.						
Unit – I	**DC ELECTRICAL CIRCUITS**						**9**
DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with							

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Independent sources only (Steady state)		
Unit – II	**AC ELECTRICAL CIRCUITS**	**9**
Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only)		
Unit – III	**DC ELECTRICAL MACHINES**	**9**
Construction and Working principle- DC Separately and Self-excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications.		
Unit – IV	**AC ELECTRICAL MACHINES**	**9**
Construction, Working principle and Applications of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor.		
Unit – V	**MEASUREMENTS AND INSTRUMENTATION**	**9**
Functional elements of an instrument, Standards and calibration, Operating Principle, types -Moving Coil and Moving Iron meters, Measurement of three-phase power, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram- Data acquisition.		
		Total:45

TEXTBOOK:

1.	S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.
2.	S. Salivahanan, "Basic Electrical Engineering", McGraw Hill Education, First Edition, 2018

REFERENCES:

1.	Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education, 2019.
2.	Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill,

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Compute the DC electric circuit parameters for simple problems.	K4
CO2	Compute the AC electric circuit parameters for simple problems.	K4
CO3	Explain the working principle and applications of DC electrical machines.	K2
CO4	Explain the working principle and applications of AC electrical machines.	K2
CO5	Explain the operating principles of measuring instruments	K2

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	-	-	1	-	-	-	2	3	2
CO2	3	2	1	1	1	-	-	1	-	-	-	2	3	2
CO3	3	1	1	1	1	-	-	1	-	-	-	2	3	1
CO4	3	2	1	1	1	-	-	1	-	-	-	2	2	2
CO5	3	2	1	1	1	-	-	1	-	-	-	2	2	2

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AEC102 - SEMICONDUCTOR DEVICES

Programme & Branch	BE & ECE	Sem.	Category	L	T	P	C
		1	PC	3	0	0	3

Preamble	The goal is to develop a solid understanding of the device concepts that will be needed in a broad range of areas from semiconductor to circuit (analog, digital and VLSI) design and engineering.

Unit – I	**Electrons and Holes in Silicon**	**9**

Energy bands in Silicon, n-Type and p-Type silicon, Carrier Transport in Silicon, Basic Equation for Device Operation.

Unit – II	**P-N Junctions**	**9**

Energy–band Diagrams for a p-n diode, Abrupt Junction, The Diode Equation, Current-Voltage Characteristics, Time-dependent and Switching Characteristics, Diffusion Capacitance.

Unit – III	**Fundamentals of BJT**	**9**

NPN, PNP, Junctions, Input and Output Characteristics of Common Emitter, Common Base, Common Collector Amplifiers.

Unit – IV	**JFET**	**9**

Basic Concepts, Device Characteristics: Input/Output Characteristics, transfer characteristics, Transconductance, Pinch off Voltage.

Unit – V	**Fundamentals of MOSFETs**	**9**

Basic MOSFET Operation, Current-voltage relationship, Transconductance, Cut-off frequency and CMOS Technology, Special diodes and transistors LED, Avalanche Photodiode, PIN, LASERs, MISFETs, MESFETs.

Total:45

TEXTBOOK:

1. Donald Neamen, “Semiconductor Physics and Devices”, McGraw Hill Pvt Ltd, Fourth Edition, 2011.
2. Nandhitha Das Gupta and Amitava Das Gupta “Semiconductor Devices: Modeling and Technology” Prentice Hall of India Pvt Ltd, Fourth Edition, 2004.

REFERENCES:

1. Adel S. Sedra and Kenneth C.Smith, “Microelectronic Circuits”, Oxford University Press, Sixth Edition, 2009.
2. Simon M.Sze and Kwok K.Ng, “Physics of Semiconductor Devices”, John wiley & sons, 3rd edition, 2006.
3. Yuan Taur and Tak H.Ning, “Fundamentals of Modern VLSI Devices”,Second Edition, Cambridge university Press, 2009.

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom’s Taxonomy Level**
CO1	Apply the fundamental principle of electron and holes in silicon to study the parameters of semiconductor materials.	K3

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CO2	Describe the relationship between electron transport properties and the operation of semiconductor devices like Diode, Bipolar Junction Transistors, and Field Effect transistors.	K2
CO3	Investigate the different configurations of BJTs	K3
CO4	Gain knowledge in the advanced development of JFET and its operation.	K2
CO5	Learn about semiconductor devices	K2

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	1	-	-	-	-	-	1	1	1
CO2	3	2	2	3	-	1	-	-	-	-	-	1	2	1
CO3	3	3	3	2	-	1	-	-	-	-	-	1	2	1
CO4	3	3	2	3	-	2	-	-	-	-	-	1	2	1
CO5	3	2	3	2	-	1	-	-	-	-	-	1	2	1

ACS102 - PYTHON PROGRAMMING							
Programme & Branch	**BE& ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**ES**	**3**	**0**	**0**	**3**
Preamble	➢ To understand the basics of algorithmic problem solving. ➢ To learn to solve problems using Python conditionals and loops. ➢ To define Python functions and use function calls to solve problems. ➢ To use Python data structures - lists, tuples, dictionaries to represent complex data. ➢ To do input/output with files in Python.						
Unit 1	**BASICS OF PYTHON PROGRAMMING**						**9**
Overview of programming language- Python history-Interactive mode – script mode-Tokens:Literal-Keyword-Delimiter-Identifier-Data types: Integer-Floating-Complex-Boolean-String-Indentation-Input operation-Comments							
Unit 2	**CONTROL STRUCTURE, OPERATORS AND FUNCTIONS**						**9**
Statements: if, if-else, nested if, if –elif - Iterative statements: while, for, Nested loops, else in loops, break, continue and pass statements. Operators: Arithmetic-Membership-Identity-Bitwise Functions: Types, parameters, arguments: positional arguments, keyword arguments, parameters with default values, functions with arbitrary arguments, Scope of variables: Local and global scope, Recursion							
Unit 3	**COLLECTIONS, STRINGS AND REGULAR EXPRESSIONS**						**9**
List: Create Access, Negative Indices, Slicing, Splitting, List Methods, and comprehensions Tuples: Create, Indexing and Slicing, Operations on tuples. Dictionary: Create, add, traversing and replace							

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values, operations on dictionaries. Sets: Create and operations on set. Strings: Formatting, Comparison, Slicing, Splitting, Stripping, Negative indices, String functions. Regular expression: Matching the patterns, Search and replace		
Unit 4	**FILE HANDLING AND EXCEPTIONS**	**9**
Files: Open, Read, Write, Append, Tell, Seek and Close. Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, Exception Chaining, User defined Exceptions, Defining Clean-Up actions		
Unit 5	**NUMPY, PANDAS, MATPLOTLIB**	**9**
Introduction - Basics of NumPy - N-dimensional Array in NumPy – Methods and Properties - Basics of SciPy - Broadcasting in NumPy Array Operations - Array Indexing in NumPy, Pandas - Introduction - Series - Data Frame - Matplotlib - Basics - Figures and Axes - Method subplot() - Axis container		
		Total: 45

TEXTBOOKS	
1	Ashok Namdev Kamthane, Amit Ashok Kamthane "Programming and Problem Solving with Python" , 2nd edition , Mc Graw Hill
2	Dr,R,NageswaraRao, "Core Python Programming",3rd edition, Deam tech Publisher
REFERENCES	
1	Paul Dietel, Harvey Deitel, "Python for Programmers", Pearson
2	Reema Thareja," Problem Solving and programming with Python, Oxford University Press

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Develop algorithmic solutions to simple computational problems.	K3
CO2	Develop and execute simple Python programs.	K3
CO3	Write simple Python programs using conditionals and loops for solving problems.	K2
CO4	Decompose a Python program into functions.	K3
CO5	Represent compound data using Python lists, tuples, dictionaries etc.	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	2	-	-	-	-	1	1	2	2	2
CO2	2	3	2	3	2	-	-	-	2	2	3	2	3	2
CO3	2	3	2	1	1	-	-	-	2	2	3	2	2	3
CO4	2	3	2	2	3	-	-	-	2	2	3	2	2	3
CO5	2	3	1	2	2	-	-	-	-	-	-	1	3	2

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AMC101 - EMPLOYMENT ENCHANCEMENT SKILLS							
Programme & Branch	**BE& ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**MC**	**2**	**0**	**0**	**0**
Preamble							
Unit 1	**RESUME WRITING**						**6**
Resume: Objective; Formats; Meticulous & Attention to Detail; Organizing Information; Highlight skills; Mistakes to avoid; Qualification & Skill; SWOT Analysis; Assignment – Draft Resume & Corrections							
Unit 2	**INTERVIEW SKILLS**						**6**
Types of Interviews; Preparation – Company, Role, Brush up Concepts, Technical Strengths; Strengths & Weakness; Importance of Grooming; Interview Questions – HR & Technical; Non Verbal Communication; Negotiation Skills; How to start/end an interview; Group Discussion; Assignment – Preparation for "Tell me about yourself", Mock Interviews.							
Unit 3	**PROFESSIONAL ETIQUETTES**						**6**
Workplace Etiquette – Global & Local; Culture Sensitivity; Gender Sensitivity; Communication Netiquettes – Phone, Email, Social Media; Avoid Gossip; How to be personable yet be professional. Meetings: Types of meetings; Agenda; Schedule & Participants; Materials required; Minutes of Meeting.							
Unit 4	**PRESENTATION SKILLS**						**6**
What is a Presentation; Develop an effective slide; Know your Slides; Know your Audience; Barriers in Presentation; Time Management; Listening to the silent audience; Question & Answer session; Feedback.							
Unit 5	**COMMUNICATION AT WORKPLACE**						**6**
Language & Communication; Types of Communication – Internal & External, Formal & Informal; Direction of Communication Flow – Downward, Upward, Lateral, Diagonal; Team Work; Emotional Intelligence							
							Total: 30

TEXTBOOKS	
1	"Soft Skills & Employability Skills" by Sabina Pillai&Agna Fernandez
2	"Soft Skills" by Meenakshi Raman &ShaliniUpadhyay
3	"Campus Recruitment" by Ramanadhan Ramesh Babu, Israel Battu, Akash R Bhutada&Vijaya Lakshmi Krishnan
REFERENCES	
1	"Personality Development & Soft Skills (Old Edition)" by Barun K Mitra
2	"Soft Skills Training: A Workbook to develop Skills for Employment" by Frederick H Wentz
3	"Ten Soft Skills You Need to Advance Your Career(Andre Keys Book 9)" by Lisa Smith
4	"Get Your First Job: A Companion For Getting Your First Job – A Guide to

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	Employability Skills & Career Planning" by AJ Balasubramanian & Dr J Sadakkadulla

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1						1							1
CO2	-	-	1	-	-	-	-	-	2	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	-	2	-	-	-	-	-	2	-	-	-	-	-	-
CO5	-	-	-	-	2	-	-	-	-	-	-	-	1	-

AMC102 - PROFESSIONAL ETHICS AND HUMAN VALUES							
Programme & Branch	**BE& ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**MC**	**2**	**0**	**0**	**0**
Preamble	➢ To create an awareness on Engineering Ethics and Human Values. ➢ To understand social responsibility of an engineer. ➢ To appreciate ethical dilemma while discharging duties in professional life.						
Unit 1	**HUMAN VALUES**						**2**
Morals, Values and Ethics – Integrity – Work Ethic – Honesty – Courage –Empathy – Self-Confidence – Character							
Unit 2	**ENGINEERING ETHICS**						**4**
Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories. Valuing Time – Co-operation – Commitment							
Unit 3	**ENGINEERING AS SOCIAL EXPERIMENTATION**						**3**
Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study							
Unit 4	**SAFETY, RESPONSIBILITIES AND RIGHTS**						**3**
Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies							
Unit 5	**GLOBAL ISSUES**						**3**
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership							
							Total: 15
TEXTBOOKS							

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1	Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill, New York 1996
2	Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004
REFERENCES	
1	Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available).
2	Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available).
3	John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.
4	Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		1	-	-	-	2	1	-	-	2	-	2	-	1
CO2	1	-	1	-	2	-	-	-	2	-	-	-	-	-
CO3	-	-	-	-	-	-	2	-	-	-	-	-	-	2
CO4	-	2	-	-	-	-	-	2	-	-	-	-	-	-
CO5	-	-	-	-	2	-	-	-	2	-	2	-	1	-

AEC301 - BASIC ELECTRICAL ENGINEERING LABORATORY							
Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**ES**	**0**	**0**	**4**	**2**
Preamble	To provide hands on training to the students in: ➢ Soldering and testing simple electronic circuits. ➢ Assembling and testing simple electronic components on PCB. ➢ Study of basic electrical and digital equipment.						
List of Exercises / Experiments:							
1.	Soldering simple electronic circuits and checking continuity.						
2.	Assembling and testing electronic components on a small PCB.						
3.	Study of electronic components and equipments. a. Resistor Color coding using digital multi-meter. b. Assembling electronic components on breadboard.						
4.	Measurement of electrical quantities-voltage current, power & power factor in RLC						

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	circuit
5.	Verification of KVL, KCL
6.	Verification of Thevenin, Norton, Superposition Theorem
7.	Fluorescent lamp wiring
8.	Staircase wiring
9.	Study of iron box wiring and working
10.	Assembly and dismantle of computer/ laptop.
	Total: 60

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.	K3
CO2	Demonstrate the wiring of various electrical joints in common household electrical wire work.	K3
CO3	Verify theorems for Electrical devices	K2
CO4	Understand the working of basic electrical devices	K2
CO5	Apply basic electrical concepts to implement basic electrical circuits.	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	1	1	1	-	-	-	-	2	2	1
CO2	3	2	-	-	1	1	1	-	-	-	-	2	2	1
CO3	3	2	-	-	1	1	1	-	-	-	-	2	2	1
CO4	3	2	-	-	1	1	1	-	-	-	-	2	2	1
CO5	3	2	-	-	1	1	1	-	-	-	-	2	2	1

ACS301 - PYTHON PROGRAMMING LABORATORY

Programme & Branch	**BE& ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**ES**	**0**	**0**	**4**	**2**

Preamble	➢ To understand the problem-solving approaches. ➢ To learn the basic programming constructs in Python. ➢ To practice various computing strategies for Python-based solutions to real world problems. ➢ To use Python data structures - lists, tuples, dictionaries. ➢ To do input/output with files in Python.

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LIST OF EXPERIMENTS
1. Identification and solving of simple real life or scientific or technical problems and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3 Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4.Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5.Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7.Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8.Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)
9.Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10.Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)
11.Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc.
Total: 60

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Develop algorithmic solutions to simple computational problems	K3
CO2	Develop and execute simple Python programs.	K3
CO3	Implement programs in Python using conditionals and loops for solving problems.	K3
CO4	Deploy functions to decompose a Python program.	K3
CO5	Process compound data using Python data structures.	K3

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CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	1	1	1	-	-	-	-	2	2	1
CO2	3	2	-	-	1	1	1	-	-	-	-	2	2	1
CO3	3	2	-	-	1	1	1	-	-	-	-	2	2	1
CO4	3	2	-	-	1	1	1	-	-	-	-	2	2	1
CO5	3	2	-	-	1	1	1	-	-	-	-	2	2	1

AHS301 - COMMUNICATION SKILLS AND TECHNICAL WRITING							
Programme & Branch	**BE& ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		1	**HS**	**0**	**0**	**2**	**1**

Preamble	➢ Impart a thorough understanding of the principles underlying effective technical communication. ➢ Develop the skills necessary to tailor technical communication to diverse audience needs. ➢ Enhance proficiency in using language techniques and understanding genres related to technical communication. ➢ Equip students with the ability to utilize technological tools to improve technical communication practices. ➢ Foster an awareness of ethical considerations and global perspectives in technical communication.

Unit 1	**PRINCIPLES OF TECHNICAL COMMUNICATION**	**12**

Listening -Brief video snippets of conversational moments from movies and short documentaries
Speaking- Presenting oneself, introducing others, inviting people, and explaining places.
Reading - Short passages that need understanding include inference and critical analysis.
Writing-Finishing missing phrases and constructing suggestions based on supplied information.
Grammar- Who-Questions and Yes/No Questions - Parts of Speech. Vocabulary development: prefixes, suffixes, articles, countable and uncountable nouns.

Unit 2	**AUDIENCE-CENTERED COMMUNICATION**	**12**

Listening: Deep Listening - Talk Shows and Debates.
Reading: In depth Reading: Scanning Passages
Speaking: Describe current issues, happenings, etc.
Writing: Instructions, Recommendations, Note Taking, and Paragraph Writing
Grammar: Continuous tenses, prepositions and articles
Vocabulary: Phrasal verbs and one-word substitutes

Unit 3	**LANGUAGE TECHNIQUES AND GENRES IN TECHNICAL COMMUNICATION**	**12**

Listening: Listening to lectures, podcasts, audio books.
Reading: Interpretation of Tables, Charts and Graphs

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Speaking: SWOT Analysis on oneself and Narrating incidents Writing: Formal Letter Writing, Covering Letter and Memos. Grammar: Perfect Tenses and Discourse Markers Vocabulary: Nouns, usage of keywords		
Unit 4	**TECHNOLOGICAL TOOLS USED IN COMMUNICATION**	**12**
Listening: Instructional videos, webinars on personal branding and networking and TED talks Reading: Manuals, Research papers or articles, Graphic narratives, AI tools used in reading Speaking: Participating in and conducting mock virtual meetings, focusing on presentation skills and etiquette. Mock networking events and Elevator Pitch Writing: E-Mails, drafting formal messages in social media handles, and Usage of AI prompts. Grammar: Adjectives, Verbs and Adverbs.		
Unit 5	**ETHICAL AND GLOBAL PERSPECTIVES IN TECHNICAL COMMUNICATION**	**12**
Listening: Podcasts, documentaries and webinars on digital ethics and cybersecurity. Reading: Articles on fundamental ethical principles and case studies. Speaking: Cultural sensitivity and representation ross-cultural communication strategies Mock meetings to practice global collaboration. Writing: Case study analysis reports on legal and ethical responsibilities. Proposals for implementing sustainable communication practices. Grammar: Reported Speech, Idioms and phrases and Loan words		
		Total: 60

TEXTBOOKS	
1	Effective Technical Communication by M. Ashraf Rizvi (Author) 2nd Edition Paperback 2017
2	Sylvan Barnet and Hugo Bedau, 'Critical Thinking Reading and Writing', Bedford/st. Martin's: Fifth Edition (June 28, 2004)
3	Meenakshi Upadhyay, Arun Sharma – Verbal Ability and Reading Comprehension.
4	Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine Chuen Meng Goh, Cambridge.
REFERENCES	
1	Technical Communication: A Reader-Centered Approach" by Paul V. Anderson
2	"Technical Writing: Process and Product" by Sharon J. Gerson and Steven M. Gerson
3	"English for Engineers and Technologists: A Skill Approach" by Jeyanthi G. and Ramasamy P
4	"A Handbook for Technical Writers and Editors" by M. Ragunathan and M. Sundararajan

COURSEOUTCOMES: **At the end of the course, learners will be able to**	**Bloom's Taxonomy Level**

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CO1	To create clear and successful technical publications, use core technical communication concepts.	K2
CO2	Modify technical communication to the requirements and expectations of various audiences.	K2
CO3	Use proper language and genres to effectively communicate technical knowledge.	K2
CO4	Use technology technologies to improve the generation, management, and dissemination of technical material.	K2
CO5	Navigate ethical quandaries and explore global views in technological communication methods.	K2

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	1	1	1	2	1	1	-	-	-	-	-	-	-	-
CO2	1	2	1	1	1	1	-	-	-	-	-	-	-	-
CO3	1	1	2	2	1	2	-	-	-	-	-	-	-	-
CO4	1	1	1	1	1	1	-	-	-	-	-	-	-	-
CO5	2	1	1	1	1	1	-	-	-	-	-	-	-	-

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

AUTONOMOUS SYLLABUS R2024

CHOICE BASED CREDIT SYSTEM

SEM – II

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AMA103 - MATHEMATICS FOR ELECTRONICS ENGINEERS							
Programme & Branch	**BE& ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**BS**	**3**	**1**	**0**	**4**
Preamble	➢ acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems. ➢ familiarize with the notions of vector and scalar fields required in engineering problems ➢ acquaint with the concepts of vector calculus needed for problems in all engineering disciplines. ➢ To collect the matrix algebra techniques and the concepts of basis and dimension in vector spaces. ➢ To construct normalization of vectors and ortho-normal vectors.						
Unit 1	**ORDINARY DIFFERENTIAL EQUATIONS**						**9+3**
Higher order linear differential equations with constant coefficients - Method of variation of parameters - Cauchy's and Legendre's linear equations - Simultaneous first order linear equations with constant coefficients.							
Unit 2	**VECTOR FUNCTIONS**						**9+3**
Vector and scalar point functions - Vector Differential Operator – gradient of a scalar point vector divergence and of a vector point function – directional derivative – conservative vector field - solenoidal and irrotational vector fields.							
Unit 3	**VECTOR CALCULUS**						**9+3**
Gradient, divergence and curl - Directional derivative - Irrotational and solenoidal vector fields - Vector integration - Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) - Simple applications involving cubes and rectangular parallelopipeds.							
Unit 4	**LINEAR TRANSFORMATION**						**9+3**
Vector spaces – Subspaces – Linear combinations and system of Linear equations – Linear independence and Linear dependence – Bases and Dimensions – Linear Transformation – Matrix representation of Linear Transformation - Null space, Range space and dimension theorem (without proof).							
Unit 5	**INNER PRODUCT SPACES**						**9+3**
Inner product and norms - Gram Schmidt orthonormalization process - QR Factorization - Singular value decomposition.							
							Total: 60
TEXTBOOKS							
1	Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley India, 2011.						
2	Grewal. B.S., Higher Engineering Mathematics, 42nd Edition, Khanna Publishers, Delhi, 2012.						
3	Narayanan. S., Manickavachagam Pillay. T. K and Ramanaiah. G Advanced Mathematics for Engineering Students, Vol. II & III, S. Viswanathan Publishers Pvt. Ltd.1998.						
REFERENCES							

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1	Ramana, B.V., Higher Engineering Mathematics, Tata McGraw Hill Education Private Ltd., 9th Edition, New Delhi 2010.
2	Veerarajan. T, Engineering Mathematics –II, Mc Graw Hill Education, 2018.

WEB LINKS

1. https://archive.nptel.ac.in/courses/111/105/111105122/
2. http://www.math.iitb.ac.in/~gopal/MA108/Slides_Laplace_Transforms_april_17_2019.pdf

COURSEOUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Apply the methods as a potent tool in the solution of a variety of problems in the natural sciences and technology.	K3
CO2	Apply vectors in higher dimensional space in experimental data.	K3
CO3	Interpret the fundamentals of vector calculus and be fluent in the use of Stokes theorem and Gauss divergence theorem.	K4
CO4	Apply the concepts of basis and dimension in vector spaces to the solution of related complex engineering problems.	K3
CO5	Construct orthonormal basis by the concepts of normalization in inner products and to analyse complex engineering problems.	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1		-	-	-	-		-	-	1	-	-
CO2	3	3	1		-	-	-	-		-	-	-	-	-
CO3	3	3	1		-	-	-	-		-	-	1	-	-
CO4	3	3	1		-	-	-	-		-	-	1	-	-
CO5	3	3	1		-	-	-	-		-	-	1	-	-

APH101 - COMPUTATIONAL PHYSICS

Programme & Branch	**BE& ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**BS**	**3**	**0**	**0**	**3**

Preamble	• To instill knowledge on physics of semiconductors, determination of charge carriers and device applications. • The students will acquire knowledge on the concepts of Photonics. • To provide the basic concepts of quantum mechanics and various formalism of quantum mechanics • To acquire the knowledge of basic sciences required to understand the fundamentals of nanomaterials.

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	• To motivate the students towards the applications of quantum mechanics and quantum computing	
Unit 1	**PHOTONICS AND SEMICONDUCTOR DEVICES**	**9**
Intrinsic Semiconductor- Energy Band Diagram- -Direct and Indirect Band Gap Semi-Conductors – Diode Laser-Hall Effect and Devices- Logic Gates- AND, OR, NOT, NAND, E-OR, E-NOR Gates. Introduction to theory of Laser-Characteristics-Spontaneous and Stimulated Emission- Einstein's Coefficients – Population Inversion- Applications of Photonics.		
Unit 2	**DIFFERENTIAL EQUATIONS IN COMPUTATIONAL PHYSICS**	**9**
Solution of differential equations: Taylor series method, Euler method, Runge-Kutta method, predictor-corrector method. Eigen values and Eigen vectors of matrix: Determinant of a matrix, characteristic equation of a matrix, eigen values and eigen vectors of a matrix, power method.		
Unit 3	**FUNDAMENTALS OF QUANTUM MECAHNICS**	**9**
Photons and light waves- Electrons and matter waves- The Schrodinger equation (Time dependent and time independent wave equation)- Physical significance of wave function- particle in an infinite potential well: 1D, 2D and 3D Boxes-Degeneracy and Non-Degeneracy.		
Unit 4	**INTRODUCTION TO NANO MATERIAL**	**9**
Introduction to nanomaterial -Electron density in bulk material - Size dependence of Fermi energy - Quantum confinement - Quantum structures - Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterial- Properties and Applications of nano materials- Tunneling: single electron phenomena and single electron transistor-Quantum dot laser.		
Unit 5	**QUANTUM INFORMATION AND COMPUTING**	**9**
Quantum computing: Introduction - Postulates of quantum Mechanics- Differences between quantum and classical computation. Quantum system for information processing-quantum states-Classical bits-quantum bits or qubits - Density matrices- Entanglement-Quantum gates-C-NOT Gate-Bloch sphere.		
		Total: 45

TEXTBOOKS

1	Hintendra K Malik, A K Singh, "Engineering Physics" Tata McGraw Hill Education Private Limited, New Delhi 2010.
2	Vanchna Singh, Sheetal Kumar, "Engineering Physics" Cengage Learning India Pvt. Ltd. Delhi 2010.
3	V Rajendran, "Engineering Physics" Tata McGraw Hill Education Private Limited, New Delhi 2011.

REFERENCES

1	Dattu R Joshi, "Engineering Physics" Tata McGraw Hill Education Private Limited, New Delhi 2010.
2	A Marikani, "Engineering Physics" PHI Learning Private Limited New Delhi 2010.
3	Kenneth B. Howell, "Ordinary Differential Equations", CRC Press, 21 January 2023.

COURSEOUTCOMES: On completion of this course, the students will gain knowledge and will be able to	**Bloom's Taxonomy Level**

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CO1	understand clearly of semiconductor physics and functioning of semiconductor devices.	K2
CO2	solve differential equations arising in computational physics	K2
CO3	understand the basic concepts and principles of quantum mechanics	K2
CO4	explain the effects of quantum confinement on the electronic structure and corresponding physical and chemical properties of materials.	K2
CO5	Apply the quantum mechanical principals and basic concept of quantum computing	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	1	1	1	1	1	1	1	-	-
CO2	3	3	2	2	1	1	1	1	1	1	1	1	-	-
CO3	3	3	2	2	1	1	1	1	1	1	1	1	-	-
CO4	3	3	3	3	1	1	1	1	1	1	1	1	-	-
CO5	3	3	3	3	1	1	1	1	1	1	1	1	-	-

AAI101 - INTRODUCTION TO DATA SCIENCE							
Programme & Branch	**BE& ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**ES**	**3**	**0**	**0**	**3**
Preamble	➢ To understand the data science fundamentals and process. ➢ To learn to describe the data for the data science process. ➢ To learn to describe the relationship between data. ➢ To utilize the Python libraries for Data Wrangling. ➢ To present and interpret data using visualization libraries in Python						
Unit 1	**INTRODUCTION**						**9**
Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model–presenting findings and building applications - Data Mining - Data Warehousing – Basic Statistical descriptions of Data							
Unit 2	**DESCRIBING DATA**						**9**
Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores							
Unit 3	**DESCRIBING RELATIONSHIPS**						**9**
Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula forcorrelation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r2 –multiple regression equations –regression towards the mean							
Unit 4	**PYTHON LIBRARIES FOR DATA WRANGLING**						**9**

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Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, Boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets –aggregation and grouping – pivot tables		
Unit 5	**DATA VISUALIZATION**	**9**
Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.		
		Total: 45

TEXTBOOKS	
1	David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (Unit I)
2	Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.(Units II and III)
3	Jake Vander Plas, "Python Data Science Handbook", O'Reilly, 2016. (Units IV and V)
REFERENCES	
1	Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press,2014.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Define the data science process	K1
CO2	Understand different types of data description for data science process	K2
CO3	Gain knowledge on relationships between data	K2
CO4	Use the Python Libraries for Data Wrangling	K3
CO5	Apply visualization Libraries in Python to interpret and explore data	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO1	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	-	-	-	-	1	1	2	2	2	1
CO2	2	3	2	3	2	-	-	-	2	2	3	2	3	2	1
CO3	2	3	2	1	1	-	-	-	2	2	3	2	2	3	1
CO4	2	3	2	2	3	-	-	-	2	2	3	2	2	3	1
CO5	2	3	1	2	2	-	-	-	-	-	-	1	3	2	2

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AEC104 - ELECTRONIC CIRCUITS

Programme & Branch	BE & ECE	Sem.	Category	L	T	P	C
		2	PC	3	0	0	3

Preamble	➢ To impart knowledge of electronic circuit principles and analytical viewpoints.

Unit – I	**Transistor Biasing**	**9**

Need for biasing, operating point, load line analysis, BJT biasing-methods, basic stability, fixed bias, collector to base bias, self-bias, Bias Stabilization and stability factors, compensation, Thermal runaway, Thermal stability.

Unit - II	**Biasing of JFET**	**9**

JFET - DC Load Line and Bias Point - Various biasing methods of JFET - JFET Bias Circuit Design.

Unit - III	**Transistor Amplifiers**	**9**

Small signal Analysis of Common Emitter amplifiers – Small signal Analysis of JFET-Common source amplifier, Differential Amplifier, Cascade, Cascode amplifiers.

Unit - IV	**Frequency Analysis of transistor amplifiers**	**9**

Amplifier frequency response -Low frequency and Miller effect, High frequency analysis of CE amplifier, short circuit current gain, cut off frequency – fα and fβ unity gain and Determination of bandwidth of single stage amplifiers.

Unit - V	**Feedback Amplifiers and Oscillators**	**9**

Voltage / Current, Series, Shunt feedback Amplifiers – positive feedback–Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts, and Crystal oscillators.

Total:45

TEXTBOOK:

1.	S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, Electronic Devices and Circuits, 2nd Edition, TMH, 2007.
2.	Donald.A. Neamen, Electronic Circuit Analysis and Design –2nd Edition,Tata Mc Graw Hill, 2009.

REFERENCES:

1.	David A., "Bell Electronic Devices and Circuits", Oxford Higher Education Press, 5th Edition, 2010
2.	D.Schilling and C.Belove, "Electronic Circuits", 3rd Edition, Mc Graw Hill, 1989.
3.	Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson Education / PHI, 2008.

COURSE OUTCOMES: At the end of the course, learners will be able to	**Bloom's Taxonomy Level**

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CO1	Design various biasing methods of BJT.	K3
CO2	Design various biasing methods of JFET.	K3
CO3	Derive the small signal parameters of amplifiers.	K3
CO4	Analyze frequency response of BJT and FET amplifiers	K4
CO5	Design feedback amplifiers and oscillators.	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO1	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2					1	1	1	1	2	
CO2	3	2	2	2					1	1	1	1	2	
CO3	3	2	2	2	2				1	1	1	1	2	
CO4	3	2	2	2	2				1	1	1	1	2	
CO5	3	1	-	-	1							1	2	

AEC105 - DIGITAL ELECTRONICS

Programme & Branch	BE & ECE	Sem.	Category	L	T	P	C
		2	PC	3	0	0	3

Preamble	➢ This subject explores the fundamental principles of digital logic and circuits, laying the groundwork for understanding modern computing systems. ➢ From Boolean algebra to sequential logic design, the course delves into the core concepts that underpin digital electronics. ➢ Through a combination of theory and practical experimentation, students learn to design and analyze digital circuits, preparing them for a variety of applications in fields such as computer engineering, electronics, telecommunications, and beyond.

Unit – I	BASIC CONCEPTS	9

Review of number systems-representation-conversions, Review of Boolean algebra- theorems, sum of product and product of sum simplification, canonical forms min term and max term, Simplification of Boolean expressions-Karnaugh map, completely and incompletely specified functions, Implementation of Boolean expressions using universal gates, Tabulation methods.

Unit – II	COMBINATIONAL LOGIC CIRCUITS	9

Problem formulation and design of combinational circuits - Code-Converters, Half and Full Adders, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux, Case study: Digital trans-receiver / 8 bit Arithmetic and logic unit, Parity Generator/Checker, Seven Segment display decoder

Unit – III	SYNCHRONOUS SEQUENTIAL CIRCUITS	9

Latches, Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis and design of clocked sequential circuits – Design - Moore/Mealy models, state minimization, state assignment, lock - out condition circuit implementation - Counters, Ripple Counters, Ring Counters, Shift registers, Universal Shift Register. Model Development: Designing of rolling display/real time clock

Unit – IV	ASYNCHRONOUS SEQUENTIAL CIRCUITS	9

Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Fundamental and Pulse mode sequential circuits, Design of

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Hazard free circuits.		
Unit – V	**LOGIC FAMILIES AND PROGRAMMABLE LOGIC DEVICES**	**9**
Logic families- Propagation Delay, Fan - In and Fan - Out - Noise Margin - RTL, TTL, ECL, CMOS - Comparison of Logic families - Implementation of combinational logic/sequential logic design using standard ICs, PROM, PLA and PAL, basic memory, static ROM, PROM, EPROM, EEPROM, EAPROM.		
		Total:45

TEXTBOOK:

1.	M. Morris Mano and Michael D. Ciletti, 'Digital Design', Pearson, 5th Edition, 2013. (Unit - I - V)

REFERENCES:

1.	Charles H. Roth, Jr, 'Fundamentals of Logic Design', Jaico Books, 4th Edition, 2002.
2.	William I. Fletcher, "An Engineering Approach to Digital Design", Prentice- Hall of India, 1980.
3.	Floyd T.L., "Digital Fundamentals", Charles E. Merril publishing company,1982.
4.	John. F. Wakerly, "Digital Design Principles and Practices", Pearson Education, 4 th Edition,2007.

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Use Boolean algebra and simplification procedures relevant to digital logic.	K2
CO2	Design various combinational digital circuits using logic gates.	K3
CO3	Analyze and design synchronous sequential circuits.	K4
CO4	Analyze and design asynchronous sequential circuits.	K4
CO5	Build logic gates and use programmable devices	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	2	-	-	-	-	3	3	3	2
CO2	3	2	2	2	-	-	-	-	-	-	2	1	2	2
CO3	3	3	3	2	-	2	-	-	-	-	2	2	3	2
CO4	3	3	2	2	-	-	-	-	-	-	3	2	2	1
CO5	3	3	3	3	-	-	-	-	-	-	2	2	3	2

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AHS101 - தமிழர்மரபு							
Programme & Branch	**BE& ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**HS**	**1**	**0**	**0**	**1**
Preamble							
அலகு I	**மொழிமற்றும்இலக்கியம்**						**3**
இந்திய மொழிக் குடும்பங்கள்-திராவிட மொழிகள்-தமிழ் ஒரு செம்மொழி தமிழ் செவ்விலக்கியங்கள்-சங்க இலக்கியத்தின் சமயச்சார் பற்ற தன்மை சங்க இலக்கியத்தில்பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள்-தமிழ்க் காப்பியங்கள்,தமிழகத்தில் சமணபௌத்த சமயங்களின் தாக்கம்-பக்தி இலக்கியம்,ஆழ்வார்கள் மற்றும் நாயன்மார்கள்-சிற்றிலக்கியங்கள்-தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி தமிழ் இலக்கியவளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.							
அலகு II	**மரபு –பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை சிற்பக்கலை**						**3**
நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன்சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப்பொருட்கள், பொம்மைகள் – தேர்செய்யும்கலை – சுடுமண்சிற்பங்கள் – நாட்டுப்புறத்தெய்வங்கள் – குமரி முனையில் திருவள்ளுவர் சிலை – இசைக்கருவிகள் – மிருதங்கம் , பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூகபொருளாதார வாழ்வில் கோவில்களின் பங்கு.							
அலகு III	**நாட்டுப் புறக்கலைகள் மற்றும் வீரவிளையாட்டுகள்**						**3**
தெருக்கூத்து,கரகாட்டம், வில்லுப்பாட்டு, கணியான்கூத்து, ஒயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்							
அலகு IV	**தமிழர்களின் திணைக் கோட்பாடுகள்**						**3**
தமிழகத்தின் தாவரங்களும்,விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறைமுகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.							
அலகு V	**இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத்**						**3**

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	தமிழர்களின் பங்களிப்பு	
இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின்பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சுவரலாறு.		
		Total: 15
TEXTBOOKS		
1	**தமிழகவரலாறு – மக்களும்பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு:தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).**	
2	**கணினித்தமிழ் – முனைவர்இல. சுந்தரம். (விகடன்பிரசுரம்).**	
3	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)	
REFERENCES		
1	**கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல்துறைவெளியீடு)**	
2	**பொருநை ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)**	
3	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies	
4	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)	

AHS101 -HERITAGE OF TAMILS							
Programme & Branch	**BE& MECH**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**HS**	**1**	**0**	**0**	**1**
Preamble							
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.							

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UNIT III	FOLK AND MARTIAL ARTS	3
Therukoothu, Karagattam, VilluPattu, KaniyanKoothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.		
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.		
		Total: 15

TEXTBOOKS	
1	**தமிழகவரலாறு – மக்களும்பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு:தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).**
2	**கணினித்தமிழ் – முனைவர்இல. சுந்தரம். (விகடன்பிரசுரம்).**
3	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
REFERENCES	
1	**கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல்துறைவெளியீடு)**
2	**பொருநை ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)**
3	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies
4	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	1	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	1	-	-	-	1	-	-	-	-	-
CO4	-	-	-	-	-	-	-	2	-	1	-	2	-	-

AMC103 - INDIAN CONSTITUTION							
Programme & Branch	**BE& ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**MC**	**1**	**0**	**0**	**0**

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Preamble	➢ This Course intends to impart a comprehensive outlook about the nature of the Indian constitution; rights and duties of the citizens, Political Institutions of Central and State governments and its relationship with each other and the organization and functions of local government. ➢ A detailed analysis of the functions of the statutory bodies are incorporated in this course.	
Unit 1	**Introduction to Indian constitution**	**3**
Constitutional Assembly – Philosophy – Preamble – Salient Features of Indian Constitution		
Unit 2	**Fundamental rights and duties**	**3**
Fundamental Rights – Directive Principles of State Policy – Fundamental Duties.		
Unit 3	**Functions of Central and State governments**	**3**
Union Executive – President: Election – Powers and Functions – Council of Ministers – Prime Minister: Position and Powers – Relationship between Prime Minister and President. State Executive – Governor: Powers and functions – Chief Minister: Position and Powers – Relationship between Chief Minister and Governor.		
Unit 4	**Union and State Legislature**	**3**
Union Legislature: Structure, Powers and Functions – Speaker: Power and Functions – Procedures of Constitutional Amendment – State Legislature: Structure, Powers and Functions.		
Unit 5	**Judicial powers and functions**	**3**
Judiciary – Supreme Court: Powers and Functions – High Court: Powers and Functions – Judicial Review		
		Total: 15
TEXTBOOKS		
1	Siwach,J.R, Dynamics of Indian Government and Politics, New Delhi: Sterling, 1985.	
2	Narang, A.S., Indian Government and Politics New Delhi: Gitanjali ,1995	
REFERENCES		
1	Thakur, R. The Government and Politics of India: London: Macmillan, 1995.	
2	Gupta,D.C, Indian Government and Politic, New Delhi, 1996	

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	3	3	3	-	3	-	2	-	1
CO2	2	-	-	-	-	3	3	3	-	3	-	2	-	1
CO3	2	-	-	-	-	3	3	3	-	3	-	2	-	1
CO4	-	3	-	-	-	3	3	3	-	3	-	2	-	1
CO5	1	-	-	-	-	3	3	3	-	3	-	2	-	1

AEC303 - ELECTRONIC CIRCUITS LABORATORY							
Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**PC**	**0**	**0**	**2**	**1**

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Preamble	To build a firm foundation on electronic circuits.
List of Exercises / Experiments:	
1.	Characterization of CE and CS amplifiers.
2.	Transfer characteristics of Differential Amplifiers.
3.	Characterization of Cascode Amplifiers.
4.	Characterization of Cascade Amplifiers.
5.	Determination of bandwidth of single stage amplifiers.
6.	Analysis of BJT with Fixed bias and Voltage divider bias using Spice.
7.	Analysis of FET with fixed bias, self-bias and voltage divider bias using simulation software like Spice.
8.	Analysis of Cascode and Cascade amplifiers using Spice.
	Total: 30
REFERENCES/MANUAL/SOFTWARE:	
1.	Laboratory Manual
2.	SPICE

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Analyze the Characteristics of various transiter amplifiers	K4
CO2	Analyze performance parameters of differential amplifier	K4
CO3	Investigate the frequency response of single stage amplifiers	K4
CO4	Examine Various biasing methods using SPICE simulation	K4
CO5	Infer the frequency response of single and multistage amplifiers using SPICE simulation	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3				3				2	2
CO2	3	3	2	2	3				3				2	2
CO3	3	3	2	2	3				3				2	2
CO4	3	3	2	2	3				3				2	2
CO5	3	3	2	2	3				3				2	2

AEC304 - DIGITAL ELECTRONICS LABORATORY							
Programme & Branch	**BE & ECE**	**Sem**	**Category**	**L**	**T**	**P**	**C**
		2	**PC**	**0**	**0**	**2**	**1**
Preamble	To build a firm foundation on electronic circuits.						
List of Exercises / Experiments:							
1.	Verification of Boolean theorems using logic gates.						

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2.	Design and implementation of combinational circuits using gates for arbitrary functions.
3.	Implementation of 4-bit binary adder/subtractor circuits.
4.	Implementation of code converters.
5.	Implementation of BCD adder, encoder, and decoder circuits.
6.	Design and implementation of Multiplexer and De-multiplexer using logic gates
7.	Construction and verification of 4-bit ripple counters and Mod-10 / Mod-12 Ripple counters
8.	Design and implementation of 3-bit synchronous up/down counter
9.	Design and implementation of SISO, SIPO, PISO, PIPO Shift Registers.
10.	Design and Implementation of a Universal Shift register.
	Total: 30

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Design various combinational digital circuits using logic gate	K4
CO2	Design distinct code converters.	K4
CO3	Design Coding and multiplexing circuits using logic gates	K4
CO4	Analyze the performance of different types of shift registers.	K4
CO5	Design different types of counters.	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3				3				2	2
CO2	3	3	2	2	3				3				2	2
CO3	3	3	2	2	3				3				2	2
CO4	3	3	2	2	3				3				2	2
CO5	3	3	2	2	3				3				2	2

APH301 - COMPUTATIONAL PHYSICS LABORATORY

Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**BS**	**0**	**0**	**4**	**2**

Preamble

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To make the student an active participant in each part of all exercises.

List of Exercises / Experiments:

1.	Torsional pendulum - Determination of rigidity modulus of wire and moment of

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	inertia of regular and irregular objects
2.	Simple harmonic oscillations of cantilever
3.	Non-uniform bending - Determination of Young's modulus
4.	Uniform bending – Determination of Young's modulus
5.	Laser- Determination of the wavelength of the laser using grating
6.	Air wedge - Determination of thickness of a thin sheet/wire
7 (a).	Optical fibre -Determination of Numerical Aperture and acceptance angle
7(b).	Compact disc- Determination of width of the groove using laser
8.	Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
	Total: 60

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual

COURSE OUTCOMES: Upon completion of the course, the students should be able to		**Bloom's Taxonomy Level**
CO1	Understand the functioning of various physics laboratory equipment	K2
CO2	Use graphical models to analyze laboratory data	K4
CO3	Use mathematical models as a medium for quantitative reasoning and describing physical reality	K2
CO4	Access, process and analyze scientific information	K4
CO5	Solve problems individually and collaborative	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	1	-	-	-	-	-	-	-	-	-
CO2	3	3	3	1	1	-	-	-	-	-	-	-	-	-
CO3	3	2	3	1	1	-	-	-	-	-	-	-	-	-
CO4	3	3	2	1	1	-	-	-	-	-	-	-	-	-
CO5	3	2	3	1	1	-	-	-	-	-	-	-	-	-

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AMC301 - YOGA AND HAPPY LIVING							
Programme& Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		2	**MC**	**0**	**0**	**2**	**0**
Preamble	➢ To gain a foundational understanding of the principles and philosophy underlying Asana (physical postures), Pranayama (breathing techniques), and Mudra (gestures). ➢ To practice breathing techniques (pranayama) that can be performed while seated, improving respiratory function and promoting relaxation. ➢ To develop the skills and confidence to sustain a personal Mudra Pranayama practice, fostering long-term physical, mental, and emotional health benefits. ➢ To Cultivate positive relationships and social connections. ➢ To Foster personal growth and self-awareness.						
Unit – I	**Foundations of Yoga: Asana, Pranayama, and Mudra Practices**						**3**
Introduction to Asana – Pranayama – Mudhra – Practices							
Unit – II	**Yoga on a Chair: Practicing Sugasana, Padhmasana, Vajrasana, and Dhrona Mudra**						**3**
Sugasana – Padhmasana – Vajrasana – On chair with Dhrona mudhra – Practices							
Unit – III	**Essential Mudra Pranayama: Introduction to Types and Sectional Breathing**						**3**
Mudhra Pranayama – Intro. – Types – Sectional Breathing - Practices							
Unit – IV	**Building Positive Relationships**						**3**
The importance of social connections -Effective communication skills - Conflict resolution and empathy							
Unit – V	**Work-Life Balance**						**3**
Time management and prioritization - Setting boundaries and saying no - Finding purpose and meaning in work.							
							Total:15

REFERENCES:

1.	B.K.S. Iyengar, Light on Yoga", HarperCollins Publishers, Latest Edition.
2.	"The Yoga Sutras of Patanjali" translated by Sri Swami Satchidananda, Integral Yoga Publications, Latest Edition.
3.	Gretchen Rubin "The Happiness Project", HarperCollins Publishers, Latest Edition.
4.	Tal Ben-Shahar, "Happier: Learn the Secrets to Daily Joy and Lasting Fulfillment", McGraw-Hill Education, Latest Edition.

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Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Gain knowledge of the basic postures (asanas) in yoga, including their physical and mental benefits.
CO2	Learn the correct technique and benefits of Sukhasana (Easy Pose), a simple cross-legged sitting posture that promotes relaxation and meditation.
CO3	Understand the basic principles of pranayama, including its importance in yoga and overall health.
CO4	Understand the significance of building and maintaining strong social connections and how these connections contribute to overall well-being and success in personal and professional life.
CO5	Improve their decision-making skills by learning how to evaluate tasks and commitments in relation to their goals and values.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	-	-	1	-	-	1	-	-
CO2	-	-	-	-	-	1	-	-	1	-	-	1	-	-
CO3	-	-	-	-	-	1	-	-	1	-	-	1	-	-
CO4	-	-	-	-	-	1	-	-	1	-	-	1	-	-
CO5	-	-	-	-	-	1	-	-	1	-	-	1	-	-

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

AUTONOMOUS SYLLABUS R2024

CHOICE BASED CREDIT SYSTEM

SEM – III

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AMA104 - TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS							
Programme & Branch	**BE& ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		3	**BS**	**3**	**1**	**0**	**4**
Preamble	➢ Understand the applications of Fourier series in engineering apart from its uses in solving boundary value problems. ➢ Understand the basic concepts of the Fourier transform techniques and its application in Engineering. ➢ Use the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.						
Unit 1	**PARTIAL DIFFERENTIAL EQUATIONS**						**9+3**
Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation – Linear homogeneous partial differential equations of second and higher order with constant coefficients.							
Unit 2	**FOURIER SERIES**						**9+3**
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Parseval's identity – Harmonic analysis.							
Unit 3	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**						**9+3**
Classification of PDE – Method of separation of variables - Solutions of one-dimensional wave equation using Fourier series – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Cartesian coordinates only).							
Unit 4	**FOURIER TRANSFORMS**						**9+3**
Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity							
Unit 5	**Z – TRANSFORMS**						**9+3**
Z- transforms - Elementary properties – Convolution theorem - Inverse Z - transform using partial and convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.							
							Total: 60

TEXTBOOKS

1	Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley India, 2011.
2	Grewal. B.S., Higher Engineering Mathematics, 42nd Edition, Khanna Publishers, Delhi, 2012.
3	Narayanan. S., ManickavachagamPillay. T. K and Ramanaiah. G Advanced Mathematics for Engineering Students, Vol. II & III, S. Viswanathan Publishers Pvt. Ltd.1998.

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REFERENCES	
1	Veerarajan. T., Transforms and Partial Differential Equation, Tata McGraw Hill Publishing Company Limited, New Delhi, 2012.
2	Ramana, B.V., Higher Engineering Mathematics, Tata McGraw Hill Education Private Ltd., 9th Edition, New Delhi 2010
3	Michael Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson Education, 2011

COURSEOUTCOMES: At the end of the course, learners will be able to		Bloom's Taxonomy Level
CO1	Acquire problem solving skills to handle first order and higher order Partial differential equations.	K3
CO2	Demonstrate Fourier series to study the behaviour of periodic functions and their applications in engineering problems such as system communications, digital signal processing and field theory.	K3
CO3	Develop skills in classification, formulation, solution, and interpretation of PDE models.	K3
CO4	Develop the skill of conversion between time domain to frequency domain using the concept of Fourier Transforms.	K3
CO5	Use the effective mathematical tools for the solutions of partial differential equations by using Z-transform techniques for discrete time systems.	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	-	-	-	-	2	-	-	3	-	-
CO2	3	3	1	1	-	-	-	-	2	-	-	3	-	-
CO3	3	3	1	1	-	-	-	-	2	-	-	3	-	-
CO4	3	3	1	1	-	-	-	-	2	-	-	3	-	-
CO5	3	3	1	1	-	-	-	-	2	-	-	3	-	-

AEC106 - SIGNALS AND SYSTEMS							
Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		3	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ This course provides a foundation for understanding the various types of signals and systems. ➢ Processing signals is the process of digitizing real-world signals and then manipulating them mathematically in time or frequency domain. ➢ It helps in noise suppression in communication.						

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Unit – I	CLASSIFICATION OF SIGNALS AND SYSTEMS	9
Basic Operation on the signals- Classification of Signals: Continuous Time and Discrete Time-Classification of systems: Continuous Time systems and Discrete Time Systems		
Unit – II	**CONTINUOUS TIME SIGNAL ANALYSIS**	**9**
Fourier Series representation of Periodic Signals-Convergence issues-Properties-Continuous Time Fourier Transform-Properties		
Unit – III	**CONTINUOUS TIME SYSTEM ANALYSIS**	**9**
Continuous Time LTI systems -Laplace Transform-Region of Convergence-Properties- Analysis and characterization of LTI systems using the Laplace Transform		
Unit – IV	**DISCRETE TIME SIGNAL ANALYSIS**	**9**
Sampling Theorem-Reconstruction of a signal from its samples-Aliasing- Fourier Series representation of Discrete Time Periodic Signals- Properties-Discrete Time Fourier Transform-Properties		
Unit – V	**DISCRETE TIME SYSTEM ANALYSIS**	**9**
Discrete Time LTI systems- Z-Transform-Region of Convergence-Properties-Inverse Z Transform-Analysis and characterization of LTI systems using the Z Transform		
		Total:45

TEXTBOOK:

1.	Ramesh Babu.P, Anandanatarajan.R,"Signals and Systems "5th Revised Edition, Vijay Nicole Imprints, 2022
2.	Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson, 2007
3.	B. P. Lathi, "Principles of Linear Systems and Signals", Second Edition, Oxford, 2009

REFERENCES:

1.	Simon Haykin,"Signals and Systems",Secod Edition,John Wiley,1999
2.	R.E.Zeimer, W.H.Tranter and R.D.Fannin, "Signals & Systems - Continuous and Discrete", Pearson, 2007.
3.	John Alan Stuller, —An Introduction to Signals and Systems, Thomson, 2007.

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Analyze the properties of signals & systems	K4
CO2	Apply Fourier Series and Fourier transform in Continuous time signal analysis	K3
CO3	Analyze continuous time LTI systems using Fourier and Laplace Transforms	K4
CO4	Apply Fourier Series and Fourier transform in Discrete time signal analysis	K3
CO5	Examine discrete time LTI systems using Z transform and DTFT	K4

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CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2							2			2	3	1
CO2	3	2							2			2	3	1
CO3	3	2							2			2	3	1
CO4	3	2							2			2	3	1
CO5	3	2							2			2	3	1

AEC107 - ELECTROMAGNETIC FIELDS

Programme & Branch	BE & ECE	Sem.	Category	L	T	P	C
		3	PC	3	0	0	3

Preamble	➢ This course provides a foundation for understanding the basics of Static Electric, Magnetic and Electromagnetic Fields. ➢ To study the Electric and Magnetic fields through Faraday's Law, Displacement Current and Maxwell's Equation. ➢ It helps to determine the Significance of Time Varying Fields and Propagation of EM Waves.

Unit – I	INTRODUCTION	9

Electromagnetic model - Units and constants - Review of vector algebra - Rectangular, cylindrical and spherical coordinate systems - Line, surface and volume integrals - Gradient of a scalar field - Divergence of a vector field - Divergence theorem - Curl of a vector field - Stoke's theorem - Null identities - Helmholtz's theorem

Unit – II	ELECTROSTATICS	9

Electric field, Coulomb's law - Gauss's law and applications - Electric potential, Conductors in static electric field - Dielectrics in static electric field - Electric flux density and dielectric constant - Boundary conditions - Electrostatics boundary value problems - Capacitance, Parallel, cylindrical and spherical capacitors, Electrostatic energy - Poisson's and Laplace's equations

Unit – III	MAGNETOSTATICS	9

Lorentz force equation - Ampere's law - Vector magnetic potential - Biot-Savart law and applications - Magnetic field intensity and idea of relative permeability - Calculation of magnetic field intensity for various current distributions Magnetic circuits - Behaviour of magnetic materials - Boundary conditions - Inductance and inductors - Magnetic energy - Magnetic forces and torques

Unit – IV	TIME-VARYING FIELDS AND MAXWELL's EQUATIONS	9

Faraday's law - Displacement current and Maxwell-Ampere law - Maxwell's equations - Potential functions - Electromagnetic boundary conditions - Wave equations and solutions - Time-harmonic fields - Observing the Phenomenon of wave propagation with the aid of Maxwell's equations

Unit – V	PLANE ELECTROMAGNETIC WAVES	9

Plane waves in lossless media - Plane waves in lossy media (low-loss dielectrics and good conductors), Group velocity - Electromagnetic power flow and Poynting vector - Normal incidence at a plane conducting boundary - Normal incidence at a plane dielectric boundary

Total:45

TEXTBOOK:

1. K.A.Gangadhar and P.M.Ramanathan, Electromagnetic Field Theory (Including Antennas and

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	Wave Propagation), Khanna Publishers, Standard Edition (1 January 1997)
2.	D.K. Cheng, Field and wave electromagnetics, 2nd ed., Pearson (India), 2002
3.	M.N.O.Sadiku and S.V. Kulkarni, Principles of electromagnetics, 6th ed., Oxford(Asian Edition), 2015
REFERENCES:	
1.	Edward C. Jordan & Keith G. Balmain,Electromagnetic waves and Radiating Systems, Second Edition, Prentice-Hall Electrical Engineering Series, 2012.
2.	W.H. Hayt and J.A. Buck, Engineering electromagnetics, 7th ed., McGraw-Hill (India), 2006
3.	B.M. Notaros, Electromagnetics, Pearson: New Jersey, 2011

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Relate the fundamentals of vector, coordinate system to electromagnetic concepts	K3
CO2	Analyze the characteristics of Electrostatic field	K4
CO3	Interpret the concepts of Electric field in material space and solve the boundary conditions	K4
CO4	Explain the concepts and characteristics of Magneto Static field in material space and solve boundary conditions.	K4
CO5	Determine the significance of time varying fields	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PO1 1	PO12	PSO1	PSO2
CO1	2	1	1	1	-					1	-	2	1	2
CO2	2	2	3	3	2					1	1	2	2	2
CO3	2	2	3	2	2					1	1	2	2	2
CO4	2	2	3	2	2					1	1	2	1	1
CO5	2	2	2	2	2					2	2	1	2	2

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AEC108 - MICROPROCESSOR AND MICROCONTROLLER							
Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		3	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ This course understands the architecture of Microprocessor and Microcontroller. It helps to interface microcontroller with supporting chips. ➢ It helps to o study the Architecture of RISC Processor. ➢ It helps to design a microcontroller-based system						
Unit – I	**THE 8086 MICROPROCESSORS**						**9**
Overview of Microprocessors, 8086 – Architecture, Signals, Addressing modes, Instruction set and assembler directives, Assembly language programming, Stacks, Procedures, Macros, Interrupts and interrupt service routines, System bus timing.							
Unit – II	**8051 MICROCONTROLLERS**						**9**
Functional block diagram and pin diagram of 8051- Power supply, clock and reset circuit- Program Counter and ROM space in 8051-Program and Data Memory organization-addressing modes. Instruction Set: data transfer, arithmetic and logical, program branching instructions and Boolean variable manipulation.							
Unit – III	**ON-CHIP PERIPHERALS AND PROGRAMMING TECHNIQUES**						**9**
Parallel Port Structure and bit-manipulation programming, timer/counter-Operating Modes-Programming 8051 Timers - Counter Programming-Serial Communication: Basics of Serial Communication-UART Operating Modes-RS232 Standards-8051 connection to RS232-Serial Port Programming. Interrupt: 8051 Interrupt- External and Internal Interrupts- Programming timer Interrupts, external hardware interrupts and serial communication interrupts -Interrupt Priority and Programming. Power Saving Modes.							
Unit – IV	**PERIPHERAL INTERFACING AND PROGRAMMING**						**9**
Parallel communication interface, Serial communication interface, D/A and A/D Interface, Timer, Keyboard /display controller, Traffic Light control, and Stepper Motor Interfacing Techniques							
Unit – V	**RISC ARCHITECTURE**						**9**
Overview of RISC processor, Hybrid architecture, Advantages of RISC, Features of RISC, Design issues of RISC Processor, Performance issues in pipelined system, Architecture of ARM7 and Sun Ultra SPARC.							
							Total:45
TEXTBOOK:							
1.	Muhammad Ali Mazidi, J.G. Mazidi, R.D. McKinlay," The 8051 Microcontroller and Embedded Systems", Second Edition, Prentice Hall of India Pvt. Ltd., 2007						
2.	A.K.Ray,K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd edition, Tata McGrawHill, 2012						
REFERENCES:							

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1.	Krishna Kant, — “Microprocessors and Microcontrollers- Architecture, programming and system design 8085, 8086, 8051,8096”, Prentice Hall of India, New Delhi, 2007.
2.	Kenneth J Ayala, — “The 8051 Microcontroller – Architecture, Programming and Applications”, Penram International Publications, Mumbai India, 1996
3.	Doughlas V.Hall,”Microprocessors and Interfacing, Programming and Hardware”, TMH, 2012

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	Analyze the programs on 8086 microprocessors	K3
CO2	Interpret 8051 Microcontrollers architecture and its functionalities.	K2
CO3	Design microcontroller-based systems for real time applications	K3
CO4	Interface the peripherals and I/O devices using 8051 microcontrollers.	K3
CO5	Analyze the architecture of RISC processors.	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2								2	2
CO2	3	3	3	2	2							1	2	2
CO3	3	3	3	2	2	1							2	2
CO4	3	3	3	2	2	1							2	2
CO5	3	3	3	2	2	1						1	2	2

AEC109 - ANALOG AND DIGITAL COMMUNICATION							
Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		3	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ To endow the fundamentals and analytical perspectives of communication systems.						
Unit - I	**Amplitude Modulation**						**9**
Introduction: Modulation and its need– Linear modulation schemes: DSBSC, SSBSC and VSB-power spectrum –Frequency translation – Frequency division multiplexing – Super heterodyne receivers – Noise in AM receivers: coherent detection, envelope detection.							
Unit - II	**Angle Modulation**						**9**
Frequency modulation, Narrowband FM, Wideband FM – Generation of FM: indirect method – FM demodulation: frequency discriminator – Non-linear effects in FM systems – Noise in FM receivers – capture effect – pre-emphasis and de-emphasis in FM							
Unit - III	**Pulse Modulation and Baseband Pulse Transmission**						**9**

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Sampling process – PAM – Quantization process –PCM – TDM – Delta modulation, Line coding: unipolar NRZ, PolarNRZ, Unipolar RZ, Manchester – Matched Filter as optimum receiver – Inter symbol Interference – Eye patterns – Nyquist Criterion for distortion less baseband binary transmission – Pulse shaping with raised cosine filter – Duobinary signaling – Adaptive equalization: LMS algorithm		
Unit - IV	**Passband Digital Transmission and Spread Spectrum Communication**	**9**
Introduction – Coherent Phase shift keying: BPSK, QPSK, OQPSK, π/4 shifted QPSK – QAM- BER analysis of BPSK and QPSK-concepts of MSK-Spread Spectrum: PN sequence and its properties- Direct Sequence Spread Spectrum- Frequency Hopping Spread Spectrum		
Unit - V	**Information Theory and Coding**	**9**
Entropy and its properties – Source coding theorem: Huffman coding, LZ coding – Discrete Memory less Channel –mutual information and its properties – Channel coding theorem – information capacity theorem; Hamming codes –Convolutional codes – Trellis diagram– Viterbi algorithm – Trellis coded modulation :8 ary PSK		
		Total:45

TEXTBOOK:

1.	Simon Haykin, Michael Moher, "Introduction to Analog and Digital Communications", 2nd Edition, John Wiley &Sons, New Delhi, 2012.

REFERENCES:

1.	B.P.Lathi,"Modern Analog and Digital Communication Systems", 3 rd Edition, Oxford University Press,2007.
2.	Gautam Sahe, Taub & Schilling, "Principles of Communication Systems", 4th Edition, McGraw-Hill, New Delhi,2007.
2.	Wayne Tomasi, "Advanced Electronic Communication Systems", 6th Edition, Pearson Education, 2009.

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Infer the effect of noise in AM receivers	K3
CO2	Interpret the effect of noise in FM receivers	K3
CO3	Identify inter-symbol interference	K3
CO4	Apply the scheme of passband digital transmission	K3
CO5	Inspect the characteristics of discrete memory less channel forlossless, error free communication	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2							2		2	
CO2	3	2	2	2							2		2	
CO3	3	2	2	2	2								2	
CO4	3	2	2	2	2				2	2	2	2	2	
CO5	3	3	2	2	2				2	2		2	2	

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AMC104 - ENVIRONMENTAL ENGINEERING AND SUSTAINABILITY							
Programme & Branch	**BE& ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		3	**MC**	**2**	**0**	**0**	**0**
Preamble	➢ To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation. ➢ To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters. ➢ To facilitate the understanding of global and Indian scenario of renewable and non renewable resources, causes of their degradation and measures to preserve them. ➢ To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management. ➢ To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.						
Unit 1	**ENVIRONMENT AND BIODIVERSITY**						**6**
Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.							
Unit 2	**ENVIRONMENTAL POLLUTION**						**6**
Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.							
Unit 3	**RENEWABLE SOURCES OF ENERGY**						**6**
Energy management and conservation, New Energy Sources: Need of new sources. Different types of new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.							
Unit 4	**SUSTAINABILITY AND MANAGEMENT**						**6**
Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols-Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.							
Unit 5	**SUSTAINABILITY PRACTICES**						**6**

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Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles - carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio economic and technological change.	
	Total: 30
TEXTBOOKS	
1	Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2	Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3	Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4	Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5	Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
6	Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7	Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.
REFERENCES	
1	R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38 . Edition 2010.
2	Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3	Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4	Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5	Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

COURSEOUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.	K2
CO2	To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.	K2

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CO3	To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.	K2
CO4	To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.	K2
CO5	To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.	K2

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1				2	3					2		
CO2	3	2				3	3					2		
CO3	3		1			2	2					2		
CO4	3	2	1	1		2	2					2		
CO5	3	2	1			2	2					1		

AHS102 - SKILL ENHANCEMENT - I (APTITUDE & COGNITIVE SKILLS – PHASE 1)

Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		3	**HS**	**2**	**0**	**0**	**1**

Preamble

- To categorize, apply and use thought process to distinguish between concepts of Quantitative methods.
- To educate and enrich the students on quantitative ability, reasoning ability, and verbal ability.
- To learn about various aspects of soft skills and learn ways to develop personality
- Understand the importance and type of communication in personal and professional environment
- To create awareness on Human Centered Approach.

Unit 1	**NUMERICAL COMPUTATION**	6

Number System- Divisibility Rules- Problems on Numbers- H.C.F. and L.C.M. of Numbers- Decimal Fractions & Simplification.

Unit 2	**NUMERICAL ESTIMATION & DATA INTERPRETATION-I**	6

Averages - Problems on Ages- Data interpretation: Tabulation- Bar Graphs

Unit 3	**INTRODUCTION TO SOFT SKILLS**	6

- **Soft Skills: Personal, Professional and Social skills**

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- **Communication Skills: Verbal, Nonverbal, and Written Communication**
- **Communication Today:** Significance of Communication, Vitality of the Communication Process, Virtues of Listening, Fundamentals of Good Listening, responding after listening, need for Intercultural Communication, Communicating Digital World.

Unit 4	**PERSONALITY SKILLS**	6

- **Personality Development:** Knowing Yourself, Positive Thinking, Physical Fitness, Positive attitude, Integrity and Honesty
- **Emotional Intelligence:** Meaning and Definition, need for Emotional Intelligence, Components of Emotional Intelligence, Competencies of Emotional Intelligence, Skills to Develop Emotional Intelligence
- **Stress and Time Management:** Stress, Sources of Stress, Ways to Cope with Stress, Principles and Techniques for Time Management.
-

Unit 5	**DESIGN THINKING**	6

HOW MIGHT 'WE'

Revisiting Wheel of Life – Balancing Priorities – Project Update – QBL Application in Balancing Priorities – Handling Conflicts – Leveraging Constraints – Respond Vs. React – Importance of Teamwork – Project Assignment.

Total:30

COURSE OUTCOMES: At the end of the course, learners will be able to	**Bloom's Taxonomy Level**
Use their logical thinking and analytical abilities to solve Quantitative aptitude questions from company specific and other competitive tests.	K3
Have an awareness of how design thinking can be applied in a wide range of contexts, from the personal to global. Investigate and think creatively about design problems and opportunities.	K4

REFERENCES:

1.	Quantitative Aptitude for Competitive Exams by R. S. Agarwal.
2.	Quantum CAT by Sarvesh Verma.
3.	The Design of Business: Why Design Thinking is the Next Competitive Advantage, by Roger Martin Thinking in Systems, Donella Meadows.

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AEC305 - MICROPROCESSOR AND MICROCONTROLLER LABORATORY							
Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		3	**PC**	**0**	**0**	**2**	**1**
Preamble	To Introduce ALP concepts, features, and Coding methods						
List of Exercises / Experiments:							
8086 Programs using kits and MASM							
1.	Basic arithmetic and Logical operations						
2.	Move a data block without overlap						
3.	Code conversion, decimal arithmetic, and Matrix operations.						
4.	Floating point operations, string manipulations, sorting and searching						
5.	Password checking, Print RAM size and system date						
6.	Counters and Time Delay						
Peripherals and Interfacing Experiments							
7.	Traffic light controller						
8.	Stepper motor control						
9.	Keyboard and Display						
10.	A/D and D/A interface and Waveform Generation						
11.	Serial interface and Parallel interface						
	8051 Experiments using kits and MASM						
12.	Basic arithmetic and Logical operations						
13.	Square and Cube program, Find 2's complement of a number						
14.	Unpacked BCD to ASCII						
	Total: 30						
REFERENCES/MANUAL/SOFTWARE:							
1.	Laboratory Manual						
2.	MASM						

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Write ALP Programs for fixed and Floating Point and Arithmetic	K2
CO2	Interface different I/Os with processor	K3
CO3	Generate waveforms using Microprocessors	K3
CO4	Implement the basic programs in 8051 microcontrollers	K3
CO5	Write ALP Programs in 8051 using MASM	K2

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2										1	1
CO2	3	2	2	2		2						2	1	1
CO3	3	2	2	2	2						2	2	1	1

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

AEC306 - ANALOG AND DIGITAL COMMUNICATION LABORATORY							
Programme & Branch	**BE & ECE**	**Sem**	**Category**	**L**	**T**	**P**	**C**
		3	**PC**	**0**	**0**	**2**	**1**
Preamble	To build a firm foundation on analog and digital communication systems.						

List of Exercises / Experiments:

1.	Verification of analog pulse modulation using discrete components
2.	Verification of Pulse code modulation and demodulation
3.	Verification of Delta Modulation and demodulation
4.	Verification of PAM, PPM & PWM Modulation and demodulation
5.	Verification of Time division multiplexing and demultiplexing
6.	Simulation of line coding schemes
7.	Simulation of AM & FM Modulation and Demodulation
8.	Simulation of Analog signal sampling and reconstruction
9.	Simulation of ASK, PSK, FSK
10.	Simulation of DPSK, QPSK, QAM generation and detection schemes
11.	Generation of Huffman coding and decoding
12.	Simulation of Linear Block Codes and cyclic error control coding schemes
	Total:30

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual
2.	MATLAB

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Examine the analog modulation and analog to digital pulse conversion	K4
CO2	Analyze passband digital modulation	K4
CO3	Implementation of Shift keying using MATLAB	K4
CO4	Infer the performance of source coding	K3
CO5	Infer the performance of channel coding	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3						2	2	2	1
CO2	3	3	2	2	3				3	2	2	2	2	1

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CO3	3	3	2	2	3				3	2	2	2	2	1
CO4	3	3	2	2	3				3	2	2	2	2	1
CO5	3	3	2	2	3				3	2	2	2	2	1

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

AUTONOMOUS SYLLABUS R2024

CHOICE BASED CREDIT SYSTEM

SEM – IV

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AEC110 - EMBEDDED SYSTEMS AND IOT DESIGN							
Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		4	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ This course helps to understand the basics, ARM architecture in embedded systems. ➢ It helps to study the design process of an embedded system ➢ It helps to understand the real – time processing in an embedded system. It helps to learn the architecture and design flow of IoT, to build an IoT based system.						
Unit – I	**BASICS OF EMBEDDED SYSTEMS**						**9**
Review of Microcontrollers- Embedded System Design Process – Model Train Controller – ARM Processor – Instruction Set Preliminaries-CPU- Programming Input and Output – Supervisor Mode – Exceptions and Trap.							
Unit – II	**EMBEDDED COMPUTING PLATFORM**						**9**
Designing with computing platforms – consumer electronics architecture – platform-level performance analysis - Components for embedded programs – Models for programs – Assembly, Linking and Loading – Compilation Techniques – Program Level Performance Analysis.							
Unit – III	**PROCESSES AND OPERATING SYSTEMS**						**9**
Structure of a real – time system – Task Assignment and Scheduling – Multiple Tasks and Multiple Processes – Multirate Systems – Pre-emptive real – time Operating systems – Priority based scheduling – Interprocess Communication Mechanisms – Distributed Embedded Systems – MPSoCs and Shared Memory Multiprocessors – Design Example – Audio Player, Engine Control Unit and Video Accelerator.							
Unit – IV	**IOT ARCHITECTURE AND PROTOCOLS**						**9**
Internet – of – Things – Physical Design, Logical Design – IoT Enabling Technologies – Domain Specific IoTs – IoT and M2M – IoT System Management with NETCONF – YANG – IoT Platform Design – Methodology – IoT Reference Model – Domain Model – Communication Model – IoT Reference Architecture – IoT Protocols - MQTT, XMPP, Modbus, CANBUS and BACNet.							
Unit – V	**IOT SYSTEM DESIGN**						**9**
Basic building blocks of an IoT device – Raspberry Pi – Board – Linux on Raspberry Pi – Interfaces – Programming with Python – Case Studies: Home Automation, Smart Cities, Environment and Agriculture.							
							Total:45
TEXTBOOK:							
1.	Marilyn Wolf, Computers as Components – Principles of Embedded Computing System Design, Third Edition, Morgan Kaufmann, 2012. (Unit – I, II, III)						
2.	Raj Kamal, Embedded system: Architecture Programming and Design, TMH Publication, Second Edition, 2008 (Unit – I)						
3.	Arshdeep Bahga, Vijay Madisetti, Internet – of- Things – A Hands-on Approach, Universities Press, 2015. (Unit – IV, V)						

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REFERENCES:	
1.	Mayur Ramgir, Internet – of – Things, Architecture, Implementation and Security, First Edition, Pearson Education, 2020.
2.	Lyla B.Das, Embedded Systems: An Integrated Approach, Pearson Education 2013.
3.	Jane.W.S .Liu, Real – Time Systems, Pearson Education, 2003.

COURSE OUTCOMES: At the end of the course, learners will be able to		Bloom's Taxonomy Level
CO1	Understand the fundamentals of embedded systems, ARM processor instruction sets, and system-level design concepts.	K2
CO2	Analyze embedded computing platforms, program models for efficient embedded system design.	K3
CO3	Explain real-time operating system structures, task scheduling methods and communication in multiprocessor and distributed embedded systems.	K3
CO4	Comprehend IoT architecture, models, and communication protocols.	K2
CO5	Design and implement an IoT based system for any real time application.	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2								2	2
CO2	3	3	3	2	2							1	2	2
CO3	3	3	2	2	2	1							2	2
CO4	3	3	2	2	2	1							2	2
CO5	3	3	2	2	2	1					1	1	2	2

AEC111 - DIGITAL SIGNAL PROCESSING							
Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		4	**PC**	**4**	**1**	**0**	**4**
Preamble	➢ This course will introduce the learners to various filter design and constructing various digital signal processors. ➢ This can be helpful to acquire knowledge on various applications of DSP processor.						
Unit – I	**DISCRETE FOURIER TRANSFORM**						**12**
Sampling Theorem, concept of frequency in discrete-time signals, summary of analysis & synthesis equations for FT & DTFT, frequency domain sampling, Discrete Fourier transform (DFT) - deriving DFT from DTFT, properties of DFT - periodicity, symmetry, circular convolution. Linear filtering using DFT. Filtering long data sequences - overlap save and overlap add method. Fast computation of DFT - Radix-2 Decimation-in-time (DIT) Fast Fourier transform (FFT), Decimation-in-frequency (DIF) Fast Fourier transform (FFT). Linear filtering using FFT.							

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Unit – II	INFINITE IMPULSE RESPONSE FILTERS	12
Characteristics of practical frequency selective filters. characteristics of commonly used analog filters - Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF, BPF, BRF) - Approximation of derivatives, Impulse invariance method, Bilinear transformation. Frequency transformation in the analog domain. Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations.		
Unit – III	**FINITE IMPULSE RESPONSE FILTERS**	**12**
Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form realizations.		
Unit – IV	**FINITE WORD LENGTH EFFECTS**	**12**
Fixed point and floating-point number representation - ADC - quantization - truncation and rounding - quantization noise - input / output quantization - coefficient quantization error - product quantization error - overflow error - limit cycle oscillations due to product quantization and summation - scaling to prevent overflow.		
Unit – V	**INTRODUCTION TO DIGITAL SIGNAL PROCESSORS**	**12**
Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Adaptive Filters: Introduction, Applications of adaptive filtering to equalization-DSP Architecture Fixed and Floating-point architecture principles, Introduction to spectral analysis, wavelets.		
		Total:60

TEXTBOOK:

1.	John G. Proakis and Dimitris G.Manolakis, Digital Signal Processing – Principles, Algorithms and Applications, Fourth Edition, Pearson Education / Prentice Hall, 2007.
2.	A. V. Oppenheim, R.W. Schafer and J.R. Buck, ―Discrete-Time Signal Processing", 8th Indian Reprint, Pearson, 2004.

REFERENCES:

1.	Emmanuel C. Ifeachor& Barrie. W. Jervis, "Digital Signal Processing", Second Edition, Pearson Education / Prentice Hall, 2002.
2.	Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata Mc Graw Hill, 2007.
3.	Andreas Antoniou, "Digital Signal Processing", Tata Mc Graw Hill, 2006.

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Apply DFT for the analysis of digital signals & systems	K3
CO2	Design IIR filters	K4
CO3	Design FIR filters	K4
CO4	Characterize the effects of finite precision representation on digital filters	K4
CO5	Apply adaptive filters appropriately in communication systems and DSP Processors	K3

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CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2			2		1	1	3	1
CO2	3	3	3	3	2	2			2		1	1	3	1
CO3	3	3	2	2	2	2			2		1	1	3	1
CO4	3	3	2	2	3	1			2		1	1	3	1
CO5	3	2	2	2	3	2			2		1	1	3	1

AEC112 - CONTROL SYSTEMS

Programme & Branch	BE & ECE	Sem.	Category	L	T	P	C
		3	PC	3	0	0	3

Preamble	➢ This course aims to introduce to the students the principles and applications of control systems in everyday life. ➢ The basic concept of block diagram reduction, time domain analysis solutions to time invariant systems and deals with the different aspects of stability analysis of systems in time domain and frequency domain

Unit – I	Introduction	9

Concept of control system, Classification of control systems – Open loop and closed loop control systems, Differences, Examples of control systems- Effects of feedback, Feedback Characteristics. Transfer Function Representation: Block diagram algebra, Determining the Transfer function from Block Diagrams, Signal flow graphs (SFG) – Reduction using Mason's gain formula- Transfer function of SFG's.

Unit – II	Time Response Analysis	9

Standard test signals, Time response of first order systems, Characteristic Equation of Feedback control systems, Transient response of second order systems – Time domain specifications, Steady state response, Steady state errors and error constants. PID controllers: Effects of proportional derivative, proportional integral systems on steady state error.

Unit – III	Stability Analysis in S-Domain	9

The concept of stability – Routh-Hurwitz's stability criterion – qualitative stability and conditional stability – Limitations of Routh-Hurwitz's stability. Root Locus Technique: Concept of root locus – Construction of root locus.

Unit – IV	Frequency Response Analysis	9

Introduction, Frequency domain specifications, bode plot diagrams-Determination of Phase margin and Gain margin, Stability analysis from Bode plots, Polar plots.

Unit – V	State Space Analysis of Continuous Systems	9

Concepts of state, state variables and state model, Derivation of state models from block diagrams, Diagonalization, Solving the time invariant state equations, State Transition Matrix and its properties, Concepts of Controllability and observability.

Total:45

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1.	R. Stefani, B. Shahrian, C. Savant & G. Hostetter, "Design of Feedback Control Systems", Oxford University Press, 2002.
2.	K. Ogata, "Modern Control Engineering", Prentice Hall, 1997.
REFERENCES:	
1.	B. C. Kuo & F. Golnaraghi, "Automatic Control Systems", John Wiley, 2003.
2.	M. Gopal, "Control Systems: Principles and Designs", 2nd Edition, McGraw Hill, 2002.
3.	R. C. Dorf & R. H. Bishop, "Modern Control Systems", Prentice Hall, 2000

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Analyze the modeling of linear-time-invariant systems using transfer function and state space forms.	K4
CO2	Apply the system response and stability in both time, domain	K3
CO3	Analyze the system response and stability in frequency domain.	K4
CO4	Apply different types of compensators using in time-domain and frequency domain specifications.	K3
CO5	Analyze the system response and stability of systems represented in state space form	K4

AEC113 - LINEAR INTEGRATED CIRCUITS

Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		4	**PC**	**4**	**1**	**0**	**4**

Preamble	➢ This course aims to focus on the basic principles and characteristics of operational amplifiers (Op-Amps) and their internal circuitry and applications. ➢ To learn the principles and techniques of Analog-to-Digital (A/D) and Digital-to-Analog (D/A) conversion, waveform generators and special function ICs, including timers, voltage regulators, and amplifiers.	
Unit – I	**BASICS OF OPERATIONAL AMPLIFIERS**	**12**
Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages - and internal circuit diagrams of IC 741, Current mirror and current sources, DC and AC performance characteristics, slew rate.		
Unit – II	**APPLICATIONS OF OPERATIONAL AMPLIFIERS**	**12**
Sign Changer, Scale Changer, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Rectifier, Comparators, clipper and clamper, Active LP, HP filters.		
Unit – III	**ANALOG MULTIPLIER AND PLL**	**12**
Analog multiplier ICs and their applications, - Gilbert Multiplier cell – Variable transconductance technique, Operation of the basic PLL, Voltage controlled oscillator, Monolithic PLL IC 565, Application		

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of PLL for AM detection, FM detection, FSK demodulation and Frequency synthesizing.		
Unit – IV	**ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS**	**12**
Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, A/D Converters – specifications - Flash type – Successive Approximation type - Dual Slope type		
Unit – V	**WAVEFORM GENERATORS AND SPECIAL FUNCTION ICS**	**12**
Sine-wave, Square wave, Triangular wave generators, Function generator IC8038, Timer IC 555, IC Voltage regulators - IC 723 general purpose regulator - Audio Power amplifier, Video Amplifier, Isolation Amplifier, SMPS.		
		Total:60

TEXTBOOK:

1.	D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 2018, Fifth Edition. (Unit I – V)
2.	Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", 4th Edition, Tata Mc Graw-Hill, 2016 (Unit I – V)

REFERENCES:

1.	Ramakant A. Gayakwad, "OP-AMP and Linear ICs", 4th Edition, Prentice Hall / Pearson Education, 2015
2.	Robert F.Coughlin, Frederick F.Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth Edition, PHI, 2001
3.	S.Salivahanan & V.S. Kanchana Bhaskaran, "Linear Integrated Circuits", TMH,2nd Edition, 4th Reprint, 2016.

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Design linear and nonlinear applications of OP – AMPS	K3
CO2	Design applications using analog multiplier and PLL	K3
CO3	Design ADC and DAC using OP- Amp	K3
CO4	Generate waveforms using OP – AMP Circuits	K2
CO5	Analyze special function ICs	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-							1	-	2	1
CO2	2	3	3	2							-	-	2	1
CO3	1	-	-	2							-	-	2	1
CO4	1	-	-	2							-	-	2	1
CO5	1	2	3	3							1	3	2	1

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AHS103 - Skill Enhancement – II (APTITUDE & COGNITIVE SKILLS – PHASE - II)							
Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		4	**HS**	**2**	**0**	**0**	**1**
PREAMBLE	This Course aims to ➢ Improve the ability of arithmetic reasoning, quantitative ability. ➢ Prepare effective resumes, emails, and job applications. ➢ Train students in interview and group discussion skills for job placement. ➢ Create awareness on Human Centered Approach. ➢ Focus on preparing Critical thinking and problem-solving experiences.						
UNIT I	**MODERN APTITUDE**						**6**
Permutations– Circular permutations - Permutations with Repetition Allowed- Permutations without Repetition- Combinations- Properties and identities -Combinations with repetition -Committee and team selection Problems - Probability							
UNIT II	**NUMERICAL ESTIMATION & DATA INTERPRETATION - II**						**6**
Partnership-Ratio and Proportion- Time and Distance- Data interpretation: Pie Chart - Line Graphs.							
UNIT III	**ACADEMIC SKILLS**						**6**
Employment Communication: Resume, Importance of Resume, Formats of Resume, Email Writing, Etiquette, Job Application or Cover Letter.							
UNIT IV	**INTERVIEW SKILLS**						**6**
Job Interviews: Definition of Interview, Types of Interviews, Preparatory Steps and Tips for Job Interviews, FAQ During Interviews. **Group Discussion:** Importance of Group Discussions, Types of Group Discussions, topic-based and Case-based Group Discussion, Difference between Group Discussion, Panel Discussion and Debate.							
UNIT V	**DESIGN THINKING - 'US' TOGETHER**						**6**
Project Update – Random Association Method – Brainstorming – Brainstorming Activity – "Yes, and" – "Yes, but" – Journey Mapping – Project Assignment.							
							Total:30
REFERENCES:							
1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal.							
2. Quantum CAT by Sarvesh Verma.							

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3. Soft Skills: an Integrated Approach to Maximise Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India.

COURSE OUTCOMES: **At the end of the course, learners will be able to**	**Bloom's Taxonomy Level**
Apply the principles of permutations and combinations to solve real-life problems involving arrangements, selections, and probability.	K3
Analyze and interpret aptitude-based problems by employing logical reasoning techniques for effective decision-making.	K4
Apply knowledge to write emails, cover letters, and prepare for interviews, analysing and evaluating their performance.	K3
Apply creative problem-solving techniques, including Random Association Method, Brainstorming, and Journey Mapping, to generate innovative solutions and develop effective project plans.	K3

AEC307 - EMBEDDED SYSTEMS AND IOT DESIGN LABORATORY							
Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		4	**PC**	**0**	**0**	**4**	**2**
Preamble	➢ This course will introduce the learners to focus on embedded programming, Arduino, Raspberry Pi. ➢ Help them understand the sensor interfacing, and IoT communication.						
List of Exercises / Experiments:							
1.	Write Basic and arithmetic Programs Using Embedded C.						
2.	Introduction to Arduino platform and programming						
3.	Explore different communication methods with IOT devices (Zigbee, GSM, Bluetooth)						
4.	Introduction to Raspberry PI platform and python programming						
5.	Interfacing sensors with LED						
Experiments using ARM							
6.	Interfacing ADC and DAC						
7.	Blinking of LEDs and LCD						
8.	Interfacing keyboard and Stepper Motor						
Mini projects for IoT							
9.	Garbage Segregator and Bin Level Indicator						
10.	Color-based Product Sorting						
11.	Image Processing based Fire Detection						
12.	Vehicle Number Plate Detection						

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13.	Smart Lock System
	Total: 60

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual
2.	Keil µ vision-ARM Processor

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Develop and execute basic Embedded C programs.	K3
CO2	Demonstrate proficiency in programming and interfacing peripheral devices using Arduino and ARM processors.	K3
CO3	Explore and implement various communication methods.	K3
CO4	Apply Python programming on Raspberry Pi to interface sensors.	K3
CO5	Design and implement a mini project using IoT.	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2								1	1
CO2	3	2	2	2	2							2	1	1
CO3	3	2	2	2	2						2	2	1	1
CO4	3	2	2	2	3							2	1	1
CO5	3	2	2	2	3							2	1	1

AEC308 - DIGITAL SIGNAL PROCESSING LABORATORY

Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		4	**PC**	**0**	**0**	**4**	**2**
Preamble	➢ This course will introduce the learners to various filter designs and construct various digital signal processors. ➢ This can be helpful to acquire knowledge on various applications of DSP processor.						

PRACTICAL EXERCISES:

MATLAB / EQUIVALENT SOFTWARE PACKAGE/ DSP PROCESSOR BASED IMPLEMENTATION

1. Generation of elementary Discrete-Time sequences
2. Linear and Circular convolutions
3. Auto correlation and Cross Correlation
4. Frequency Analysis using DFT
5. Design of FIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operation
6. Design of Butterworth and Chebyshev IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations
7. Study of architecture of Digital Signal Processor
8. Perform MAC operation using various addressing modes

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9. Generation of various signals and random noise
10. Design and demonstration of FIR Filter for Low pass, High pass, Band pass and Band stop filtering
11. Design and demonstration of Butter worth and Chebyshev IIR Filters for Low pass, High pass, Band pass and Band stop filtering
12. Implement an Up-sampling and Down-sampling operation in DSP Processor

TOTAL:60

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Carry out basic signal processing operations	K2
CO2	Demonstrate their abilities towards MATLAB based implementation of various DSP systems	K4
CO3	Analyze the architecture of a DSP Processor	K4
CO4	Design and Implement the FIR and IIR Filters in DSP Processor for performing filtering operation over real-time signals	K3
CO5	Design a DSP system for various applications of DSP	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2			2		1	1	3	1
CO2	3	3	3	3	2	2			2		1	1	3	1
CO3	3	3	2	2	2	2			2		1	1	3	1
CO4	3	3	2	2	3	1			2		1	1	3	1
CO5	3	2	2	2	3	2			2		1	1	3	1

AEC309 - LINEAR INTEGRATED CIRCUITS LABORATORY

Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		4	**PC**	**0**	**0**	**4**	**2**

Preamble

This course will make the learners to

- Understand Op-Amp configurations, design, and test various circuits (amplifiers, filters, oscillators, multivibrators).
- Learn applications of linear ICs (Op-Amps, NE555) in signal processing, power management, and data conversion.

List of Experiments:

1. Inverting, non-inverting and differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier
4. Active lowpass, High pass.

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5. Astable & Monostable multivibrators using Opamp
6. Schmitt Trigger using op-amp.
7. Phase shift and Wien bridge oscillators using Opamp.
8. Astable and Monostable multivibrators using NE555 Timer.
9. Low and high voltage regulator power supply using LM723.
10. Study of SMPS

Experiments using Spice

1. Active lowpass, High pass filter
2. Astable and Monostable multivibrators using NE555 Timer
3. Integrator and Differentiator
4. Schmitt trigger

Total: 60

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual
2.	SPICE

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Apply Op-Amp configurations to understand its applications in amplifiers.	K3
CO2	Apply Op-Amps to design active filters and oscillators.	K3
CO3	Analyze multivibrators using Op-Amps and NE555 Timer using spice tool.	K4
CO4	Apply PLL concepts in frequency multiplication and clock synchronization.	K3
CO5	Apply ICs (LM317, LM723) in DC power supply design.	K3

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	3	-						1	1	2	2
CO2	2	3	3	3	-						1	1	2	2
CO3	2	3	3	3	-						1	1	2	2
CO4	2	3	3	3	2						1	1	2	2
CO5	2	3	-	-	-						-	-	2	2

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

AUTONOMOUS SYLLABUS R2024

CHOICE BASED CREDIT SYSTEM

SEM – V

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ACS110 - COMPUTER NETWORKS							
Programme & Branch	**B. Tech & IT**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		4	**PC**	**3**	**0**	**0**	**3**
Preamble	➢ To understand the protocol layering and physical level communication. ➢ To analyze the performance of a network. ➢ To understand the various components required to build different networks. ➢ To learn the functions of network layer and the various routing protocols. ➢ To familiarize the functions and protocols of the Transport layer.						
Unit - I	**INTRODUCTION AND PHYSICAL LAYER**						**9**
Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.							
Unit - II	**DATA-LINK LAYER & MEDIA ACCESS**						**9**
Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – HDLC– PPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices.							
Unit - III	**NETWORK LAYER**						**9**
Network Layer Services – Packet switching – Performance – IPV4 Addresses – Forwarding of IP Packets - Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol.							
Unit - IV	**TRANSPORT LAYER**						**9**
Introduction – Transport Layer Protocols – Services – Port Numbers – User DatagramProtocol – Transmission Control Protocol – SCTP.							
Unit - V	**APPLICATION LAYER**						**9**
WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP.							
							Total:45
TEXTBOOK:							
1.	Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.						
REFERENCES:							
1.	Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.						
2.	William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.						
3.	Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.						

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4.	Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.
5.	James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach.
6.	Featuring the Internet, Sixth Edition, Pearson Education, 2013.

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Understand the basic layers and its functions in computer networks.	K2
CO2	Evaluate the performance of a network.	K3
CO3	Understand the basics of how data flows from one node to another.	K2
CO4	Analyze and design routing algorithms.	K4
CO5	Understand the working of various application layer protocols.	K2

CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	1	3	1	1	-	-	-	1	3	3	3	2	1	3
CO2	3	1	1	2	2	-	-	-	3	2	1	1	3	1	2
CO3	3	3	2	1	2	-	-	-	3	3	1	2	2	2	2
CO4	1	2	2	3	2	-	-	-	3	1	3	1	1	2	1
CO5	2	2	1	1	3	-	-	-	1	2	2	3	1	3	3

AEC114 - VLSI DESIGN

Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		5	**PC**	**3**	**0**	**0**	**3**

Preamble	➢ This course aims at understanding the basic concepts of Digital CMOS VLSI Circuit by studying Logic design, Physical structure and fabrication of semiconductor devices ➢ How they are combined to build systems for efficient data processing and also it aims at ASIC Physical design flow, including logic synthesis, floor-planning, Placement and Routing. ➢ Students Work from design entry using Verilog code to GDSII file generation of an ASIC.

Unit – I	**MOS TRANSISTOR PRINCIPLES**	**9**

MOS logic families (NMOS and CMOS) - Ideal and Non-Ideal IV Characteristics - CMOS devices. MOS(FET) Transistor Characteristic under Static and Dynamic Conditions - Technology Scaling - power consumption

Unit – II	**COMBINATIONAL LOGIC CIRCUITS**	**9**

Propagation Delays - stick diagram - Layout diagrams - Examples of combinational logic design - Elmore's constant - Static Logic Gates - Dynamic Logic Gates - Pass Transistor Logic - Power

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Dissipation - Low Power Design principles		
Unit – III	**SEQUENTIAL LOGIC CIRCUITS AND CLOCKING STRATEGIES**	**9**
Static Latches and Registers - Dynamic Latches and Registers – Pipelines – Non bistable Sequential Circuits. Timing classification of Digital Systems - Synchronous Design - Self-Timed Circuit Design		
Unit – IV	**INTERCONNECT, MEMORY ARCHITECTURE AND ARITHMETIC CIRCUITS**	**9**
Interconnect Parameters – Capacitance, Resistance, and Inductance - Electrical Wire Models - Sequential digital circuits: adders, multipliers, comparators, shift registers. Logic Implementation using Programmable Devices (ROM, PLA, FPGA) - Memory Architecture and Building Blocks - Memory Core and Memory Peripherals Circuitry		
Unit – V	**ASIC DESIGN AND TESTING**	**9**
Introduction to wafer to chip fabrication process flow - Microchip design process & issues in test and verification of complex chips - embedded cores and SOCs - Fault models - Test coding. ASIC Design Flow - Introduction to ASICs - Introduction to test benches - Writing test benches in Verilog HDL - Automatic test pattern generation - Design for testability - Scan design: Test interface and boundary scan		
		Total:45

TEXTBOOK:

1.	Jan D Rabaey, Anantha Chandrakasan, "Digital Integrated Circuits: A Design Perspective", PHI, 2016. (Units II, III and IV)
2.	Neil H E Weste, Kamran Eshranghian, "Principles of CMOS VLSI Design: A System Perspective," Addison Wesley, 2009. (Units - I, IV).
3.	Michael J Smith," Application Specific Integrated Circuits, Addison Wesley, (Unit - V)
4.	Samir Palnitkar," Verilog HDL: A guide to Digital Design and Synthesis", Second Edition, Pearson Education, 2003. (Unit - V)
5.	Parag K.Lala," Digital Circuit Testing and Testability", Academic Press, 1997, (Unit - V)

REFERENCES:

1.	D.A. Hodges and H.G. Jackson, Analysis and Design of Digital Integrated Circuits, International Student Edition, McGraw Hill 1983
2.	P. Rashinkar, Paterson and L. Singh, "System-on-a-Chip Verification-Methodology and Techniques", Kluwer Academic Publishers,2001
3.	Samiha Mourad and Yervant Zorian, "Principles of Testing Electronic Systems", Wiley 2000
4.	M. Bushnell and V. D. Agarwal, "Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits", Kluwer Academic Publishers, 2000

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom's Taxonomy Level**
CO1	Knowledge of MOS technology in depth	K2
CO2	Understand Combinational Logic Circuits and Design Principles	K2
CO3	Understand Sequential Logic Circuits and Clocking Strategies	K2

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CO4	Understand Memory architecture and building blocks	K2
CO5	Understand the ASIC Design Process and Testing	K2

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	-	-	-	-	-	-	-	-	-	3	3
CO2	3	2	3	2	-	-	-	-	-	-	-	1	3	3
CO3	2	3	2	3	1	1	-	-	-	-	-	2	3	2
CO4	-	-	1	1	-	-	-	-	-	-	-	3	3	3
CO5	-	-	-	-	-	2	-	-	-	-	1	-	3	2

AEC115 - TRANSMISSION LINES AND RF SYSTEMS

Programme & Branch	BE & ECE	Sem.	Category	L	T	P	C
		4	PC	3	0	0	3

Preamble	This course aims to provide students with the technological skills needed in understanding the behaviour of two wire line, planar transmission lines and the design of RF circuits.

Unit – I	**TRANSMISSION LINE THEORY**	**9**

Types, General theory of Transmission lines - the transmission line - general solution - terminated lossless two-wire line – characteristic impedance, propagation constant, input impedance. The infinite line -Wavelength, velocity of propagation - Waveform distortion - the distortion less line.

Unit – II	**HIGH FREQUENCY TRANSMISSION LINES**	**9**

Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of dissipation less line - Reflection losses.

Unit – III	**IMPEDANCE MATCHING IN HIGH FREQUENCY LINE**	**9**

Impedance matching: Quarter wave transformer, One Eighth wave line, Half wave line- Impedance matching by stubs- Single stub matching - Smith chart – Application of Smith chart, Single stub matching using Smith chart.

Unit – IV	**WAVEGUIDES**	**9**

Waves between parallel planes of perfect conductors- Transverse Electric waves and Transverse Magnetic waves, Characteristics of TE, TM and TEM waves, TM and TE waves in rectangular waveguides.

Unit – V	**ACTIVE RF DEVICES**	**9**

Active RF components: Bipolar junction transistors, RF field effect transistors, High electron mobility transistors, RF Amplifiers: power relation, stability considerations, gain considerations and noise figure.

Total:45

TEXTBOOK:

1.	David M. Pozar," Microwave Engineering," John Wiley & Sons, Fourth Edition, 2015.
2.	G. S. N. Raju, Electromagnetic Field Theory and Transmission Lines, Pearson education 2009.
3.	John D Ryder, "Networks lines and fields", Prentice Hall of India, New Delhi,2005.
4.	Annapurna Das, Sisir K. Das, "Microwave Engineering", McGraw Hill Education (India) private

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	limited, Third edition, 2000.
REFERENCES:	
1.	Mathew M. Radmanesh, “Radio Frequency & Microwave Electronics”, Pearson Education Asia, Second Edition, 2002
2.	D. K. Misra, “Radio Frequency and Microwave Communication Circuits”- Analysis and Design, John Wiley & Sons, 2004.
3.	Richard Chi-Hsi Li - , “RF Circuit Design” – A John Wiley & Sons, Inc, Publications
4.	W.Alan Davis, Krishna Agarwal, “Radio Frequency Circuit Design”, John willy & Sons,2001

COURSE OUTCOMES: **At the end of the course, learners will be able to**		**Bloom’s Taxonomy Level**
CO1	Explain the characteristics of transmission lines and its losses.	K2
CO2	Calculate the standing wave ratio and input impedance in high-frequency transmission lines.	K3
CO3	Analyze impedance matching by stubs using Smith Charts.	K2
CO4	Comprehend the characteristics of TE and TM waves.	K3
CO5	Illustrate various RF active devices.	K3

CO/PO	PO 1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1				1		1	2	1
CO2	3	2	2	3	2	1				1		1	2	1
CO3	3	3	3	2	1	2				1		1	2	1
CO4	3	3	2	3	2	1				1		1	2	1
CO5	3	2	3	2	2	1				1		1	2	1

AEC310 - VLSI DESIGN LABORATORY							
Programme & Branch	**BE & ECE**	**Sem.**	**Category**	**L**	**T**	**P**	**C**
		5	**PC**	**0**	**0**	**4**	**2**
Preamble	To build a firm foundation on Digital System Design						
List of Exercises / Experiments:							
1.	Design of basic combinational and sequential (Flip-flops) circuits using HDL. Simulate it using Xilinx/Altera Software and implement it by Xilinx/Altera FPGA						
2.	Design an Adder; Multiplier (Min 8 Bit) using HDL. Simulate it using Xilinx/Altera						

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	Software and implement it by Xilinx/Altera FPGA
3.	Design and implement Universal Shift Register using HDL. Simulate it using Xilinx/Altera Software
4.	Design Memories using HDL. Simulate it using Xilinx/Altera Software and implement it by Xilinx/Altera FPGA
5.	Design Finite State Machine (Moore/Mealy) using HDL. Simulate it using Xilinx/Altera Software and implement it by Xilinx/Altera FPGA
6.	Design a 3-bit synchronous up/down counter using HDL. Simulate it using Xilinx/Altera Software and implement it by Xilinx/Altera FPGA
7.	Design 4-bit Asynchronous up/down counter using HDL. Simulate it using Xilinx/Altera Software and implement it by Xilinx/Altera FPGA
8.	Design and simulate CMOS Basic Gates & Flip-Flops. Generate Manual/Automatic Layout
9.	Design and simulate a 4-bit synchronous counter using Flip-Flops. Generate Manual/Automatic Layout
10.	Design and simulate a CMOS Inverting Amplifier
11.	Design and Simulate basic Common Source, Common Gate and Common Drain Amplifiers
12.	Design and simulate simple 5 transistor differential amplifier
	Total: 60

REFERENCES/MANUAL/SOFTWARE:

1.	Laboratory Manual
2.	CADENCE Software & Xilinx Software

COURSE OUTCOMES: At the end of the course, learners will be able to		**Bloom's Taxonomy Level**
CO1	Write HDL code for basic as well as advanced digital integrated circuit	K4
CO2	Import the logic modules into FPGA Boards	K4
CO3	Synthesize Place and Route the digital Ips	K4
CO4	Design, Simulate and Extract the layouts of Digital & Analog IC Blocks using EDA tools	K4
CO5	Test and Verification of IC design	K4

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	2	3
CO2	3	3	1	1	-	-	-	-	-	-	-	-	2	1
CO3	1	2	2	2	-	-	-	-	-	-	1	1	2	2
CO4	-	1	3	3	1	-	-	-	-	-	1	1	2	2
CO5	3	3	3	3	1	-	-	-	-	-	1	1	2	2

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