SEMESTER – III

Course Code	Category	Course Title	L	T	P	C
Theory						
MA23302	BS	Linear Algebra and Numerical Methods	3	1	0	4
EC23301	PC	Analog Electronics	3	0	0	3
EC23302	PC	Digital Electronics	3	0	0	3
EC23303	PC	Signals and Systems	3	1	0	4
MC23302	MC	Human Values and Gender Equality	2	0	0	0
Theory with Practical						
IT23307	ES	Fundamentals of Data Structures in C	3	0	2	4
Practical						
EC23304	PC	Analog Electronics Laboratory	0	0	2	1
EC23305	PC	Digital Electronics Laboratory	0	0	4	2
GE23301	EE	Professional Development I	0	0	2	1
		TOTAL	**17**	**2**	**10**	**22**

SEMESTER – IV

Course Code	Category	Course Title	L	T	P	C
Theory						
MA23402	BS	Probability and Random Processes	3	1	0	4
EC23401	PC	Analog Integrated Circuits	3	0	0	3
EC23402	PC	Electromagnetic Fields and Waves	3	0	0	3
EC23403	PC	Digital Signal Processing	3	1	0	4
MC23401	MC	Environmental Sciences and Sustainability	2	0	0	0
Theory with Practical						
EC23404	PC	Microprocessor and Microcontrollers	3	0	2	4
Practical						
EC23405	PC	Analog Integrated Circuits Laboratory	0	0	4	2
EC23406	PC	Digital Signal Processing Laboratory	0	0	2	1
GE23401	EE	Professional Development II	0	0	2	1
		TOTAL	**18**	**2**	**10**	**22**

PAVAI ENGINEERING COLLEGE, NAMAKKAL
APPROVED
BOARD OF STUDIES
Electronics & Communication Engineering
8/8/24
AUTONOMOUS

MA23302	LINEAR ALGEBRA AND NUMERICAL METHODS	3	1	0	4

COURSE OBJECTIVES

To enable the students to

1.	apply the dependent and independent relations of vector spaces.
2.	learn and apply the concepts of linear transformation.
3.	apply various numerical techniques for solving algebraic/transcendental equations and system of linear equations.
4.	develop the knowledge of numerical differentiation and numerical integration techniques.
5.	acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I	VECTOR SPACES	12

Vector spaces - Subspaces - Linear combinations and Linear system of equations - Linear dependence and linear independence - Bases and Dimensions.

UNIT II	LINEAR TRANSFORMATION AND INNER PRODUCT SPACES	12

Linear Transformation - Null spaces and ranges - Statement of Dimension theorem - Matrix representation of a linear transformation. Inner product - Norms - Gram Schmidt orthogonalization and orthonormalization process.

UNIT III	SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS	12

Solution of equations - Iteration method: Numerical solution to trancedental equations by Newton Raphson method - Solution of linear system by Gaussian elimination and Gauss - Jordon method - Inverse of a matrix by Gauss Jordon method -Iterative method: Gauss-Seidel method - Eigenvalue of a matrix by power method.

UNIT IV	INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION	12

Interpolations - Newton's forward and backward difference interpolation - Approximation of interpolation polynomials- Divided differences- Lagrangian methods for equal and unequal intervals- Numerical differentiation and integration by trapezoidal and Simpson's 1/3 rules.

UNIT V	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	12

Single step methods: Taylor series method - Modified Euler method for first order equation - Fourth order Runge - Kutta method for solving first order equations - Multistep methods: Milne's and Adam's predictor and corrector methods.

TOTAL PERIODS	60

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	classify the dependent and independent relations of vector spaces.	Understanding (K2)
CO2	explain the knowledge of linear transformation.	Analyzing (K4)
CO3	acquire the basics of algebraic and transcendental equations and their numerical solutions.	Applying (K3)
CO4	apply the interpolation methods for constructing approximate polynomials.	Applying (K3)
CO5	demonstrate the knowledge of numerical differentiation and integration in computational and simulation processes.	Applying (K3)

TEXT BOOKS

1. Friedberg, A.H., Insel, A.J. and Spence, L., "Linear Algebra", Prentice - Hall of India, New Delhi, 2004.
2. M.K.Jain, S.R.K. Iyangar, R.K.Jain, "Numerical Methods for Scientific & Engineering Computation" New Age International (P) Ltd, New Delhi, 2005.

REFERENCES

1. Strang G., Linear Algebra and its applications, Thomson (Brooks/Cole), New Delhi, 2005.
2. Gerald C.F. and Wheatley, P.O., "Applied Numerical Analysis" 6th Edition, Pearson Education Asia, New Delhi, 2002.
3. Erwin Kreyszig., "Advanced Engineering Mathematics" 10th edition, Wiley Publications, 2010.
4. T. Veerarajan and T .Ramachandran, "Numerical Methods with programming in C", 2nd Ed., Tata McGraw-Hill, 2006.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

COs	PO's												PSO's	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	-	-	-	-	-	-	-	3	3	3
CO2	3	3	2	3	-	-	-	-	-	-	-	3	3	3
CO3	3	3	2	3	-	-	-	-	-	-	-	3	3	3
CO4	3	3	2	3	-	-	-	-	-	-	-	3	3	3
CO5	3	3	2	2	-	-	-	-	-	-	-	3	3	3

EC23301	ANALOG ELECTRONICS	3	0	0	3

COURSE OBJECTIVES

To enable the students to

1.	know the methods of transistor biasing.
2.	understand amplifier circuits.
3.	learn the feedback amplifiers and oscillators circuits.
4.	acquire the basics of tuned amplifiers and power amplifiers.
5.	comprehend the concepts of power supplies.

UNIT I	BJT BIASING	9

Transistor Biasing - DC, AC load line, Operating point; Various biasing methods for BJT - Stability factors; Bias compensation techniques; Thermal stability; FET Biasing.

UNIT II	AMPLIFIERS	9

BJT amplifier design - Hybrid equivalent circuits; Analysis of CE, CC and CB Configuration using BJT, Miller's theorem; Frequency response; Multistage amplifiers - Coupling methods, Two stage RC coupled amplifiers; Differential amplifier - Modes of gain, Methods of improving CMRR; MOSFET Amplifiers.

UNIT III	FEEDBACK AMPLIFIERS	9

Basic concepts of feedback - Block diagram, General characteristics of negative feedback, Transfer gain, Cut off frequency with feedback, Effect of negative feedback on input and output resistances; Steps and Design of Feedback Amplifier circuits.

UNIT IV	OSCILLATORS	9

Oscillator - classification, Barkhausen criterion; RC oscillators - RC Phase shift, Wein bridge oscillators; LC oscillators - Hartley, Colpitts Oscillator, Clapp oscillator and Crystal oscillators.

UNIT V	TUNED AMPLIFIERS AND POWER AMPLIFIERS	9

Tuned amplifiers - Classification of tuned amplifiers, Analysis of capacitor coupled tuned amplifier, Effect of cascading of single tuned and Double tuned amplifier on Bandwidth ; Power amplifiers - Class A, Class B, Class AB, Class C, Parameters, Conversion efficiency.

	TOTAL PERIODS	45

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	identify suitable biasing method for BJT.	Understanding (K2)
CO2	design single stage, multistage and differential amplifiers using BJT.	Applying (K3)

CO3	analyze the performance of feedback amplifiers.	Analyzing (K4)
CO4	apply and verify the working of oscillators.	Applying (K3)
CO5	explain the concepts of tuned amplifiers and power amplifiers.	Understanding (K2)

TEXT BOOKS

1. Boylestad L Robert and Nashelsky Louis., "Electronic Devices and circuits", 11th Edition, Prentice Hall of India, New Delhi, 2014.
2. Salivahanan.S, Sureshkumar.N, "Electronic Devices and Circuits", 5th Edition, McGraw Hill, 2022.

REFERENCES

1. John D Ryder, "Electronic fundamentals and Applications: Integrated and Discrete systems", 5th Edition, PHI, 2003.
2. Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic circuits", 6th Edition, Oxford University Press, 2010.
3. David A Bell., "Electronic Devices and Circuits", Prentice Hall of India, New Delhi, 2010.
4. Donald .A. Neamen, "Electronic Circuit Analysis and Design", 2nd edition, Tata McGraw Hill, 2009.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

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

EC23302	DIGITAL ELECTRONICS	3	0	0	3

COURSE OBJECTIVES

To enable the students to

1.	learn the fundamentals of Boolean algebra and digital logic gates.
2.	know the concepts of various combinational circuits.
3.	acquire knowledge about different synchronous sequential circuits.
4.	be familiar with the operation of asynchronous sequential circuits.
5.	gain basic knowledge about memory devices and HDL programming.

UNIT I	BOOLEAN ALGEBRA AND LOGIC GATES	9

Boolean postulates and laws - De-Morgan's Theorem, Principle of Duality; Boolean functions - Sum of Products and Product of Sums, Simplifications of Boolean functions - Karnaugh map minimization, Tabulation method, Don't care Conditions; Logic Function Implementation using gates, NAND, NOR; TTL - NAND, CMOS - NAND, NOR, NOT.

UNIT II	COMBINATIONAL CIRCUITS	9

Design procedure of Combinational circuits - Adders, Subtractors, 4-bit Parallel adder / Subtractor, Carry look ahead adder, BCD adder, Multiplexer, Demultiplexer, Encoder, Decoder, Magnitude Comparator, Parity generator and checker; Code converters.

UNIT III	SEQUENTIAL CIRCUITS	9

Latches; Flip flops - Triggering of Flip-flops, Realization of flip flop using other flip flops; Asynchronous and Synchronous counters; Moore and Mealy; Design of Synchronous counters - Modulo - N counter, Ring counter, Johnson Counter; Shift registers - SISO, SIPO, PISO, PIPO.

UNIT IV	ASYNCHRONOUS SEQUENTIAL CIRCUITS	9

Design of fundamental mode and pulse mode circuits - Primitive flow table, Minimization of Primitive flow table, State assignment, Excitation table; Cycles - Race Free State assignment; Hazards - Static, Dynamic, Essential Hazards, Hazards elimination.

UNIT V	MEMORY DEVICES AND HDL	9

Classification of Memories - ROM Organization, types; RAM Organization, types - Static RAM Cell, Bipolar RAM cell, Dynamic RAM cell; Memory decoding; Memory Expansion; Programmable Logic Devices - PLA, PAL, FPGA; Introduction to HDL - Simple programs Using Verilog HDL.

	TOTAL PERIODS	45

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	apply Boolean functions in digital design.	Applying (K3)
CO2	implement combinational circuits.	Understanding (K2)
CO3	design synchronous sequential circuits.	Applying (K3)
CO4	analyze the types of asynchronous sequential circuits.	Analyzing (K4)
CO5	apply the concepts of Memory, PLDs and Verilog HDL.	Applying (K3)

TEXT BOOKS

1. M. Morris Mano and Michael D. Ciletti, 'Digital Design', Pearson, 6th Edition, 2018.
2. H. Charles Roth Jr, "Digital System Design using VHDL", Thomson/ Brooks cole, 2015.

REFERENCES

1. S. Salivahanan and S. Arivazhagan, "Digital Circuits and Design", 5th Edition, Vikas Publishing House Pvt.Ltd, New Delhi, 2018.
2. John .M Yarbrough, "Digital Logic Applications and Design", Thomson Publications, New Delhi, 2007.
3. Charles H.Roth, "Fundamentals of Logic Design", Thomson Publication Company, 7th Edition, 2013.
4. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 8th edition, Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 2014.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

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

EC23303	SIGNALS AND SYSTEMS	3	1	0	4

COURSE OBJECTIVES

To enable the students to

1.	understand the rudimentary concepts of continuous time and discrete time signals and systems.
2.	gain knowledge in signals and systems utilizing different transforms.
3.	know about the analysis and realization of LTI-Continuous Time systems.
4.	acquire the fundamental cognizance in Sampling and Z transform.
5.	learn the realization of LTI-Discrete time systems.

UNIT I	CLASSIFICATION OF SIGNALS AND SYSTEMS	12

Continuous time signals - Discrete time signals - step, ramp, pulse, impulse, parabola, signum, sine, sinc, exponential; Operation on signals; Classification of CT and DT signals - periodic, aperiodic signals, Energy, Power signals, Even, odd ; CT systems and DT systems - Properties ; LTI system - Properties; Convolution Integral; Convolution sum.

UNIT II	ANALYSIS OF CONTINUOUS TIME SIGNALS	12

Fourier series - definition, properties, analysis; Fourier transform - definition, properties, analysis; Laplace Transform - definition, ROC, properties, Laplace Transform;

UNIT III	LINEAR TIME INVARIANT- CONTINUOUS TIME SYSTEMS	12

Differential Equations - impulse response, Step response, output response ; Block diagram representation - Direct Form I , Direct Form II , Cascade , Parallel realisation.

UNIT IV	ANALYSIS OF DISCRETE TIME SIGNALS	12

Sampling Theorem - Reconstruction, Aliasing; DTFT - properties; Z transform - Region of Convergence, Properties of ROC, Properties of Z transform, Inverse Z transform using Partial fraction method.

UNIT V	LINEAR TIME INVARIANT- DISCRETE TIME SYSTEMS	12

Solution of Difference Equations using Z transforms; Block diagram representation - Direct Form I - Direct Form II, Cascade, Parallel realisation.

TOTAL PERIODS	60

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	apply the basic concepts to solve problems in continuous time, discrete time signals and systems.	Applying (K3)
CO2	analyze continuous-time signals and systems.	Analyzing (K4)

CO3	examine problems and give solutions relating to LTI- continuous time systems.	Applying (K3)
CO4	analyze Sampling theorem and Z transform.	Analyzing (K4)
CO5	solve problems in LTI- discrete time systems.	Applying (K3)

TEXT BOOKS

1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, "Signals and Systems", 2nd edition, Prentice Hall India, 2010.
2. B. P. Lathi, "Principles of Linear Systems and Signals", Oxford, 3rd edition, 2013.

REFERENCES

1. A. NagoorKani, "Signals & Systems", Tata McGraw Hill, 2010.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
3. H P Hsu, Rakesh Ranjan, "Signals and Systems", Schaum's Outlines, Tata McGraw Hill, Indian Reprint 2007.
4. John Alan Stuller, "An Introduction to Signals and Systems", Thomson, 2007.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

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

MC23302	HUMAN VALUES AND GENDER EQUALITY	2	0	0	0

COURSE OBJECTIVES

To enable the students to

1.	define different types of human values and their impact on individual behaviour and societal norms.
2.	apply principles of personal development such as self-confidence, self-discipline, and resilience to navigate modern challenges effectively.
3.	evaluate the role of values in shaping professional ethics, civic sense and global citizenship.
4.	examine the socio-economic factors influencing gender inequality and explore avenues for empowerment and advocacy.
5.	critically analyze prevalent issues and challenges faced by women, including gender-based violence, discrimination, and cultural biases, and propose measures for their eradication.

UNIT I	HUMAN VALUES	6

Value Education - Definition, Types of values; Human values - Acceptance, Consideration. Appreciation, Listening. Empathy, Sympathy, Honesty, Integrity, Wisdom, Decision making, Self- actualization, Character formation towards positive personality, Contentment; - Religious Values - Humility, Compassion, Gratitude. Peace, Justice, Freedom, Equality.

UNIT II	PERSONALITY DEVELOPMENT	6

Personal Development - Introspection, Self-confidence, Self-discipline; Flexibility -Peer pressure - Sensitization towards Gender Equality; Reliability; Unity; Modern Challenges of Adolescent Emotions and behavior - Comparison and Competition, Positive and Negative attitudes; Family values; Self- improvement - Physical exercises, Meditation ,Yoga.

UNIT III	VALUE EDUCATION TOWARDS NATIONAL AND GLOBAL DEVELOPMENT	6

Professional Values -. Integrity, Responsibility, Punctuality, Dedication - Perseverance - Competence; Civic sense and Responsibility; Global Values - Computer Ethics, Moral Leadership, Code of Conduct; Corporate Social Responsibility; Aesthetic values; National Integration and International understanding of Religious Values – Spirituality, thought process.

UNIT IV	GENDER EQUALITY	6

Gender Equality - Definition, Empowerment, Economic Equality; Condition of Women in India- Education, Healthcare, Political Representation, Gender-based Violence; Challenging Stereotypes: Parental and Caregiving Responsibilities; Legal and Policy Reform; Cultural Shifts; Global Perspective; Male Chauvinism; Sustainable Development.

UNIT V	WOMEN ISSUES AND CHALLENGES	6
Women Issues and Challenges - female feticide, violence against women; Domestic violence- dowry related abuse and deaths, Physical violence, Emotional abuse; Sexual assault; Honour killing; Eve-teasing- Stalking, e-stalking (cyber-crime).		
	TOTAL PERIODS	**30**

COURSE OUTCOMES At the end of this course, the students will be able to		**BT MAPPED** (Highest Level)
CO1	discuss the concept of human values and their significance in personal and societal development.	Understanding (K2)
CO2	demonstrate introspective skills to enhance personal growth and self-awareness.	Applying (K3)
CO3	recognize the importance of gender equality in promoting a just and equitable society.	Understanding (K2)
CO4	cultivate a sense of social responsibility and ethical conduct towards achieving national and global development.	Analyzing (K4)
CO5	analyse the challenges faced by women in various spheres and identify strategies for addressing them.	Analyzing (K4)

TEXT BOOKS

1. A Foundation Course in Human Values and Professional Ethics: Presenting a Universal Approach to Value Education - Through Self-exploration. New Delhi, 2016.
2. Aurther, John. Personality Development. Lotus Press, 2018.

REFERENCES

1. Joshi, Dhananjay. Value Education in Global Perspective. Lotus Press, 2014.
2. Mahrotra, Mamta. Gender Inequality in India: Challenging Social Norms. Prabhat Books, 2015.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

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

IT23307	FUNDAMENTALS OF DATA STRUCTURES IN C	3	0	2	4

COURSE OBJECTIVES

To enable the students to

1.	introduce the basics and advanced features of C Programming languages.
2.	learn the concepts of programming in C.
3.	understand the concepts of Abstract Data Types (ADT) and linear data structures.
4.	know the concepts of non-linear data structures.
5.	familiarize the concepts of sorting and searching techniques.

UNIT I	C PROGRAMMING BASICS	9

Structure of a C program – Compilation and Linking Processes, Constants, Variables, Data Types, Expressions Using Operators in C, Managing Input and Output Operations; Decision Making and Branching – Looping Statements; Introduction to Arrays - Declaration, Initialization, One Dimensional Array and Two Dimensional Arrays; String- String Operations - Length, Compare, Concatenate, Copy.

UNIT II	FUNCTIONS, POINTERS, STRUCTURES AND UNIONS	9

Functions – Pass by Value, Pass by Reference, Recursion; Pointers – Definition, Initialization, Pointers Arithmetic; Structures and Unions – Structure - Definition, Structure Within a Structure; Union - Programs using Structures and Unions

UNIT III	LINEAR DATA STRUCTURES	9

Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List Implementation - Singly Linked Lists – Stack ADT – Queue ADT – Evaluating Arithmetic Expressions.

UNIT IV	NON-LINEAR DATA STRUCTURES	9

Trees – Binary Tress – Binary Tree Representation and Traversals – Binary Search Tree - AVL Trees –Graph and Its Representations– Graph Traversals – Representations of Graphs – Breadth First Search – Depth First Search

UNIT V	SEARCHING AND SORTING ALGORITHMS	9

Searching: Linear Search– Sequential Search – Binary Search; Sorting: Bubble Sort – Insertion Sort– Selection Sort- Divide and Conquer: Merge sort– Quick sort.

List of Experiments

1. Basic C Programs – Looping, Arrays and String functions
2. Implementation of Stack and Queue using Arrays and Linked List.
3. Implementation of Binary Search Tree.
4. Implementing of BFS and DFS algorithms.

5. Implementation any Application using Linear Search.
6. Implementation any Application using Binary Search.
7. Implementation of Insertion Sort, Bubble Sort.
8. Implementation of Quick Sort and Merge Sort

TOTAL PERIODS	**75**

COURSE OUTCOMES At the end of this course, the students will be able to		**BT MAPPED** (Highest Level)
CO1	understand the advanced features of C for solving problems	Understanding (K2)
CO2	develop C programs using functions and pointers to solve real world applications	Applying (K3)
CO3	create functions in C to perform operations on linear data structures	Analyzing (K4)
CO4	implement the given problem using non-linear data structure	Applying (K3)
CO5	select and use the sort and search algorithms for a given application	Analyzing (K4)

TEXT BOOKS

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2020.
2. Reema Theraja, "Programming in C", Second Edition, Oxford University Press, 2016.

REFERENCES

1. Brian W. Kernighan, Rob Pike, "The Practice of Programming", Pearson Education, 1999
2. Paul J. Deitel, Harvey Deitel, "C How to Program", Seventh Edition, Pearson Education, 2013.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, 2002.
4. Ellis Horowitz, Sartaj Sahni and Susan Anderson, "Fundamentals of Data Structures", Second Edition, University Press, 2008.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

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

EC23304	ANALOG ELECTRONICS LABORATORY	0	0	2	1

COURSE OBJECTIVES

To enable the students to

1.	gain the knowledge on biasing methods and frequency response of amplifiers.
2.	learn to determine the bandwidth and efficiency of Cascade / Cascode amplifiers.
3.	demonstrate the working principle of oscillators.
4.	simulate amplifiers and oscillators.

LIST OF EXPERIMENTS

1.	Design the biasing methods of fixed bias and Voltage divider bias amplifier using BJT.
2.	Determination of the Frequency response of CE/CB/CC amplifier.
3.	Determination of the bandwidth of Cascade / Cascode amplifier.
4.	Determine the Efficiency of Class A/Class B power amplifier.
5.	Design and implementation of Oscillators.
6.	Simulation of BJT amplifier Configurations (CE/CB/CC) using Multisim/equivalent Software.
7.	Simulation of Oscillators using Multisim/equivalent Software.

TOTAL PERIODS 30

COURSE OUTCOMES At the end of this course, the students will be able to		**BT MAPPED** (Highest Level)
CO1	analyze biasing methods and frequency response of amplifiers.	Analyzing (K4)
CO2	determine the bandwidth of Cascade / Cascode amplifier and Efficiency of Power amplifiers.	Applying (K3)
CO3	design and implement Oscillators for the given frequency.	Applying (K3)
CO4	simulate BJT amplifiers and Oscillators.	Creating (K6)

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

COs	PO's												PSO's	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	-	-	-	-	2	1	-	3	3	3
CO2	3	3	3	1	-	-	-	-	2	1	-	3	3	3
CO3	3	3	3	1	-	-	-	-	2	1	-	3	3	3
CO4	3	3	3	1	3	-	-	-	2	1	-	3	3	3

EC23305	DIGITAL ELECTRONICS LABORATORY	0	0	4	2

COURSE OBJECTIVES

To enable the students to

1.	design and implement adders, subtractors and code converters.
2.	verify the working of various combinational logic circuits.
3.	implement counters and shift registers.
4.	simulate combinational and sequential circuits using Verilog HDL.

LIST OF EXPERIMENTS

1.	Design and implementation of Adders and Subtractors using logic gates.
2.	Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483.
3.	Design and implementation of Binary to Gray and Gray to Binary - Code converters using logic gates.
4.	Design and implementation of 2 Bit Magnitude Comparator using logic gates.
5.	Design and implementation of Multiplexer and De-multiplexer.
6.	Design and implementation of Encoder and decoder.
7.	Construction and verification of 4-bit Ripple counter.
8.	Design and implementation of 3-bit synchronous up / down counter.
9.	Implementation of 4-bit shift registers using Flip flops. (SISO, SIPO, PISO, PIPO).
10.	Design and Simulation of Combinational and Sequential Circuits using Verilog HDL.

TOTAL PERIODS 60

COURSE OUTCOMES At the end of this course, the students will be able to		**BT MAPPED** (Highest Level)
CO1	design adders, subtractors and code converters using basic logic gates.	Applying (K3)
CO2	design and implement various combinational circuits.	Applying (K3)
CO3	design counters and shift registers using Flip Flops.	Applying (K3)
CO4	simulate digital circuits with Verilog HDL.	Applying (K3)

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

COs	PO's												PSO's	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	-	-	-	-	1	1	-	2	3	3
CO2	3	3	2	1	-	-	-	-	1	1	-	2	3	3
CO3	3	3	2	1	-	-	-	-	1	1	-	2	3	3
CO4	3	3	2	1	3	-	-	-	1	1	-	2	3	3

GE23301	PROFESSIONAL DEVELOPMENT I	0	0	2	1

COURSE OBJECTIVES	
To enable the students to	
1.	enhance and evaluate the student's professional skills and introduce the function of corporate world.
2.	enhance and develop the students behavioral, speaking and listening skills to face the interview.
3.	solve advance level verbal aptitude tests to get placed in Tier I companies.
4.	improve their reasoning skills to get placed in reputed companies.

UNIT I	SELF - UNDERSTANDING AND PERSONALITY ENHANCEMENT SKILLS	7

Introduction self-exploration; SWOT analysis - Types and barriers; Effective communication in workplace; Leadership skills; Decision making - Problem solving; Goal setting - Critical, strategic and lateral thinking; JAM level- I; Basic resume building level- I.

UNIT II	BEHAVIOURAL SKILLS, LISTENING AND SPEAKING SKILLS	7

Behavioural skills; Time management; Emotional intelligence; Analytical thinking- Listening; Listening and hearing; Self-introduction; Group discussion - Types and importance, evaluation criteria, do's and don'ts of GD; GD Level-1.

UNIT III	QUANTITATIVE APTITUDE	8

Number System; LCM and HCF; Simple interest and compound interest; Average; Pipes and cisterns; Area; Profit and loss.

UNIT IV	LOGICAL REASONING	8

Series Completion – Letter Series – Symbol Series – Number Series – Arithmetic Reasoning

TOTAL PERIODS	30

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	define and analyze soft skills to improve the leadership skills.	Analyzing (K4)
CO2	demonstrate the behavioral skills through various activities.	Applying (K3)
CO3	develop the problem solving skills through quantitative aptitude.	Applying (K3)
CO4	illustrate the logical reasoning Skills to solve real world problems.	Analyzing (K4)

TEXT BOOKS

1. Agarwal, R.S. "Objective General English", S.Chand & Co.2021.

2. Agarwal, R.S. "Quantitative Aptitude", S.Chand & Co.2021.

REFERENCES

1. Abhijit Guha, "Quantitative Aptitude ", Tata-Mcgraw Hill, 2023.
2. Agarwal, R.S." a modern approach to Verbal & Non Verbal Reasoning", S.Chand & Co Ltd, New Delhi.2021.
3. Word Power Made Easy By Norman Lewis, Wr.Goyal Publications, 2021.
4. Abhijit Guha, "Quantitative Aptitude ", Tata-Mcgraw Hill, 2023.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

COs	PO's												PSO's	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	3	3	2	3	-	3	1	1
CO2	-	-	-	-	-	-	2	3	2	3	-	3	1	1
CO3	3	2	2	2	-	1	-	-	-	-	2	-	2	2
CO4	2	1	3	2	-	3	3	1	-	1	2	-	2	2

MA23402	PROBABILITY AND RANDOM PROCESSES	3	1	0	4
	(Common to BME, ECE)				

COURSE OBJECTIVES

To enable the students to

1.	analyse the concept of probability.
2.	understand the concepts of standard distribution methods.
3.	learn the two-dimensional random variable, correlation and regression.
4.	provide insight into the classification of random process and Markov process.
5.	correlate the function and properties of linear time invariant system.

UNIT I	RANDOM VARIABLES	12

Axioms of probability - Conditional probability - Total probability - Baye's theorem - Random variables- Probability mass function - Probability density function - Properties - Moments - Moment generating functions and their properties.

UNIT II	STANDARD DISTRIBUTION	12

Binomial, Poisson, Geometric, Uniform, Exponential and Normal distribution and their properties.

UNIT III	TWO DIMENSIONAL RANDOM VARIABLES	12

Functions of a random variable - Joint distributions - Marginal and conditional distributions - Covariance - Correlation and Linear regression - Transformation of random variables.

UNIT IV	RANDOM PROCESS AND MARKOV PROCESS	12

Classification - Stationary process (WSS, SSS) - Poisson process - Markov Process - Transition probabilities - Markov Chains - Limiting Distributions.

UNIT V	CORRELATION AND SPECTRAL DENSITIES	12

Auto correlation functions - Cross correlation functions - Properties - Power spectral density - Cross spectral density - Properties. Linear time invariant system - System transfer function - Linear systems with random inputs - Autocorrelation and Cross correlation functions of input and output.

TOTAL PERIODS 60

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	apply the basic probability axioms and concept in the core areas of random phenomena.	Applying (K3)
CO2	assign suitable probability distributions in engineering problems.	Applying (K3)
CO3	apply the concept of two dimensional random variables.	Applying (K3)

CO4	handle random process techniques in solving real life engineering specialization.	Applying (K3)
CO5	analyze the response of random inputs to linear time invariant systems.	Analyzing (K4)

TEXT BOOKS

1. T. Veerarajan, "Probability, Statistics and Random Processes", 2nd edition, Tata McGraw- Hill, New Delhi, 2008.
2. Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 2nd Indian reprint, 2010.

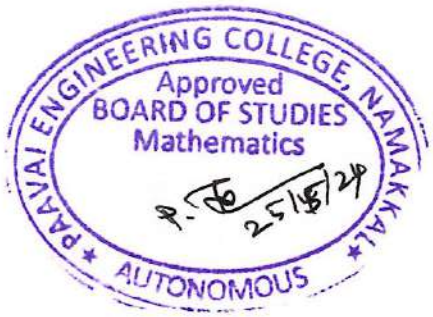
REFERENCES

1. Yates. R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
2. Cooper. G.R., Mc Gillem. C.D., "Probabilistic Methods of Signal and System Analysis", 3rd Indian Edition, Oxford University Press, New Delhi, 2012.
3. Hsu and Hwei, "Schaum's Outline of Theory and Problems of Probability, Random variables and Random Processes", Tata McGraw – Hill, New Delhi, 2008.
4. Leon-Garcia, Albert, "Probability and Random Processes for Electrical Engineering", 2nd ed., Pearson Education, 2008.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

COs	PO's												PSO's	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	-	-	-	-	-	-	-	3	3	3
CO2	3	3	3	2	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	3	3	3
CO4	3	3	2	3	-	-	-	-	-	-	-	3	3	3
CO5	3	3	2	2	-	-	-	-	-	-	-	3	3	3



EC23401	ANALOG INTEGRATED CIRCUITS	3	0	0	3

COURSE OBJECTIVES

To enable the students to

1. understand IC fabrication process and basics of operational amplifier.
2. learn the applications of operational amplifier.
3. be familiar with the working of PLL and active filters.
4. know the principles of Analog to Digital and Digital to Analog Converters.
5. acquire knowledge about special function IC's.

UNIT I	INTEGRATED CIRCUIT FABRICATION AND OPERATIONAL AMPLIFIER	9

Manufacturing process of monolithic IC - Operational amplifier - Basic information of Op-Amps, Ideal and Practical Op-Amp Characteristics, General operational amplifier stages, Open and closed loop configurations, DC Characteristics of Op-Amp, AC Characteristics of Op-Amp - Frequency compensation, Slew rate.

UNIT II	APPLICATIONS OF OPERATIONAL AMPLIFIERS	9

Inverting and Non-inverting voltage amplifiers - Sign changer, Scale changer; Voltage follower; Adder and Subtractor; Instrumentation amplifier; Voltage to Current, Current to Voltage converter; Logarithmic amplifier, Anti-logarithmic amplifiers; Differentiator; Integrator; Comparator; Schmitt trigger; Precision Rectifiers.

UNITIII	PHASE LOCKED LOOP AND ACTIVE FILTERS	9

Phase Locked Loop (PLL) - Basic principles, Phase Detector / Comparator; Voltage controlled Oscillator; Monolithic PLL - PLL applications; Active filters - Design of first and second order Low pass, high pass, band pass filters.

UNIT IV	ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS	9

Digital to Analog Converters - DAC Specifications, Binary weighted resistor type, R-2R ladder type; sample and hold circuits; Analog-to-Digital Converters - ADC Specifications, Flash type ADC, Counter type ADC, Successive approximation register type ADC, Dual slope ADC.

UNIT V	SPECIAL FUNCTION INTEGRATED CIRCUITS	9

Wave Generators - Sine, Square, Triangle, Saw-tooth Wave; IC741; Astable and monostable Multivibrators; IC 555 timer - description, functional diagram, Astable, Monostable operation; Voltage regulator using IC723, LM317.

TOTAL PERIODS	45

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	recognize the characteristics of operational amplifier.	Understanding (K2)
CO2	identify the applications of Operational Amplifier.	Understanding (K2)
CO3	learn the working and design of PLL and filters.	Understanding (K2)
CO4	understand Analog to Digital and Digital to Analog Converters of given specifications.	Understanding (K2)
CO5	design and operate special function IC's for real time applications.	Applying (K3)

TEXT BOOKS

1. D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 6th edition 2021.
2. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", McGraw Hill, 3rd edition 2017.

REFERENCES

1. William D.Stanely, "Operational Amplifiers with Linear Integrated Circuits", Pearson Education, 6th Edition, 2004.
2. David L.Terrell, "Op Amps-Design, Application, and Troubleshooting", Elsevier publications 2005.
3. Ramakant A. Gayakwad, "OP - AMP and Linear IC's", Prentice Hall, 1994.
4. Botkar K.R., "Integrated Circuits", Khanna Publishers, 1996.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

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

EC23402	ELECTROMAGNETIC FIELDS AND WAVES	3	0	0	3

COURSE OBJECTIVES

To enable the students to

1.	be familiar with the fields and potentials due to static charges.
2.	acquire knowledge on the effect of materials in electric fields.
3.	gain knowledge about the parameters of magneto-static fields.
4.	learn about time varying fields and Maxwell's Equation derivation.
5.	understand the propagation of waves in different media.

UNIT I	ELECTROSTATIC FIELDS	9

Co-ordinate systems ; Vector differential operators; Coulombs law; Divergence theorem; Stokes theorem; Electric field intensity - charge distribution, electric flux density - Applications of Gauss's law, Electric potential, Electric dipole, Energy and Energy density.

UNIT II	ELECTRIC FIELDS IN MATERIAL SPACE	9

Properties of materials; Convection, Conduction, displacement current; Conductors - Resistance; Polarization in dielectrics - Dielectric constant, Dielectric strength; Uniqueness theorem; Continuity equation, relaxation time; Boundary conditions; Poisson's and Laplace's equation - General procedure for solving Poisson's and Laplace's equation; Capacitance - Types of capacitors.

UNIT III	MAGNETOSTATIC FIELDS	9

Biot- Savart'slaw - Magnetic flux Density, Field intensity; Ampere's circuit law - applications of Ampere's Law, Magnetic scalar, vector potentials; Force due to magnetic fields - Magnetic Torque, magnetic moment; Magnetic boundary conditions; Inductors and Inductances - magnetic energy, magnetic circuits.

UNIT IV	TIME VARYING FIELDS AND MAXWELL'S EQUATIONS	9

Faraday's law -Transformer, motional Electromotive forces; Effect of Displacement current; Maxwell's equation in final forms; time varying potentials; time harmonic fields.

UNIT V	ELECTROMAGNETIC WAVE PROPAGATION	9

Plane Wave propagation - Lossy dielectric, lossless dielectrics, free space, good conductors; Power and Poynting vector; Reflection of plane waves - normal incidence; Application-microwave oven.

TOTAL PERIODS	45

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	determine the field potentials due to static changes.	Understanding (K2)

CO2	analyze the effect of field on materials and solve boundary value problems.	Analyzing (K4)
CO3	find out field intensity due to magneto static fields.	Analyzing (K4)
CO4	interpret Maxwell's equations for time varying electromagnetic fields for different media.	Understanding (K2)
CO5	explain the propagation of waves in different medias.	Understanding (K2)

TEXT BOOKS

1. Mathew.N.O. Sadiku, "Principles of Electromagnetics", Oxford University Press, 6th Edition, 2015.
2. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", Prentice-Hall of India, 2nd edition, 2015.

REFERENCES

1. Kraus, Fleisch, "Electromagnetics with Applications", McGraw-Hill, 5th Edition, 2017.
2. David. K. Cheng, "Field and wave Electromagnetics", 2nd edition, Pearson education, 2014.
3. Karl E. Longman and Sava V. Savov, "Fundamentals of Electro-Magnetics", Prentice Hall of India, 2006.
4. W.H. Hayt and A. Buck, "Engineering Electromagnetics", 9th Edition, McGraw Hill, 2020.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

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

EC20403	DIGITAL SIGNAL PROCESSING	3	1	0	4

COURSE OBJECTIVES	
To enable the students to	
1.	infer the concepts of Discrete Fourier Transform.
2.	know the characteristics and design of IIR filters.
3.	understand the characteristics of FIR filters for filtering the undesired signals.
4.	impart knowledge on the effects of finite word length.
5.	inculcate the concepts of digital signal processor and its applications.

UNIT I	DISCRETE FOURIER TRANSFORM	12

DFT and its properties, Relation between DTFT and DFT, FFT algorithms - Radix-2 FFT algorithm, Decimation in time, Decimation in Frequency algorithms; Linear and circular convolution - overlap add and save methods.

UNIT II	INFINITE IMPULSE RESPONSE FILTERS	12

Review of design of Analog Butterworth and Chebyshev filters, Frequency transformation in Analog domain - Design of IIR Digital Filters using impulse invariance technique - Design of Digital filters using Bilinear Transform - Pre-warping.

UNIT III	FINITE IMPULSE RESPONSE FILTERS	12

Symmetric and Anti-Symmetric FIR Filters, Linear Phase FIR filters - Design using Rectangular, Hamming and Hanning Windows - Frequency Sampling Method - FIR filter structure: Linear phase structure.

UNIT IV	FINITE WORD LENGTH EFFECTS	12

Fixed Point and Floating Point Number Representations - ADC , Quantization, Truncation and Rounding Errors; Quantization noise - Input and Output Quantization - Coefficient Quantization Error, Product Quantization Error, Overflow Error; Limit Cycle Oscillations - Scaling to prevent overflow.

UNIT V	DSP PROCESSOR AND ITS APPLICATIONS	12

Overview of Digital Signal Processors, Selecting Digital Signal Processors, Applications of PDSPs – Communication Systems, Audio Signal Processing, Control and Data Acquisition, Biometric Information Processing, Image/Video Processing. Von Neumann Architecture, Harvard Architecture, VLIW Architecture, Multiply Accumulate Unit (MAC), Pipelining, Architecture of TMS320C50 – Bus structure, Central Processing Unit, On-chip memory, On-chip peripherals.

TOTAL PERIODS	60

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	apply the basic concepts to solve problems in continuous time, discrete time signals and systems.	Applying (K3)
CO2	analyze continuous-time signals and systems.	Analyzing (K4)

CO3	examine problems and give solutions relating to LTI- continuous time systems.	Applying (K3)
CO4	analyze Sampling theorem and Z transform.	Analyzing (K4)
CO5	solve problems in LTI- discrete time systems.	Applying (K3)

TEXT BOOKS

1. John G. Proakis & Dimitris G.Manolakis, "Digital Signal Processing - Principles, Algorithms & Applications", 4th Edition, Pearson Education / Prentice Hall, 2014.
2. P.Ramesh Babu "Digital Signal Processing", 6th Edition, Scitech-2017.

REFERENCES

1. Emmanuel C.Ifeachor, & Barrie.W.Jervis, "Digital Signal Processing", 2nd Edition, Pearson Education / Prentice Hall, 2002.
2. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata McGraw Hill, 4th Edition, 2013.
3. A.V.Oppenheim, R.W. Schafer and J.R. Buck, "Discrete-Time Signal Processing", 1st Edition, Pearson, 2015.
4. P.Ramesh Babu "Digital Signal Processing", 6th Edition, Scitech, 2015.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

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

MC23401	ENVIRONMENTAL SCIENCES AND SUSTAINABILITY	2	0	0	0

COURSE OBJECTIVES	
To enable the students to	
1	establish the knowledge of precious resources of the environment and their various impacts.
2	create awareness on ecosystem and biodiversity preserve.
3	learn scientific and technological solutions to current day pollution issues.
4	analyze climate changes, concept of carbon credit and the challenges of environmental management.
5	understand green materials, energy cycles and the role of sustainable urbanization.

UNIT I	ENVIRONMENT AND NATURAL RESOURCES	6

Definition, scope and importance of Environment. Forest resources: Use and over-exploitation, deforestation, - mining, dams and their effects on forests and tribal people. Water resources: Use and over- utilization of surface and ground water, dams-benefits and problems. Food resources: effects of modern agriculture, fertilizer-pesticide problems. Role of an individual in conservation of natural resources.

UNIT II	ECOSYSTEMS AND BIODIVERSITY	6

Concept of an ecosystem: Structure and function of an ecosystem - ecological succession - food chains and food webs. Ecosystems- Types of ecosystem: Introduction - forest ecosystem and lake ecosystems. Biodiversity: Introduction - definition (genetic - species - ecosystem). Diversity - Value of biodiversity - Hotspots of biodiversity - Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT III	ENVIRONMENTAL POLLUTION	6

Pollution: Définition - air pollution - water pollution - marine pollution - noise pollution. Solid waste management: Causes - effects - control measures of urban and industrial wastes. Role of an individual in prevention of pollution - Electronic waste -Sources-Causes and its effects- Pollution case studies-Field study of local polluted site – Industrial/Agricultural

UNIT IV	SUSTAINABILITY AND ENVIRONMENT	6

Sustainability - from unsustainability to sustainability-millennium development goals, and protocols. Sustainable development goals-targets, indicators and intervention areas. Climate change— acid rain - ozone layer depletion. Regional and local environmental issues and possible solutions-case studies. Concept of carbon credit, carbon footprint. Environmental management in industry-A case study.

UNIT V	SUSTAINABILITY PRACTICES	6

Zero waste and R concept, Circular economy, ISO 14000 Series, Environmental Impact Assessment - Sustainable energy: Non-conventional Sources, Green materials, Energy Cycles - carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio economical and technological change.

	TOTAL PERIODS	30

COURSE OUTCOMES		
At the end of this course, students will be able to		**BT Mapped (Highest Level)**
CO1	find the method of conservation of natural resources	Understanding (K2)
CO2	understand ecosystem and the conservation of biodiversity.	Understanding (K2)
CO3	aware of environmental pollution and interpret its effects.	Understanding (K2)
CO4	apply sustainable development for technological advancement and societal development.	Applying (K3)
CO5	measure the sustainability practices for green energy cycles.	Analyzing (K4)

TEXT BOOKS

1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, 1st edition, 2017.
2. Gilbert M. Masters, Wendell P. Ela " Introduction to Environmental Engineering and Science", 3rd edition, Pearson, 2022.

REFERENCES

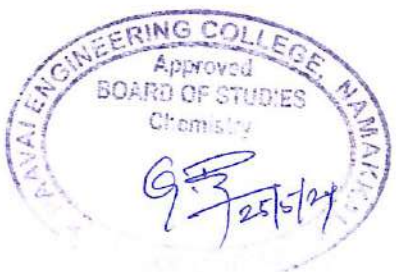
1. William P. Cunningham and Mary Ann Cunningham, "Environmental Science: A Global Concern", McGraw Hill, 16th edition, 2023.
2. C. S. Rao, Environmental Pollution and Control engineering, New Age International (P) ltd Publication, New Delhi, 4th edition, 2021.
3. Erach Bharucha, "Textbook of Environmental Studies", Universities Press Pvt. Ltd., edition, 2020.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 4th Edition, 2015.

CO-PO MAPPING :

Mapping of Course Outcome (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes PSO's

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

CO's	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	-	1	-	-	-	2	-	-	1	1	-	-	2	1
CO2	-	2	-	-	1	1	-	1	-	-	-	-	2	1
CO3	2	-	1	1	-	-	-	2	-	-	-	2	2	1
CO4	-	2	-	-	1	-	3	1	1	-	1	1	2	1
CO5	2	2	-	1	-	-	2	1	-	-	-	1	2	1



EC23404	MICROPROCESSOR AND MICROCONTROLLERS	3	0	2	4

COURSE OBJECTIVES	
To enable the students to	
1.	know the basic knowledge about 8086 Microprocessor.
2.	understand the bus architecture of 8086 Microprocessor.
3.	learn the architecture of 8051 microcontroller.
4.	design a microcontroller-based system.
5.	understand the concepts of PIC 16F8XX Flash Microcontroller.

UNIT I	8086 MICROPROCESSOR	9

8086 Microprocessor - Pin Configuration, Architecture, addressing modes, Instruction set, assembler directives, Assembly language programming.

UNIT II	8086 SYSTEM BUS STRUCTURE	9

8086 signals - Basic configurations, System bus timing, System design using 8086; IO programming; Introduction to Multiprogramming - System Bus Structure, Multiprocessor configurations, Coprocessor, Closely coupled and loosely Coupled configurations; Introduction to advanced processors.

UNIT III	8051 MICROCONTROLLER	9

Comparison of microprocessor and microcontroller; 8051 - Architecture, Special Function Registers (SFRs), I/O Ports and circuits, External Memory, Instruction set, Addressing modes, Assembly language programming.

UNIT IV	IO INTERFACING AND MICROCONTROLLER APPLICATONS	9

Timers / Counter, Serial Communication, LED, Push Button, Relays and Latch Connections, LCD, Keyboard/Display controller, ADC, Automation and Control Application.

UNIT V	PIC 16F8XX FLASH MICROCONTROLLER	9

PIC16F877A Architecture, Pin Diagram, Status Register, Option Register, Power Control Register, Memory organization , Data EEPROM and Flash Program EEPROM, Timers - I/O ports - Interrupts in 16F877.

LIST OF EXPERIMENTS

Assembly Language programming using 8086 Microprocessor

1.	Basic arithmetic and Logical operations.
2.	Move a data block without overlap.
3.	String manipulations.
4.	Sorting and searching.
5.	Basic arithmetic and Logical operations.

6.	Stepper Motor interfacing.
7.	Traffic Light controller.
	TOTAL PERIODS 75

COURSE OUTCOMES At the end of this course, the students will be able to		**BT MAPPED** (Highest Level)
CO1	perform the operations of 8086 microprocessor.	Applying (K3)
CO2	describe the operations of 8086 microprocessor bus architecture.	Understanding (K2)
CO3	execute 8051 microcontroller basic operations.	Applying (K3)
CO4	elucidate and implement interfacing with 8051 microcontroller.	Applying (K3)
CO5	explain the concepts of PIC 16f877 and its I/O port connections.	Understanding (K2)

TEXT BOOKS

1. Barry B.Brey, "The Intel Microprocessors Arcitecture, Programming and Interfacing", Pearson, 8th Edition, 2012.
2. Ajay V Deshmukh, "Microcontrollers Theory and Applications", Tata Mcgraw - Hill, 2010.

REFERENCES

1. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and Applications with 8085". Penram International Publishing reprint, 6th Edition, 2017.
2. Krishna Kant, Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051 and 8096, PHI, 2007, Seventh Reprint, 2011.
3. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay," The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011.
4. Kenneth J. Ayala., "The 8051 Microcontroller", 3rd Edition, Thompson Delmar Learning, 2012.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

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

EC23405	ANALOG INTEGRATED CIRCUITS LABORATORY	0	0	4	2

COURSE OBJECTIVES

To enable the students to

1.	understand the applications of operational amplifier.
2.	learn the working of filters, multi-vibrators and oscillators using operational amplifier.
3.	realize multivibrators using NE555, Voltage Regulators and PLL applications.
4.	simulate the Op-Amp applications.

LIST OF EXPERIMENTS

1.	Inverting, Non-inverting amplifier and differential amplifier.
2.	Instrumentation amplifier.
3.	Integrator and Differentiator.
4.	Active low pass, High pass and band pass filters.
5.	Astable, Monostable Multivibrators and Schmitt trigger (using IC 741).
6.	Phase shift Oscillator and Wien bridge oscillators (using IC 741).
7.	Astable and monostable Multivibrators using NE555 Timer.
8.	Voltage regulators using IC723 and LM317.
9.	Phase Locked Loop application.
10.	Simulation of Instrumentation amplifier, Integrator, Differentiator, Multivibrator and Oscillator.

TOTAL PERIODS 60

COURSE OUTCOMES At the end of this course, the students will be able to		**BT MAPPED** (Highest Level)
CO1	demonstrate the applications of operational amplifier.	Applying (K3)
CO2	analyze the working of filters, multivibrators and oscillators using operational amplifier.	Applying (K3)
CO3	design Multivibrator using NE555, Voltage Regulators and PLL applications.	Applying (K3)
CO4	simulate the Op-Amp applications.	Analyzing (K4)

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

COs	PO's												PSO's	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	-	3	2
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	2
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	2
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	2

EC23406	DIGITAL SIGNAL PROCESSING LABORATORY	0	0	2	1

COURSE OBJECTIVES

To enable the students to

1.	generate the basic types of signals using SCILAB.
2.	practice Linear and Circular Convolution using MATLAB.
3.	understand concepts of DFT, FIR and IIR filters.
4.	know the concepts of Decimation and interpolation.

LIST OF EXPERIMENTS

1.	Generation of Basic types of Signals.
2.	Linear Convolution.
3.	Circular Convolution.
4.	Spectrum Analysis using DFT.
5.	FIR filter design.
6.	IIR filter design.
7.	Decimation and interpolation.

TOTAL PERIODS 30

COURSE OUTCOMES At the end of this course, the students will be able to		**BT MAPPED** (Highest Level)
CO1	generate basic types of signals.	Applying (K3)
CO2	perform Linear and Circular Convolution.	Applying (K3)
CO3	analyse DFT, FIR and IIR filters.	Applying (K3)
CO4	demonstrate Decimation and interpolation.	Applying (K3)

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

COs	PO's												PSO's	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	3	-	-	-	3	-	-	3	3	3
CO2	3	2	3	2	3	-	-	-	3	-	-	3	3	3
CO3	3	2	3	2	3	-	-	-	3	-	-	3	3	3
CO4	3	2	3	2	3	-	-	-	3	-	-	3	3	3

GE23401	PROFESSIONAL DEVELOPMENT II	0	0	2	1

COURSE OBJECTIVES	
To enable the students to	
1.	enhance their own behavioural skills to survive in corporate world.
2.	evaluate their listening and speaking skills to face the interviews in a successful way.
3.	solve advance level verbal aptitude tests to get placed in Tier I companies.
4.	improve their reasoning skills to get placed in reputed companies.

UNIT I	WRITING SKILLS	7
Email writing; Fixing and cancelling appointments; Paper submission for seminars and conferences; Business communication; Stress management; Body language; Dress code; Self-introduction II; Update resume building II; JAM level -3.		
UNIT II	**PRESENTATION SKILLS**	**7**
Presentation skills - Types and methods of delivering presentation, ways and methods to improve presentation skills; Mini presentation in smaller groups; Situational role play; Face to face interview; Group discussion level IL; JAM Level-4.		
UNIT III	**QUANTITATIVE APTITUDE - I**	**8**
Simplification; Time, speed and distance; Trains; Boats and streams; Ratio and proportion; Partnership; Percentage.		
UNIT IV	**LOGICAL REASONING**	**8**
Seating arrangement; Arithmetic reasoning; Character puzzle; Syllogisms; Matching definitions; Statements and arguments.		
	TOTAL PERIODS	**30**

COURSE OUTCOMES At the end of this course, the students will be able to		BT MAPPED (Highest Level)
CO1	interpret the personality development through various activities.	Understanding (K2)
CO2	examine speaking and listening skills to excel in their jobs.	Analyzing (K4)
CO3	develop the quantitative skills and analytical skills to face the interview.	Applying (K3)
CO4	extend the reasoning abilities by scoring exceeded percentage to get placed in reputed companies.	Understanding (K2)

TEXT BOOKS

1. Agarwal, R.S. "Objective General English", S.Chand & Co.2021.
2. Agarwal, R.S. "Quantitative Aptitude", S.Chand & Co.2021.

REFERENCES

1. Abhijit Guha, "Quantitative Aptitude ", Tata-Mcgraw Hill, 2023.
2. Agarwal, R.S." a modern approach to Verbal & Non Verbal Reasoning", S.Chand & Co Ltd, New Delhi.2021.
3. Word Power Made Easy By Norman Lewis, Wr.Goyal Publications, 2021.

CO-PO MAPPING :

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's) (1/2/3 indicates the strength of correlation) 3 – Strong , 2 – Medium , 1 – Weak

COs	PO's												PSO's	
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CO1	-	-	-	-	-	-	3	3	2	3	-	3	1	2
CO2	-	-	-	-	-	-	2	3	2	3	-	3	1	2
CO3	3	2	2	-	-	1	-	-	-	-	2	-	2	2
CO4	2	3	3	2	-	3	3	1	-	1	2	-	2	2
CO5	-	-	-	-	-	-	3	3	2	3	-	3	1	2