PAAVAI ENGINEERING COLLEGE, NAMAKKAL - 637 018

(AUTONOMOUS)

B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

ACADEMIC REGULATIONS – 2019

CHOICE BASED CREDIT SYSTEM

SEMESTER III

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1	BS	MA19302	Linear Algebra and Partial Differential Equations	3	1	0	4
2	ES	IT19304	Fundamentals of Data structures in C	3	0	0	3
3	PC	EC19301	Analog Electronics	3	0	0	3
4	PC	EC19302	Digital Electronics	3	0	0	3
5	PC	EC19303	Electromagnetic Fields and Waves	3	0	0	3
6	MC	MC19301	Value Education	2	0	0	0
Practicals							
7	PC	EC19304	Analog Electronics Laboratory	0	0	4	2
8	PC	EC19305	Digital Electronics Laboratory	0	0	4	2
9	ES	IT19307	Fundamentals of Data structures in C laboratory	0	0	4	2
			TOTAL	**17**	**1**	**12**	**22**

SEMESTER IV

S.No.	Category	Course Code	Course Title	L	T	P	C
Theory							
1	BS	MA19402	Probability and Random processes	3	1	0	4
2	ES	EC19401	Control Systems	3	0	0	3
3	PC	EC19402	Signals and Systems	3	1	0	4
4	PC	EC19403	Linear Integrated Circuits	3	0	0	3
5	PC	EC19404	Microprocessors and Microcontrollers	3	0	0	3
6	MC	MC19401	Environmental Science and Engineering	3	0	0	0

Practicals							
7	PC	EC19405	Linear Integrated Circuits Laboratory	0	0	4	2
8	PC	EC19406	Microprocessors and Microcontrollers Laboratory	0	0	4	2
9	EE	EN19401	English Proficiency Course laboratory	0	0	2	1
			TOTAL	**18**	**2**	**10**	**22**

MA19302	LINEAR ALGEBRA AND PARTIAL DIFFERENTIALEQUATIONS	3	1	0	4

OBJECTIVES

To enable the students to

- apply the dependent and independent relations of vector spaces.
- learn and apply the concepts of linear transformation and diagonalisation.
- solve Fourier series and analyze the representation of periodic functions
- formulate and solve partial differential equations.
- use mathematical tools for the solution of PDEs that model several physical processes
- apply the dependent and independent relations of vector spaces.

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 – Dimension theorem; Matrix representation of a linear transformations; Review of Eigen values and Eigen vectors; Diagonalizability; Inner product, norms; Gram Schmidt orthogonalization process; Adjoint of linear operations; Least square approximation.

UNIT III FOURIER SERIES **12**

Dirichlet's conditions; General Fourier series; Odd and even functions; Half range series; Complex form of Fourier Series; Parseval's identity; Harmonic Analysis.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS **12**

Formation of partial differential equations; Lagrange's linear equation; Solutions of four standard types of first order partial differential equations; Linear partial differential equations of second order with constant coefficients.

UNIT V FOURIER SERIES SOLUTION TO PARTIAL DIFFERENTIAL EQUATIONS **12**

Solutions of One-dimensional wave and heat equation; Steady state two-dimensional heat equation.

TOTAL PERIODS: 60

OUTCOMES

At the end of the course, the students will be able to

- employ the dependent and independent relations of vector spaces.
- demonstrate the knowledge of linear transformation and diagonalisation.

- derive Fourier series, their possible forms of representations of periodic functions
- formulate and solve partial differential equations
- solve certain boundary value problems and apply the methods and results in engineering applications.

TEXT BOOKS

1. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012.
2. Friedberg, A.H., Insel, A.J. and Spence, L., Linear Algebra‖, Prentice - Hall of India, New Delhi, 2004.
3. Narayanan S., ManickavasagamPillai.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" ,Vol. II & III, S.Viswanathan Publishers Pvt Ltd. 1998.

REFERENCE BOOKS

1. Kumaresan, S., Linear Algebra – A geometric approach‖, Prentice – Hall of India, New Delhi, Reprint, 2010.
2. Strang, G., Linear Algebra and its applications‖, Thomson (Brooks/Cole), New Delhi, 2005.
3. Larry C. Andrews, Bhimsen K. Shivamoggi, "Integral Transforms for Enginears", SPIE Optical Engineering press, Washington USA (1999).
4. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company limited, New Delhi (2010).
5. Erwin Kreyszig., "Advanced Engineering Mathematics" 10th Edition,Wiley Publications.

CO/PO MAPPING

(1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO5	3	3	3	-	-	-	-	-	-	-	-	-	3	3

IT19304 **FUNDAMENTALS OF DATA STRUCTURES IN C** **3 0 0 3**

COURSE OBJECTIVES

To enable students to

- introduce the basics of C programming language.
- learn the concepts of advanced features of C.
- understand the concepts of ADTs and linear data structures.
- know the concepts of non-linear data structure and hashing.
- 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; Storage classes - Pre-processor directives.

UNIT III LINEAR DATA STRUCTURES **9**

Abstract Data Types (ADTs) - Arrays and its representations; Stacks and Queues - Linked lists - Linked list-based implementation of Stacks and Queues, Evaluation of Expressions, Linked list based polynomial addition.

UNIT IV NON-LINEAR DATA STRUCTURES **9**

Trees - Binary Trees, Binary tree representation and traversals; Binary Search Trees - Applications of trees. Set representations - Union, Find operations; Graph and its representations - Graph Traversals.

UNIT V SEARCHING AND SORTING ALGORITHMS **9**

Searching - Linear Search, Binary Search; Sorting - Bubble Sort, Insertion sort, Merge sort, Quick sort; Hash tables - Overflow handling.

TOTAL PERIODS **45**

COURSE OUTCOMES

At the end this course, students will be able to

- develop C programs for any real world/technical application.
- apply advanced features of C in solving problems.
- write functions to implement linear data structure operations.

- implement the given problem using non–linear data structure.
- appropriately use sort and search algorithms for a given application.

TEXT BOOKS

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 1997.
2. Reema Thareja, "Programming in C", Second Edition, Oxford University Press, 2016.

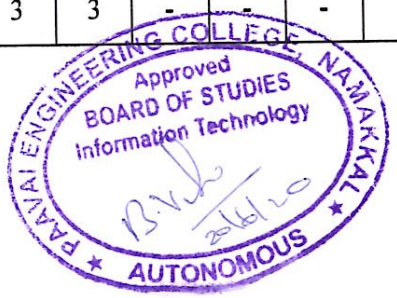
REFERENCES

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,1983.
4. Ellis Horowitz, Sartaj Sahni and Susan Anderson, "Fundamentals of Data Structures", Galgotia, 2008.

CO/PO MAPPING

(1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak

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



EC19301 **ANALOG ELECTRONICS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- understand the methods of transistor biasing.
- design the various amplifier circuits.
- analyze the feedback amplifiers and oscillators circuits.
- explore the basics of tuned amplifiers and power amplifiers.
- acquire the concepts of power supplies and filters.

UNIT I BJT BIASING **9**

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

UNIT II AMPLIFIERS **9**

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

UNIT III FEEDBACK AMPLIFIERS AND OSCILLATORS **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 ; Oscillator - classification, Barkhausen criterion; Analysis of RC oscillators - RC Phase shift ,Wein bridge oscillators ; LC oscillators - Hartley, Colpitts Oscillator.

UNIT IV 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 - Direct Coupled Class A, Complementary Symmetry Class B, Class C Power Amplifier, Parameters, Conversion efficiency.

UNIT V POWER SUPPLIES, RECTIFIERS AND FILTERS **9**

Linear Mode Power Supply; Half wave, Full wave Rectifiers, parameters; Filters - L, C, LC, CLC or π filters; Series and Shunt Voltage Regulators; Switched mode power supply (SMPS).

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, the student will be able to

- identify suitable biasing method for BJT and FET.
- design different BJT,Multistage and differential amplifiers.
- analyze the performance of feedback amplifiers and oscillators.
- apply and verify the concepts of Power amplifiers and tuned amplifiers.
- apply the concepts of devices to design DC power supplies and filters.

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", 3rd edition, McGraw Hill, 2014.

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

(1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak

CO	Programme Outcomes (PO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
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

EC19302 **DIGITAL ELECTRONICS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- understand the fundamentals of boolean algebra and digital logic gates
- design the various combinational circuits.
- verify synchronous sequential circuits using flip-flop.
- analyze asynchronous sequential circuits.
- acquire 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 -Minimization of Boolean functions, Karnaugh map minimization, Tabulation method; Don't care Conditions; Logic Gates Implementations - Logic Functions using gates, NAND, NOR; TTL - CMOS, NAND, NOR, NOT; Tristate gates.

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**

Flip flops - Triggering of Flip-flops, Realization of flip flop using other flip flops; Asynchronous and Synchronous counters; Classification of sequential circuits - Moore and Mealy; Design of Synchronous counters- Modulo - N counter; Shift registers.

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; ASM Chart; Hazards - Static, Dynamic, Essential Hazards, Hazards elimination.

UNIT V MEMORY DEVICES AND INTRODUCTION TO 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

Upon the completion of the course, the students will be able to

- use boolean functions in digital design.
- implement various combinational circuits.
- design different synchronous sequential circuits for real time applications.
- identify the effect of hazards in asynchronous sequential circuits.
- compile the digital logic circuits using Verilog HDL.

TEXT BOOKS

1. M. Morris Mano, "Digital Design", 3rd edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2003 Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
2. H. Charles Roth Jr, "Digital System Design using VHDL", Thomson/ Brookscole, 2005.(Unit V)

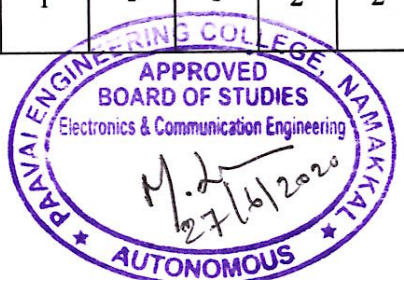
REFERENCES

1. S. Salivahanan and S. Arivazhagan, "Digital Circuits and Design", 3rd Edition, Vikas Publishing House Pvt.Ltd, New Delhi, 2007.
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, 2003.
4. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 5th edition, Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 2003. New Delhi, 2003.

CO/PO MAPPING

(1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak

CO	Programme Outcomes (PO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	2	2	-	-	1	-	-	2	2	2
CO2	3	2	2	2	2	2	-	-	1	-	-	2	2	2
CO3	3	2	2	2	2	2	-	-	1	-	-	2	2	2
CO4	3	2	2	2	2	2	-	-	1	-	-	2	2	2
CO5	3	2	2	2	2	2	-	-	1	-	-	2	2	2



EC19303 **ELECTROMAGNETIC FIELDS AND WAVES** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- analyze fields and potentials due to static charges.
- acquire knowledge of various static electric and magnetic fields.
- evaluate the parameters of static magnetic fields.
- determine the relation between the fields under time varying situations.
- illustrate the propagation of waves in uniform plane.

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 ELECRIC FIELDS IN MATERIAL SPACE **9**

Conductors - Resistance ; Polarization in dielectrics - Dielectric constant, Dielectric strength; Uniqueness theorem - Continuity equation; Boundary conditions; Poisson's and Laplace's equation - General procedure for solving Poisson's and Laplace's equation; Capacitance - Types of capacitors; Method of images.

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; Displacement current; Maxwell's equation; time varying potentials; time harmonic fields; Electromagnetic spectrum.

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 ,oblique incidence.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- determine the field potentials due to static changes.
- analyze the effect of field on materials and solve boundary value problems.

- find out field intensity due to static magnetic fields.
- interpret Maxwell's equations for time varying electromagnetic fields for different media.
- distinguish polarizations of plane waves in various medias and evaluate reflection and transmission coefficients.

TEXT BOOKS

1. Mathew.N.O.Sadiku, "Principles of Electromagnetics", Oxford University Press,2011.
2. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", Printice-hall of India/PHI,2nd edition, 2007.

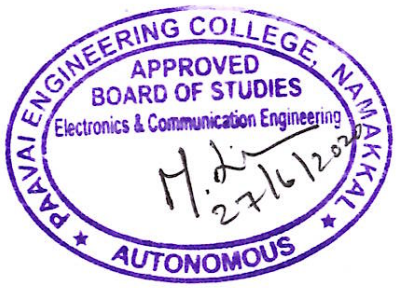
REFERENCES

1. Kraus, Fleisch, "Electromagnetics with Applications", McGraw-Hill, 2005.
2. David .K.Cheng, "Field and wave Electromagnetics", 2nd edition, Pearson education, 2004.
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", 7th Edition, McGraw Hill, 2006.

CO/PO MAPPING

(1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak

CO	Programme Outcomes (PO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	-	-	-	-	-	-	-	2	3	3
CO2	3	3	3	2	-	-	-	-	-	-	-	2	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	2	3	3
CO4	3	3	3	2	-	-	-	-	-	-	-	2	3	3
CO5	3	3	3	2	-	-	-	-	-	-	-	3	3	3



ECE

MC19301 **VALUE EDUCATION** **2 0 0 0**

COURSE OBJECTIVES

To enable the students to

- develop the individual multi-dimensionally in physical, intellectual, emotional and spiritual dimensions.
- facilitate individuals think about and reflect on different values.
- understand their responsibility in making choices and the practical implications of expressing them.
- instigate to choose their personal, social, moral and spiritual values.
- design and chisel the overall personality of an individual.

UNIT I PERSONAL VALUES **6**

Value Education – Definition, Types of values; Human values - Respect, Acceptance, Consideration, Appreciation, Listening, Openness, Affection, Patience, Honesty, Forgiveness, Sacrifice, Authenticity, Self Control, Altruism, Tolerance and Understanding, Wisdom, Decision making, Self –actualization, Character formation towards positive Personality, Contentment; Religious Values -Humility, Sympathy and Compassion, Gratitude. Peace, Justice, Freedom, Equality.

UNIT II COMMUNAL VALUES **6**

Social Values - Pity and probity - Self control - Respect to - Age, Experience, Maturity, Family members, Neighbors - Universal Brotherhood - Flexibility -Peer pressure - Sensitization towards Gender Equality, Physically challenged, Intellectually challenged - Reliability - Unity - Modern Challenges of Adolescent Emotions and behavior - Comparison and Competition- Positive and Negative thoughts- Arrogance, Anger and Selfishness.

UNIT III ENGINEERING ETHICS **6**

Professional Values -Knowledge thirst - Sincerity in profession- Regularity, Responsibility, Punctuality and Faith - Perseverance - Courage - Competence - Co-operation- Curbing unethical practices - Integrity, Social Consciousness and Responsibility. Global Values - Computer Ethics – Moral Leadership - Code of Conduct - Corporate Social Responsibility.

UNIT IV SPIRITUAL VALUES **6**

Developing Spirituality - Thinking process, Moralization of Desires - Health benefits- Physical exercises- Mental peace - Meditation - Objectives, Types, Effects on body, mind and soul- Yoga - Objectives, Types, Asanas. Family values -family's structure, function, roles, beliefs, attitudes and ideals, Family Work Ethic, Family Time, Family Traditions.

UNIT V HUMAN RIGHTS **6**

Classification of Human Rights - Right to Life, Liberty and Dignity- Right to Equality - Right against Exploitation - Cultural and Educational Rights- Physical assault and Sexual harassment - Domestic violence.

TOTAL PERIODS: 30

COURSE OUTCOMES

At the end of this course, students will be able to

- cultivate the values needed for peaceful living in the existing society.
- comprehend humanistic values to develop peace in the world.
- foster ethics in profession and usage of Technology.
- orient with the importance of value education towards personal, group and spiritual attributes.
- nurture physical, mental, spiritual growth to face the competitive world.

TEXT BOOKS

1. Sharma, S.P. Moral and Value Education; Principles and Practices, Kanishka publishers, 2013.

REFERENCES

1. Little, William, An introduction of Ethics. Allied publisher, Indian Reprint 1955.
2. "Values (Collection of Essays)". Sri Ramakrishna Math. Chennai. 1996.

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

EC19304 **ANALOG ELECTRONICS LABORATORY** **0 0 4 2**

COURSE OBJECTIVES

To enable the students to

- gain the knowledge about frequency response of different types of amplifiers.
- analyze the frequency response of multi-stage amplifiers and get the knowledge about large signal amplifiers.
- illustrate the working principle of rectifiers.
- gain hands on experience in designing feedback 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. Measurement of CMRR of differential amplifier.
4. Determination of the bandwidth of Cascade / Cascode amplifier.
5. Determination of the Frequency response of Class C tuned amplifier.
6. Design of Direct coupled Class A power amplifiers and determination its efficiency.
7. Design of Complementary symmetry Class B power amplifiers and determination its efficiency.
8. Determination of the efficiency and ripple factor of Half wave rectifier/ Full wave rectifier.
9. Design of Feedback amplifier circuits.
10. Design of RC oscillators (RC Phase shift / Wien bridge).
11. Design of LC oscillators (Hartley /Colpitts).

SIMULATION USING PSpice/MULTISIM/ EQUIVALENT SOFTWARE PACKAGE

1. Simulation of BJT amplifier Configurations (CE/CB/CC).
2. Simulation of Direct coupled Class A power amplifiers.
3. Simulation of clippers and clampers.
4. Simulation of integrator and differentiator.

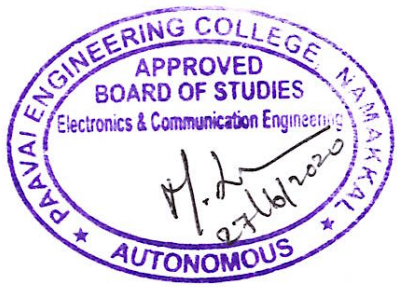
TOTAL PERIODS 60

COURSE OUTCOMES

Upon the completion of the course, the students will be able to:

- design and analyse the frequency response of different types of Amplifiers.
- measure CMRR in differential amplifier.
- analyze the bandwidth of multi-stage amplifiers and get the frequency response of power amplifiers.
- analyze the feedback,differential, power amplifiers and design oscillators for various specifications.

CO/PO MAPPING (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak													
CO	Programme Outcomes (PO)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	-	-	-	3	-	-	3	3	3
CO2	3	3	3	3	3	-	-	-	3	-	-	3	3	3
CO3	3	3	3	3	3	-	-	-	3	-	-	3	3	3
CO4	3	3	3	3	3	-	-	-	3	-	-	3	3	3



EC19305 **DIGITAL ELECTRONICS LABORATORY** **0 0 4 2**

COURSE OBJECTIVES

To enable the students to

- design and implement adders,subtractors and code converters.
- analyse the operation of various combinational logic circuits like MUX,DEMUX, Encoder, Decoder.
- apply flip flop concepts in designing registers and counters.
- write Verilog HDL code for digital circuits.

LIST OF EXPERIMENTS

1. Design and implementation of Adders and Subtractors using logic gates.
2. Design and implementation of code converters using logic gates.
   i. BCD to excess-3 code convertors and vice versa.
   ii. Binary to gray code convertors and vice-versa.
3. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483.
4. Design and implementation of 2 Bit Magnitude Comparator using logic gates.
5. Design and implementation of Multiplexer and De-multiplexer using basic logic gates and study of IC 74160 and IC 74164.
6. Design and implementation of Encoder and decoder using logic gates using the IC7445 and
7. Construction and verification of 3-bit Ripple counter and Mod-n Ripple counters.
8. Construction and verification of Mod-N counters. (Any bit)
9. Design and implementation of 3-bit synchronous up (or) down counter.
10. Implementation of 3- bit shift registers using Flip flops.
11. Design and Simulation of Full and Half Adders, Full and Half Subtractors, Multiplexer and De-multiplexer, Encoder and Decoder, 4-bit Ripple Counter using Verilog HDL.

TOTAL PERIODS 60

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- design adders, subtractors and code converters using basic logic gates and karnaugh map.
- analyze different combinational logic circuits like MUX,DEMUX, Encoder, Decoder etc.
- design various counters and shift registers in digital circuits.
- simulate digital circuits with Verilog HDL.

CO/PO MAPPING (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium , 1 – Weak														
CO	Programme Outcomes (PO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	-	-	-	-	2	-	-	3	3	3
CO2	3	3	3	2	-	-	-	-	2	-	-	-	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	3	2	3	-	-	-	-	-	-	3	3	3

IT19307 **FUNDAMENTALS OF DATA STRUCTURES IN C LABORATORY** 0 0 4 2

COURSE OBJECTIVES

To enable students to

- understand and implement basic data structures using C
- familiarize with the advanced features of C language.
- apply linear and non-linear data structures in problem solving.
- implement searching and sorting algorithms.

LIST OF EXPERIMENTS

1. Basic C Programs - looping, data manipulations, arrays
2. Programs using strings - string function implementation
3. Programs using structures and pointers
4. Programs involving dynamic memory allocations
5. Implementation of Stack using Arrays and Linked List.
6. Implementation of Queue using Arrays and Linked List.
7. Implementation of Stack and Queue applications.
8. Implementation of Binary Search Tree.
9. Implementing of BFS and DFS algorithms
10. Implementation any application using Linear Search.
11. Implementation any application using Binary Search.
12. Implementation of Insertion Sort, Bubble Sort.
13. Implementation of Quick Sort, Merge Sort.

TOTAL PERIODS 60

COURSE OUTCOMES

At the end this course, the students will be able to

- develop C programs for any real world/technical situations.
- apply advanced features of C in solving problems.
- write code using linear and non-linear data structure operations.
- implement various sorting and searching techniques.

RECOMMENDED SYSTEM/SOFTWARE REQUIREMENTS

Software: Turbo C.

Hardware: Flavor of any WINDOWS or LINUX and Standalone desktops 60 Nos.

CO/PO MAPPING (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium, 1 – Weak														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	2	2	3	2	2	-	-	-	-	-	3	2	2	2
CO2	2	2	3	2	3	-	-	-	-	-	3	2	2	3
CO3	2	2	3	2	3	-	-	-	-		2	2	3	2
CO4	2	2	3	2	2	-	-	-	-	-	2	3	2	3

MA19402 **PROBABILITY AND RANDOM PROCESSES** **3 1 0 4**

COURSE OBJECTIVES

To enable the students to

- analyse the concept of probability
- understand the concepts of standard distribution methods.
- learn the two-dimensional random variable, correlation and regression
- provide insight into the classification of random process and Markov process
- 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 variable, Probability mass function, Probability density function; 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, 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 the course, the students will be able to

- demonstrate and apply the basic probability axioms and concept in the core areas of random phenomena.

- analyse and interpret practical solutions and fit a suitable probability distribution
- apply effectively the concept of two dimensional random variables
- handle random process techniques in solving real life engineering specialization.
- analyze the response of random inputs to linear time invariant systems.

TEXT BOOKS

1. T. Veerarajan, Probability, Statistics and Random Processes‖, 2nd ed., Tata McGraw- Hill, New Delhi, 2008.
2. Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 2nd Indian Reprint, 2010
3. Peebles. P.Z., Probability, Random Variables and Random Signal Principles‖, Tata Mc Graw Hill, 4th Edition, New Delhi, 2008.

REFERENCE BOOKS

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.
5. Venkatachalam G, Probability and Random Process, Hitech Publishing Company Pvt. Ltd., Chennai,3rd Edition, 2012.

CO/PO MAPPING
(1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium, 1 – Weak

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

EC19401 **CONTROL SYSTEMS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- gain knowledge on system modeling and time response of a system.
- understand the concept of time response analysis of control systems.
- acquire knowledge about frequency response analysis using various plots.
- adopt different methods to analyze the stability of control systems.
- know the concept of state variable analysis in control systems.

UNIT I CONTROL SYSTEM MODELING **9**

Basic Elements of Control System - Open loop, Closed loop systems; Transfer function concept- Modeling of Electric systems, Translational and rotational mechanical systems, Block Diagram reduction Techniques; Signal flow graph - Mason's gain formula.

UNIT II TIME RESPONSE ANALYSIS **9**

Standard Test Signals; Time response analysis - First Order Systems - Impulse , Step Response; Analysis of second order systems; Steady state errors; Compensation techniques - P, PI, PD,PID controllers.

UNIT III FREQUENCY RESPONSE ANALYSIS **9**

Frequency Response - Bode Plot, Polar Plot, Nyquist plot, M and N circles; Frequency Domain specifications from the plots - Gain margin, Phase margin assessment; Compensators- Lag, Lead, Lag - Lead.

UNIT IV STABILITY ANALYSIS **9**

Stability - Location of roots in S plane for stability, Routh-Hurwitz Criterion; Root Locus Technique- Construction of Root Locus.

UNIT V STATE VARIABLE ANALYSIS **9**

Concepts of State, State variable and state model - State space representation using physical, phase and canonical variables; State transition matrix - Solution of state equations, Concepts of Controllability and Observability.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- determine the models of control systems and their representation.
- design a control system using time response analysis.
- analyze the various frequency response plots.
- test the stability of a system by applying Root locus and Routh Hurwitz criterion for a system transfer function.
- compute the state space analysis of control systems.

TEXT BOOKS

1. J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 5th Edition, 2007.
2. Norman S.Nise,"Control Systems Engineering",Wiley Publishers,8th Edition, 2019

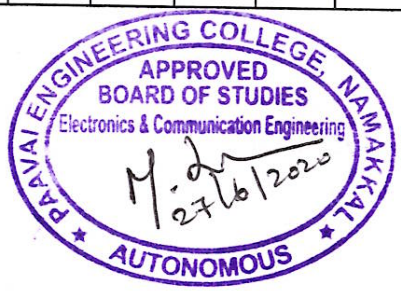
REFERENCES

1. Benjamin.C.Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition,1995.
2. M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 2nd Edition, 2002.
3. Schaum's Outline Series, "Feedback and Control Systems", Tata McGraw-Hill, 2007.
4. John J.D'azzo & Constantine H.Houpis, "Linear control system analysis and design", Tata McGraw-Hill Inc., 1995.

CO/PO MAPPING

(1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium, 1 – Weak

CO	Programme Outcomes (PO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	-	-	-	-	-	-	-	2	3	3
CO2	3	3	3	2	-	-	-	-	-	-	-	2	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	2	3	3
CO4	3	3	3	2	-	-	-	-	-	-	-	2	3	3
CO5	3	3	3	2	-	-	-	-	-	-	-	3	3	3



EC19402	SIGNALS AND SYSTEMS	3	1	0	4

COURSE OBJECTIVES

To enable the students to

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

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS **12**

Continuous time signals - Discrete time signals - step, ramp, pulse, impulse, exponential; Operation on signals; Classification of CT and DT signals - periodic, aperiodic signals, Energy, Power signals; CT systems and DT systems - Properties ; LTI system - Properties.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS **12**

Fourier series - definition, properties,analysis; Fourier transform - definition, properties, analysis; Laplace Transform - definition, ROC, properties ,Unilateral 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 transform ; Block diagram representation - Direct Form I - Direct Form.

TOTAL PERIODS **60**

COURSE OUTCOMES

Upon the completion of the course, the students will be able to

- analyze the basic concepts of solving problems in continuous time and discrete time signals and systems.
- apply transform techniques to analyze continuous-time signals and systems.
- examine problems and give solutions relating to LTI- continuous time systems.
- apply the knowledge of Sampling and Z transform in real time applications.
- develop competence in the analysis of LTI-discrete time systems.

TEXT BOOKS

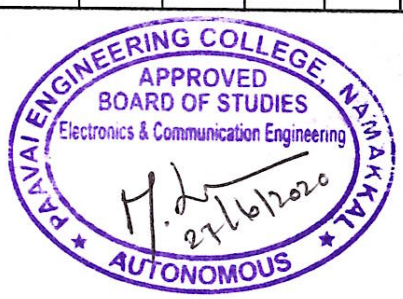
1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, "Signals and Systems", 2nd edition, Prentice Hall India, 2010.
2. B. P. Lathi, "Principles of Linear Systems and Signals", Oxford, 2nd Edition, 2009.

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
(1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium, 1 – Weak

CO	Programme Outcomes (PO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	1	-	-	-	-	-	-	-	2	3	3
CO2	3	3	-	2	-	-	-	-	-	-	-	3	3	3
CO3	3	3	1	2	-	-	-	-	-	-	-	3	3	3
CO4	3	3		1	-	-	-	-	-	-	-	2	3	3
CO5	3	3	1	2	-	-	-	-	-	-	-	2	3	3



EC19403 **LINEAR INTEGRATED CIRCUITS** **3 0 0 3**

COURSE OBJECTIVES

To enable the students to

- introduce the basics of operational amplifier.
- design linear and nonlinear applications of operational amplifier.
- understand the operation and applications of PLL and active filter.
- build data converters for the given specifications.
- acquire the basic knowledge about waveform generators.

UNIT I BASICS OF OPERATIONAL AMPLIFIER **9**

Operational amplifier - Basic information of Op-Amps, Ideal and Practical Op-Amp Characteristics, General operational amplifier stages, Open and closed loop configurations, DC, 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 toVoltage converter; Logarithmic amplifier - Anti-logarithmic amplifiers; Differentiator; Integrator; Comparator; Schmitt trigger; Precision Rectifiers.

UNITIII PLL AND ACTIVE FILTERS **9**

PLL - Basic principles, Phase Detector/Comparator; Voltage controlled Oscillator; Monolithic PLL - PLL applications; Active filters - Design of Low pass, high pass, band pass filters.

UNIT IV DATA 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 WAVEFORM GENERATORS **9**

Sine-wave Generators - Square, Triangle, Saw-tooth Wave generators; IC 741; Astable and monostable multivibrators; IC 555 timer - description, functional diagram, Astable, Monostable operation.

TOTAL PERIODS **45**

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- analyze the characteristics of operational amplifier.
- identify the problem and find a solution in the applications using operational amplifier.
- develop and analyze PLL and filter applications.
- built data converting circuits of given specification.
- design and operate waveform generators for real time applications.

TEXT BOOKS

1. D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., Fourth edition 2010.
2. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", McGraw Hill, 3rd edition 2007.

REFERENCES

1. William D.Stanely, "Operational Amplifiers with Linear Integrated Circuits", Pearson Education, 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
(1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium, 1 – Weak

CO	Programme Outcomes (PO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	-	-	-	-	-	-	-	-	3	3
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO5	3	2	2	-	-	-	-	-	-	-	-	-	3	3

EC19404 MICROPROCESSORS AND MICROCONTROLLERS 3 0 0 3

COURSE OBJECTIVES

To enable the students to

- understand the architecture and programming of 8085 and 8086 microprocessor.
- acquire knowledge about bus structures and various configurations of 8086 microprocessor.
- learn the design aspects of I/O and memory interfacing circuits
- study the architecture of 8051 microcontroller.
- design a microcontroller-based system.

UNIT I 8085 and 8086 MICROPROCESSORS 9

8085 Microprocessor - Architecture, Instruction set, Addressing modes, Assembly language programming; 8086 Microprocessor - 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 I/O programming; Introduction to Multiprogramming - System Bus Structure, Multiprocessor configurations - Coprocessor, Closely coupled and loosely Coupled configurations - Introduction to advanced processors.

UNIT III I/O INTERFACING 9

Memory Interfacing and I/O interfacing - Parallel communication interface, Serial communication interface, D/A and A/D Interface; Timer; Keyboard /display controller, Interrupt controller, DMA controller; Programming and applications; Case studies -Traffic Light control, LED display, LCD display, Keyboard display interface, Alarm Controller.

UNIT IV MICROCONTROLLER 9

8051 - Architecture, Special Function Registers (SFRs), I/O Ports and circuits, Instruction set , Addressing modes , Assembly language programming.

UNIT V INTERFACING MICROCONTROLLER 9

Programming 8051 Timers - Serial Port Programming, Interrupts Programming; LCD, Keyboard Interfacing; ADC, DAC, Sensor Interfacing; External Memory Interface - Stepper Motor and Waveform generation; Comparison of Microprocessor, Microcontroller, PIC and ARM processors.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, the students will be able to

- infer the operations of 8085 and 8086 microprocessor architecture.
- execute programs based on 8086 microprocessor bus configurations.
- design memory interfacing circuits.
- design and interface I/O circuits for real time applications.
- design and implement 8051 microcontroller based systems.

TEXT BOOKS

1. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay," The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011.

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. DoughlasV.Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH, 2012.
4. Kenneth J. Ayala., The 8051 Microcontroller, 3rd Edition, Thompson Delmar Learning, 2012.

CO/PO Mapping (3 – Strong, 2 – Medium, 1 – Weak)														
CO's	Programme Outcomes (PO's)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	2	-	-	-	-	-	-	-	3	3
CO2	3	2	2	2	2	-	-	-	-	-	-	-	3	3
CO3	3	2	2	2	2	2	2	-	-	-	-	-	3	3
CO4	3	2	2	2	2	-	-	-	-	-	-	-	3	3
CO5	3	2	2	2	2	2	2	-	-	-	-	-	3	3

MC19401 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 0

(Common to all B.E./ B.Tech Programmes)

(Mandatory, Non credit Course)

COURSE OBJECTIVES

To enable the students to

- recognize the interdisciplinary and holistic nature of the environment.
- create awareness on ecosystem and biodiversity preserve.
- study about the integrated themes of pollution control and waste management.
- understand the significance of natural resources and environment to stimulate sustainable development.
- assess the socio-economic, political and ethical issues on population with environment.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Environment - Definition, scope, importance, need for public awareness; Forest resources - Use, over exploitation, deforestation, effects on forests and tribal people; Water resources - Use, over utilization of surface and ground water; Mineral resources - Use, exploitation, environmental effects of extracting and using mineral resources; Food resources: Effects of modern agriculture - fertilizer, pesticide problems; Role of an individual in conservation of natural resources;Activity - Slogan making event on conserving natural resources or plantation of trees.

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

Concept of an ecosystem - Structure and function of an ecosystem, producers, Consumers, decomposers, energy flow in the ecosystem; Ecological succession; Food chains - food webs and ecological pyramids; Ecosystems -Types of ecosystem, Introduction, forest ecosystem. aquatic ecosystems (lakes, rivers); Biodiversity - Introduction, definition (genetic - species - ecosystem); Diversity -Value of biodiversity, Consumptive use, productive use, social values, ethical values, aesthetic values; Hotspots of biodiversity; Conservation of biodiversity– In-situ and ex-situ; conservation of biodiversity.

UNIT III POLLUTION 9

Pollution - Definition, air pollution, water pollution, marine pollution, noise pollution, thermal pollution; Solid waste management - Causes, effects, control measures of urban and industrial wastes;

Role of an individual in prevention of pollution; Disaster management - Floods, earthquake, cyclone, landslides; Electronic waste - Sources, causes and its effects.

UNIT IV SOCIAL ISSUES AND ENVIRONMENT **9**

Water conservation - rain water harvesting, watershed management; Environmental ethics – climate change, global warming and its effects on flora and fauna, acid rain, ozone layer depletion, nuclear accidents, nuclear holocaust; Environment protection act - Air (Prevention and Control of Pollution) Act, water (Prevention and control of Pollution) act.

UNIT V HUMAN POPULATION AND ENVIRONMENT **9**

Human population - Population growth, variation among nations, population explosion; Family welfare programme; Environment and human health; Human rights; Value education; HIV/AIDS; Women and child welfare; Role of information technology in environment and human health.

TOTAL PERIODS 45

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- explain the importance of interdisciplinary nature of environment studies, uses and exploitation of natural resources.
- analyze the different types of ecosystem and biodiversity, its values and protecting the environment from degradation.
- investigate the existing environmental challenges related to pollution and its management.
- select suitable strategies for sustainable management of components of environment.
- correlate the impacts of population and human activities on environment.

TEXT BOOKS

1. Raman Sivakumar, Introduction to Environmental Science and Engineering, 2nd Edn, Tata McGraw Hill Education Private Limited, New Delhi, (2010).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, (2010).

REFERENCES

1. S. Divan, Environmental Law and Policy in India, Oxford University Press, New Delhi, 2001.
2. A.K.De, Environmental Chemistry, VI edition,2015 New Age International (P) ltd Publication, NewDelhi.
3. C.S.Rao, Environmental Pollution and Control engineering, V edition, New Age International

(P) ltd Publication, New Delhi 110002

4. Clair Nathan Sawyer, Perry L. McCarty, Gene F. Parkin, "Chemistry for Environmental Engineering"

CO/PO MAPPING (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium, 1 – Weak														
CO	Programme Outcomes (PO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	1	3	3	-	2	-	3	1	-
CO2	-	-	-	-	-	1	2	3	-	2	-	3	1	-
CO3	1	-	2	-	1	1	2	3	-	2	-	3	1	2
CO4	-	-	2	-	2	1	3	3	-	2	-	2	1	1
CO5	-	1	-	-	-	1	3	3	-	2	-	2	1	-

EC19405 **LINEAR INTEGRATED CIRCUITS LABORATORY** **0 0 4 2**

COURSE OBJECTIVES

To enable the students to

- understand the applications of operational amplifier.
- analyze the working of multivibrators using operational amplifier and 555 timer.
- design oscillators and active filters for various applications.
- simulate the Op-Amp application circuits using PSPICE software.

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. Comparator and Schmitt trigger.
6. Astable, Monostable Multivibrators (using IC 741).
7. Phase shift Oscillator and Wien bridge oscillators (using IC 741).
8. Astable and monostable Multivibrators using NE555 Timer.
9. Construction and verification of 3-bit Ripple counter and Mod-n Ripple counters.
10. Construction and verification of Mod-N counters. (Any bit).

Simulation Experiments

11. Simulation of (i) Instrumentation amplifier, (ii) Integrator and Differentiator, (iii) Active low pass, High pass and band pass filters, (iv) Astable, Monostable Multivibrators and Schmitt trigger (using IC 741), (v) Phase shift Oscillator and Wien bridge oscillators (using IC 741), (vi) Astable and Monostable Multivibrators using NE555 Timer using Multisim.

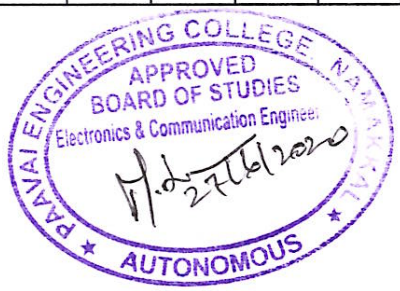
TOTAL PERIODS **60**

COURSE OUTCOMES

Upon the completion of the course, students will be able to

- design and test the Op-amp applications.
- develop and analyze op-amp filters.
- design oscillators and multivibrators for various applications.
- analyze the working of power supply.

CO/PO MAPPING (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium, 1 – Weak														
CO	Programme Outcomes (PO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
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



EC19406 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY 0 0 4 2

COURSE OBJECTIVES

To enable the students to

- implement the assembly language programming of 8085,8086 and 8051.
- experiment the interface concepts of various peripheral devices with the processor.
- understand the basic idea about the data transfer schemes and its applications.
- develop skills in simple program writing for 8051, 8086 and its applications.

Assembly Language programming using 8085 Microprocessor

1. Arithmetic operations
2. Code Conversion

Assembly Language programming using 8086 Microprocessor and MASM

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

Interfacing with 8086 Microprocessor

7. Stepper motor control.
8. Key board and Display.
9. Serial interface
10. Parallel interface
11. Digital clock

Programming using 8051 Microcontroller

12. Basic arithmetic and Logical operations.
13. ADC and DAC interfacing.
14. Traffic Light controller

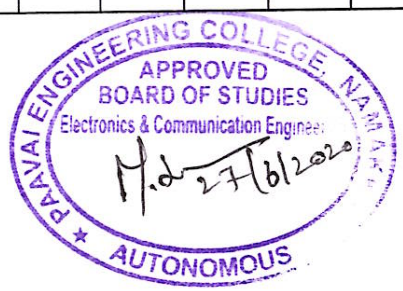
TOTAL PERIODS 60

COURSE OUTCOMES:

Upon the completion of the course, students will be able to

- write assembly language programs for various applications.
- interface different peripherals with microprocessor.
- execute programs in 8086 and 8051
- simulate programs in MASM.

CO/PO MAPPING (1,2,3 indicates the strength of correlation) 3 – Strong, 2 – Medium, 1 – Weak														
CO's	**Programme Outcomes (PO's)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	2	2	2	2	-	-	1	-	-	2	2	2
CO2	3	2	2	2	2	2	-	-	1	-	-	2	2	2
CO3	3	2	2	2	2	2	-	-	1	-	-	2	2	2
CO4	3	2	2	2	2	2	-	-	1	-	-	2	2	2



ECE

EN19401 ENGLISH PROFICIENCY COURSE LABORATORY 0 0 2 1

COURSE OBJECTIVES

To enable students to

- familiarize with the reading skills such as skimming and scanning.
- practice writing tasks to the level expected.
- develop listening strategies such as listening for key words, making inferences and identifying main ideas.
- speak well without inhibition and to assist the students in improving their vocabulary, pronunciation and comprehension of grammar.
- enrich their LSRW skills so as to crack on-line proficiency tests and to bring their career aspirations true.

EXERCISES FOR PRACTICE

1. Listening Exercises from TOEFL
    a. Conversations, Lectures
2. Listening Exercises from IELTS
    a. Places and directions
    b. Actions and processes
3. Reading Exercises from PTE
    a. Re-order paragraphs
4. Reading Exercises from IELTS
    a. Opinions and attitudes
    b. Locating and matching information
5. Reading Exercises from BEC Vantage
    a. Single informational text with lexical gaps
    b. Error identification
6. Writing Exercises from PTE
    a. Summarize written text
7. Writing Exercises from IELTS
    a. Describing maps
    b. Describing diagrams
8. Speaking IELTS format
    a. Talking about familiar topics
    b. Giving a talk
    c. Discussion on a Topic

TOTAL PERIODS 30

COURSE OUTCOMES

At the end of this course, the students will be able to

- skim, scan and infer the given texts and attend the tasks successfully.
- write coherently using appropriate vocabulary and grammar.
- listen to speeches and conversations and answer the questions.
- communicate fluently and effectively on any given topics.
- appear with confidence for on-line tests.

CO/PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programmes Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	2	3	-	-	-	3	2	-	-	-	2
CO2	-	-	2	2	-	-	1	1	3	2	-	2	-	2
CO3	-	-	-	-	-	3	1	2	3	2	2	3	2	-
CO4	-	-	-	-	-	2	2	3	3	2	2	-	2	-
CO5	-	-	2	-	-	1	2	-	3	3	-	1	2	3