LINGAYA'S VIDYAPEETH
SCHEME OF STUDIES

School: Engineering & Technology	**Batch:2024-2028**
Department: ALL	**Year: 1st**
Course: B.Tech.	**Semester:1st**

SN	Cate-gory	Course Code	Course Name	Periods			Credits	Evaluation Scheme					Subject Total Marks
								Theory			Practical		
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	BSC	BS-107E	Engineering Mathematics-I	3	1	0	4	15	25	60	-	-	100
2	BSC	BS-109E	Engineering Physics & Chemistry	3	0	2	4	15	25	60	60	40	200
3	ESC	EC-101E	Integrated Electrical and Electronics theory & practice	3	0	2	4	15	25	60	60	40	200
4	ESC	CS-101E	Problem Solving Using-C & C++	3	0	2	4	15	25	60	60	40	200
5	HSMC	HSS-101E	Effective Technical Communication-I	2	0	4	4	15	25	60	60	40	200
6	HSMC	HSS-103E	Universal Human Values	1	0	0	1	40		60	-	-	100
7	ESC	ME-151E	IDEA Lab Workshop	0	0	4	2	-	-	-	60	40	100
8	PROJ	PROJ-151E	Innovative projects 1.0 (Phase-I)/ IIC	0	0	4	2	-	-	-	60	40	100
9	AU	AU-101E	Yoga & Practice/ NSS	2	0	0	0	-	-	-	-	-	-
10	AU	AU-103E	Extra & co- curricular	0	0	2	0	-	-	-	-	-	-
							25						

Abbreviations:

ESC:	Engineering Sciences Course	ABQ:	Assignment Based Quiz
BSC:	Basic Sciences Course	MSE:	Mid Semester Examination
PROJ:	Project	ESE:	End Semester Examination
		IP:	Internal Practical
L:	Lecture	EXP:	External Practical
T:	Tutorial		
P:	Practical		

HSMC: Humanities and Social Sciences including Management Courses

AU: Audit Courses

School: Engineering & Technology	Batch:2024-2028
Department: ALL	Year: 1st
Course: B.Tech.	Semester:2nd

SN	Cate-gory	Course Code	Course Name	Periods			Credits	Evaluation Scheme					Subject Total Marks
								Theory			Practical		
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	BSC	BS-108E	Engineering Mathematics-II	3	0	0	3	15	25	60	-	-	100
2	BSC	BS-110E	Integrated Environmental Science & Engineering theory & practice	2	0	2	3	15	25	60	-	-	100
3	ESC	CS-102E	Python Programming-theory & practice	2	0	4	4	15	25	60	60	40	100
4	HSMC	HSS-102E	Effective Technical Communication-II	2	0	4	4	15	25	60	60	40	200
5	ESC	CS-104E	Design thinking with AI	2	0	4	4	15	25	60	60	40	100
6	ESC	ME-152E	Digital Fabrication & manufacturing practices	0	0	2	1	-	-	-	60	40	100
7	ESC	ME-154E	Engineering Graphics Practices	0	0	4	2	-	-	-	60	40	100
8	PEC	PEC(EC/CS/ME/CE)-102E	MOOC courses (NPTEL)	2	0	0	2	-	-	-	-	-	100
9	PROJ	PROJ-152E	Innovative projects 2.0 (Phase-II)/ IIC	0	0	4	2	-	-	-	60	40	100
10	AU	AU-152E	Introduction to Soft Skills	0	0	2	0	-	-	-	-	-	-
							25						

Abbreviations:

PCC: Program Core Courses
ESC: Engineering Sciences Course
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ABQ: Assignment Based Quiz
MSE: Mid Semester Examination
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EXP: External Practical

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B. Tech – SCHEME of STUDIES – 2024-2028

3rd Sem.

School: School of Engineering & Technology								Batch 2024					
Department: Electronics and Communication								Year-II					
Course: B. Tech ECE								Semester-III					
SN	Category	Course Code	Course Name	Periods			Credit	Evaluation Scheme					Subject Total
								Theory			Practical		
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	EC-201E	Analog Electronic Circuits	3	1	0	4	15	25	60	-	-	100
2	PCC	EC-213E	Digital System Design	3	1	0	4	15	25	60	-	-	100
3	ESC	EC-205E	Solid State Devices	3	0	0	3	15	25	60	-	-	100
4	BSC	BS-203	Numerical and Statistical Methods	3	1	0	4	15	25	60	-	-	100
5	HSMC	MG-101E	Business Economics	3	0	0	3	15	25	60	-	-	100
6	PEC	CS-201E	Data Structures & Algorithms	3	1	0	4	15	25	60	-	-	100
7	PCC	EC-251E	Analog Electronic Circuits Lab	0	0	2	1	-	-	-	60	40	100
8	PCC	EC-263E	Digital System Design Lab	0	0	2	1	-	-	-	60	40	100
9	PEC	CS-251E	Data Structures & Algorithms using C Lab	0	0	2	1	-	-	-	60	40	100
Total				**15**	**1**	**6**	**25**						**900**

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PROJ: Project
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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B. Tech – SCHEME of STUDIES – 2024-2028

4th Sem.

School: School of Engineering & Technology								Batch 2024					
Department: Electronics and Communication								Year-II					
Course: B. Tech ECE								Semester-IV					
SN	Category	Course Code	Course Name	Periods			Credit	Evaluation Scheme					Subject Total
								Theory			Practical		
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	EC-202E	Network Theory	3	1	0	4	15	25	60	-	-	100
2	PCC	EC-206E	Signals and Systems	3	1	0	4	15	25	60	-	-	100
3	PCC	EC-204E	Linear Integrated Circuits	3	1	0	4	15	25	60	-	-	100
4	PEC	EC-208E	Nano Electronics	3	0	0	3	15	25	60	-	-	100
5	PEC	EC-210E	Probability Theory and Stochastic Process	3	1	0	4	15	25	60	-	-	100
6	PEC	EC-212E	Basic and Advance Excel	2	0	0	2	15	25	60	-	-	100
7	PCC	EC-256E	Signals and Systems Lab	0	0	2	1	-	-	-	60	40	100
8	PCC	EC-254E	Linear Integrated Circuits Lab	0	0	2	1	-	-	-	60	40	100
Total				**15**	**3**	**6**	**23**						**800**

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B. Tech – SCHEME of STUDIES – 2024-2028

5th Sem.

School: School of Engineering & Technology								Batch 2024					
Department: Electronics and Communication								Year-III					
Course: B. Tech ECE								Semester-V					
SN	Category	Course Code	Course Name	Periods			Credit	Evaluation Scheme					Subject Total
								Theory			Practical		
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	EC-301E	Microprocessors & Microcontrollers	3	1	0	4	15	25	60	-	-	100
2	PCC	EC-303E	Analog and Digital Communication	3	0	0	3	15	25	60	-	-	100
3	PCC	EC-305E	Biomedical Electronics	3	0	0	3	15	25	60	-	-	100
4	PEC-I	EC-309E	CMOS Design	3	1	0	4	15	25	60	-	-	100
5	PCC	EC-307E	Electromagnetic Theory	3	1	0	4	15	25	60	-	-	100
6	PCC	EC-311E	Literature Approach and Scientific Writing	3	0	0	3	15	25	60	-	-	100
7	PCC	EC-351E	Microprocessors & Microcontroller Lab	0	0	2	1	-	-	-	60	40	100
8	PCC	EC-353E	Analog and Digital Communication Lab	0	0	2	1	-	-	-	60	40	100
Total				**18**	**1**	**6**	**23**						**800**

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B. Tech – SCHEME of STUDIES – 2024-2028

6th Sem.

School: School of Engineering & Technology								Batch 2024					
Department: Electronics and Communication								Year-III					
Course: B. Tech ECE								Semester-VI					
SN	Category	Course Code	Course Name	Periods			Credit	Evaluation Scheme					Subject Total
								Theory			Practical		
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	EC-308E	Internet of Things	3	0	0	3	15	25	60	-	-	100
2	PCC	EC-306E	Digital Signal Processing	3	1	0	4	15	25	60	-	-	100
3	PEC-II	EC-304E	Machine Learning	3	0	0	3	15	25	60	-	-	100
4	PCC	EC-302E	Control System	3	1	0	4	15	25	60	-	-	100
5	PEC-III	EC-310E	Robotics	3	0	0	3	15	25	60	-	-	100
6	PCC	EC-312E	Computer Communication Networks	3	0	0	3	15	25	60	-	-	100
7	PCC	EC-356E	Digital Signal Processing Lab	0	0	2	1	-	-	-	60	40	100
8	PCC	EC-358E	IoT Lab	0	0	2	1	-	-	-	60	40	100
9	PRC	EC-364E	**Mini Project Work**	0	0	4	2	-	-	-	-	100	100
Total				**18**	**1**	**10**	**24**						**900**

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B. Tech – SCHEME of STUDIES – 2024-2028

7th Sem.

School: School of Engineering & Technology								Batch 2024					
Department: Electronics and Communication								Year-IV					
Course: B. Tech ECE								Semester-VII					
SN	Category	Course Code	Course Name	Periods			Credit	Evaluation Scheme					Subject Total
								Theory			Practical		
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PCC	EC-401E	High Speed Electronics	3	0	0	3	15	25	60	-	-	100
2	PCC	EC-403E	Information Theory & Coding	3	1	0	4	15	25	60	-	-	100
3	PCC	EC-405E	Integrated Computer Vision	3	1	0	4	15	25	60	-	-	100
4	PCC	EC-407E	Embedded Systems	3	1	0	4	15	25	60	-	-	100
5	PEC-IV	EC-409E	VLSI Design	3	0	0	3	15	25	60	-	-	100
6	OE	CS-403C	Deep Learning	3	0	0	3	15	25	60	-	-	100
7	PCC	EC-459E	VLSI Design LAB	0	0	2	1	-	-	-	60	40	100
8	PCC	EC-457E	Embedded Systems Lab	0	0	2	1	-	-	-	60	40	100
9	PRC	EC-491E	Major Project Phase-I	0	0	4	2	-	-	-	-	100	100
Total				**18**	**2**	**10**	**25**						**900**

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

B. Tech – SCHEME of STUDIES – 2024-2028

8th Sem.

School: School of Engineering & Technology								Batch 2024					
Department: Electronics and Communication								Year-IV					
Course: B. Tech ECE								Semester-VIII					
SN	Category	Course Code	Course Name	Periods			Credit	Evaluation Scheme					Subject Total
								Theory			Practical		
				L	T	P		ABQ	MSE	ESE	IP	EXP	
1	PEC-IV	EC-402E	Wireless Sensor Network	3	0	0	3	15	25	60	-	-	100
	PCC	EC-404E	Mechatronics	3	0	0	3	15	25	60	-	-	100
2	PRC	EC-483	Major Research Project phase -II	0	0	32	16	-	-	-	-	100	100
3	PRC	EC-484	Seminar	0	0	2	1	-	-	-	-	100	100
Total				**6**	**0**	**34**	**23**						**400**

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LINGAYA'S VIDYAPEETH

SCHEME OF STUDIES

SESSION: 2022-26 2024-2026

BSC-107	Mathematics-I	L T P	Cr
		3 -1 -0	4

Course Content:

Unit I: Matrix Algebra 8 Lecture Hours
Elementary operations and their use in getting the Rank, Inverse of a matrix and solution of linear simultaneous equations. Orthogonal, Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian, Normal & Unitary matrices and their elementary properties. Eigen-values and Eigenvectors of a matrix, Cayley-Hamilton theorem, Diagonalization of a matrix.
Unit II: Differential Calculus 12 Lecture Hours
Limit, Continuity and differentiability of functions of two variables, Euler's theorem for homogeneous equations, Tangent plane and normal. Change of variables, chain rule, Jacobians, Taylor's Theorem for two variables, Error approximations. Extrema of functions of two or more variables, Lagrange's method of undetermined multipliers.
Unit III: Integral Calculus 12 Lecture Hours
Review of curve tracing and quadric surfaces, Double and Triple integrals, Change of order of integration. Change of variables. Gamma and Beta functions. Dirichlet's integral. Applications of Multiple integrals such as surface area, volumes, centre of gravity and moment of inertia.
Unit IV: Vector Calculus 8 Lecture Hours
Differentiation of vectors, gradient, divergence, curl and their physical meaning. Identities involving gradient, divergence and curl. Line and surface integrals. Green's, Gauss and Stroke's theorem and their applications.

Suggested Reading

1. Shanti Narayan (2005), Differential Calculus, S. Chand Limited, ISBN 978-8-121-90471-4
2. P. K. Mittal (2005), Integral Calculus, S. Chand Limited, ISBN-13: 978-8-121-90681-4
3. Thomas (1996), Calculus and Analytical Geometry, Pearson Education, ISBN: 978-8-817-758325-0.
4. Erwin Kreyszig, Herbert Kreyszig, Edward J. Norminton (2011), Advanced Engineering Mathematics, Wiley, ISBN: 978-0-470-45836-5
5. R. K. Jain, S. R. K. Iyengar (2004), Advanced Engineering Mathematics, Alpha Science International, ISBN: 978-1-842-65185-8.

EC-101E	INTEGRATED ELECTRICAL & ELECTRONICS THEORY & PRACTICE	L T P	Cr
		3-0-2	4

(2024-28)

Unit 1: DC Circuits
Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin, Norton and maximum power transfer Theorems.

Unit 2: AC Circuits
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

Unit 3: Transformers
Construction, working principle of transformer, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and its comparison with ordinary transformer.

Unit 4: Semiconductor, Diodes and Rectifiers
Introduction, general characteristics, energy levels, extrinsic materials n & p type, ideal diode, basic construction and characteristics, DC & AC resistance, equivalent circuits, drift & diffusion currents, transition & diffusion capacitance, diode specifications, different types of diodes (Zener, Varactor, Schottky, Power, Tunnel, Photodiode & LED), Half wave & full wave rectifiers.

Unit 5: Introduction to Digital Electronics
Analog & Digital signals, Number Systems, Logic gates - AND, OR, NOT, NAND, NOR & XOR, Boolean algebra, DeMorgan's Theorem, SOP & POS forms, Cannonical forms, Multiplexer, Demultiplexer, Adders & Subtractors.

List of experiments / demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi – meter, oscilloscope. Resistors, capacitors and inductors.
2. To verify the Thevenin's & Norton's theorem.
3. To verify the Superposition theorem.
4. To study frequency response of series & parallel RLC Circuit.
5. Load test on D.C. Shunt generator
6. Parallel operation of single phase Transformer.
7. Open circuit & short circuit test on single phase transformer.
8. Experiments using diodes.

9. Design and analysis of half -wave and full-wave rectifiers, clipping circuits and Zener regulators.
10. Experiments using logic gates.

Suggested Text / Reference Books

(i) D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
(ii) S. M. Sze and K. N. Kwok, —Physics of Semiconductor Devices, 3rd edition, John Wiley &Sons, 2006.
(iii) Taub & Schelling - Digital Integrated Electronics – McGraw Hill International Edition.

LINGAYA'S VIDYAPEETH
choose to know

LINGAYA'S VIDYAPEETH
SCHEME & SYLLABUS SESSION:
2024-28

BS-109E	Engineering Physics/Chemistry	L T P	Cr
		3 -0 -1	4

Course Content:

Unit I:
Cartesian coordinate System, Cylindrical and Spherical coordinate Systems, Gradient, Divergence of a Vector and Divergence Theorem, Curl of a vector and Stoke's theorem, Gauss's law & its applications, Maxwell's 1st eqn. (Electrostatics), Electric Energy and potential, Potential gradient, the dipole fields, Energy density in an electrostatic field. Current and current density, Continuity of current, Metallic conductors, Dielectric materials, Electrostatic boundary-value problems, Laplace's and Poisson's equations **12 Lecture**
Unit II:
Biot-Savart's law, Ampere's circuital law, Magnetic flux and magnetic flux density, Scalar and vector magnetic potentials. Magnetic dipole, Force due to Magnetic field on a differential current element, force between two differential current elements, Force and torque on a closed circuit, magnetic materials, Magnetic boundary conditions, Inductors and inductances, **10 Lecture**
Unit-III
Faraday's law, Displacement current, Maxwell's equations in point form, Maxwell's equations in integral form, EM waves in general, EM wave propagation in Lossy Dielectrics, Wave propagation in lossless dielectrics, Plane waves in free space, Plane waves in Good conductors, Power & Poynting Vector, Reflection of a plane wave at normal incidence. **10 Lecture**
Unit IV:
Polymeric Materials Mechanism and methods of polymerization, structure-activity relationship. Conducting Polymers: types (n- or p- doping) and applications, Polymeric fibre materials, Energy Storage and Sensing Devices: Fundamentals of Electrochemistry, types of electrodes, Reference electrodes, Ion-selective electrodes, Fuel cells, Batteries (Lithium-ion Batteries and EV Batteries), Renewable energy (Artificial photosynthesis), Solar cells, Sensors for IoT **10 Lecture**
Unit V:
Spectroscopic Methods for structural Analysis: Principle and applications (UV, IR, NMR, SEM and TEM) (9) 6 Chemistry of Electronic and Electrical Materials Semi-conductor and super conducting Materials, Carbon materials, Optical Materials (OLED), 2D Materials, Magnetic materials. **12 Lecture**
Books Name: 1. **The Elements of COORDINATE GEOMETRY Part-1 Cartesian Coordinates by S. L. Loney** 2. **Electricity & Magnetism, Sehgal DL, Chopra KL, Sehgal NK, Publisher: Sultan Chand & Sons** 3. **TEXTBOOK OF POLYMER SC by FRED W. BILLMEYER, JR. A Wiley-Interscience Publication John Wiley & Sons New York Chichest, New York** 4. **Spectra of Atoms and Molecules (4th Edition) Author(s) Bernath, Peter F. Publisher Oxford University Press**

LINGAYA'S VIDYAPEETH
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LINGAYA'S VIDYAPEETH
SCHEME & SYLLABUS SESSION:
2024-27

BS-109E	Engineering Physics/Chemistry	L T P	Cr
		3 -0 -1	4

Course Content:

Unit I:
Cartesian coordinate System, Cylindrical and Spherical coordinate Systems, Gradient, Divergence of a Vector and Divergence Theorem, Curl of a vector and Stoke's theorem, Gauss's law & its applications, Maxwell's 1st eqn. (Electrostatics), Electric Energy and potential, Potential gradient, the dipole fields, Energy density in an electrostatic field. Current and current density, Continuity of current, Metallic conductors, Dielectric materials, Electrostatic boundary-value problems, Laplace's and Poisson's equations **12 Lecture**
Unit II:
Biot-Savart's law, Ampere's circuital law, Magnetic flux and magnetic flux density, Scalar and vector magnetic potentials. Magnetic dipole, Force due to Magnetic field on a differential current element, force between two differential current elements, Force and torque on a closed circuit, magnetic materials, Magnetic boundary conditions, Inductors and inductances, **10 Lecture**
Unit-III
Faraday's law, Displacement current, Maxwell's equations in point form, Maxwell's equations in integral form, EM waves in general, EM wave propagation in Lossy Dielectrics, Wave propagation in lossless dielectrics, Plane waves in free space, Plane waves in Good conductors, Power & Poynting Vector, Reflection of a plane wave at normal incidence. **10 Lecture**
Unit IV:
Polymeric Materials Mechanism and methods of polymerization, structure-activity relationship. Conducting Polymers: types (n- or p- doping) and applications, Polymeric fibre materials, Energy Storage and Sensing Devices: Fundamentals of Electrochemistry, types of electrodes, Reference electrodes. Ion-selective electrodes, Fuel cells, Batteries (Lithium-ion Batteries and EV Batteries), Renewable energy (Artificial photosynthesis), Solar cells, Sensors for IoT **10 Lecture**
Unit V:
Spectroscopic Methods for structural Analysis: Principle and applications (UV, IR, NMR, SEM and TEM) (9) 6 Chemistry of Electronic and Electrical Materials Semi-conductor and super conducting Materials, Carbon materials, Optical Materials (OLED), 2D Materials, Magnetic materials. **12 Lecture**
Books Name: 1. **The Elements of COORDINATE GEOMETRY Part-1 Cartesian Coordinates by S. L. Loney** 2. **Electricity & Magnetism, Sehgal DL, Chopra KL, Sehgal NK, Publisher: Sultan Chand & Sons** 3. **TEXTBOOK OF POLYMER SC by FRED W. BILLMEYER, JR. A Wiley-Interscience Publication John Wiley & Sons New York Chichest, New York** 4. **Spectra of Atoms and Molecules (4th Edition) Author(s) Bernath, Peter F. Publisher Oxford University Press**

CS-101E	PROBLEM SOLVING USING C	L T P	Cr
		3 0 0	3

2024-20

COURSE OUTCOMES

The students undergoing this course will be able to:

CO1: Know the basic concepts of programming languages as well as operating system

CO2: Learn the basics of programming using C

CO3: Undergo the functions and pointers

CO4: Learn about the structures, unions as well as functions using recursion

CO5: Know about the dynamic programming as well as file handling

UNIT I

INTRODUCTION TO COMPUTER SYSTEMS, PROGRAMMING LANGUAGES, OPERATING SYSTEM, NETWORKING, AND SECURITY: Overview of Computer Systems: Characteristics of Computer- speed, storage, Accuracy, Categories of computer- Micro Computers, Mini Computers, Main Frames, Super Computers, Computer Organization- Central processing unit, Arithmetic and Logic Unit, Control Unit, Memory System- Primary memory, secondary memory. Data Representation in a Computer System- Number system - decimal, Binary, Octal, Hexadecimal representation and conversion.

SOFTWARE BASICS: Application software, System Software, Programming languages: Low level languages, Machine language, Assembly language, High Level languages, Translator, Assembler, Interpreter, Compiler, Operating System: Need of Operating System, Function of Operating System, Types of Operating System, Introduction to Networking: Local and Wide Area Networks.

SECURITY THREATS: Intruders, Password Cracking, Types of malicious Software- Virus, Worms, Trojan Horse, Prevention from malicious Software- Antivirus

UNIT II

BASICS OF PROGRAMMING USING C: Problem definition, Representation of Algorithms: Flow charts/ Pseudocode with example, Types of programming languages, Translators,

Introduction to C: Structure of C program, C character set, Identifier and Keywords, Data types, constants, variables, Declaration, Arithmetic expressions & precedence , statements, Symbolic constants, type conversion, Types of operators, Input and output functions in C, header files, common programming errors, Control Statements, Sequencing, Selection, Condition and iteration, Arrays and Strings: Declaring, Referencing and initializing arrays, array subscript, using for loop for sequential access, multi-dimensional array, String basics string library functions, assignment and substring, concatenation, string comparison.

UNIT III

FUNCTIONS AND POINTERS: Definition of function, function prototype, Purpose of main function, passing parameters, Scope of function, recursion, Call by value and reference, Types of storage classes, Scope of variable: Global and local, static variables, Recursion. Pointer variables, initializing pointers, pointer operators, pointer expressions, pointers and arrays, pointer and functions.

UNIT IV

STRUCTURES, UNIONS & RECURSION: Defining a structure, Declaring structure variables, Structure initialization, Copying and Comparing Structure variables, Array of structures, Arrays within structure, nested structures, Unions. Recursion as a different way of solving problems.

UNIT V

DYNAMIC ALLOCATION, AND FILE HANDLING: C's dynamic allocation functions. Streams and file types, opening and closing a data file, input and output operations, text mode versus binary mode, formatted input output operations with files, random access to files.

TEXT/REFERENCE BOOKs

1. Pradeep K. Sinha, Priti Sinha (2004), Computer Fundamentals, BPB Publications, ISBN:9788176567527.
2. Byron S. Gottfried (1996), Programming with C, McGraw-Hill Education and ISBN: 9780070240353.
3. E. Balagurusamy (1990), Programming in C, Tata McGraw-Hill Publishing ISBN: 9780074600474

CS-151E	PROBLEM SOLVING USING C LAB	L T P	Cr
		0 0 2	1

2024-28

COURSE OUTCOMES

CO1 Read, understand and trace the execution of programs written in C language.
CO2 Write the C code for a given algorithm.
CO3 Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
CO4 Write programs that perform operations using derived data types.

List of Topics (Students have to do at 3-4 programs from each section)

SEQUENTIAL CONTROL STATEMENTS

1. Write a program to Print HELLO
2. Write a program to add two numbers
3. Write a program to calculate simple interest
4. Write a program to calculate average of three numbers
5. Write a program to swap two numbers
6. Write a program to illustrate mixed data types
7. Write a program to calculate area and circumference of circle
8. Write a program to evaluate a polynomial expression
9. Write a program to add digits of a four digit number
10. Write a program to check whether the person if eligible for voting or not

CONDITIONAL CONTROL STATEMENTS

11. Write a program to find greatest of two numbers
12. Write a program to find out which type of triangle it is
13. Write a program to find out greatest of three numbers
14. Write a program to evaluate performance of the student
15. Write a program to make a basic calculator

LOOP CONTROL STATEMENTS

16. Write a program to print Fibonacci up-to the given limit
17. Write a program to find the sum of digits of a number
18. Write a program to find factorial of a number
19. Write a program to print table of any number
20. Write program for printing different pyramid pattern

ARRAYS AND STRINGS

21. Write a program to enter the elements in a one dimensional array
22. Write a program to find the sum and average of five numbers
23. Write a program to sort the array elements
24. Write a program to enter the marks of 50 students an calculate the average
25. Write a program to add 2 matrix
26. Write a program to multiply 2 matrices
27. Write a program to calculate the length of string
28. Write a program to concatenate 2 strings
29. Write a program to reverse the string
30. Write a program to count the numbers of characters in a string
31. Write a program that converts lower case characters to upper case

32. Write a program without using predefined functions to check whether the string is palindrome or not

FUNCTIONS & POINTERS

33. Write a program using function to find the largest of three numbers
34. Write a program using function to sum the digits of a number
35. Write a program to calculate factorial of a number using recursive function
36. Write a program to print first n Fibonacci using recursive function
37. Write a program to illustrate the concept of chain of pointers
38. Write a program using function to swap two numbers using call by reference
39. Write a program to calculate the area and perimeter of circle using pointers
40. Write a program to copy the contents of one array into another in the reverse order using pointers

STRUCTURES

41. Write a program to read an employee record using structure and print it
42. Write a program to prepare salary chart of employee using array of structures
43. Write a program to print the name and percentage of 20 students (array of structures and arrays withinstructures).
44. Write a program to demonstrate structure within structure.

FILE HANDLING

45. Write a program to create, open, and close files.
46. Write a program to demonstrate the purpose of different file opening modes.
47. Write a program to count the number of characters, spaces, tabs, new line characters in a file.
48. Write a program to receive strings from keyboard and write them to a file.
49. Write a program to copy a file to another.
50. Write a program to read strings from a file and display them on screen

LINGAYA'S VIDYAPEETH
choose to know

LINGAYA'S VIDYAPEETH
SCHEME & SYLLABUS SESSION:
2024-2

BS-109 E	Engineering Physics/Chemistry	L T P	Cr
		3 -0 -1	4

Course Content:

Unit I:
Cartesian coordinate System, Cylindrical and Spherical coordinate Systems, Gradient, Divergence of a Vector and Divergence Theorem, Curl of a vector and Stoke's theorem, Gauss's law & its applications, Maxwell's 1st eqn. (Electrostatics), Electric Energy and potential, Potential gradient, the dipole fields, Energy density in an electrostatic field. Current and current density, Continuity of current, Metallic conductors, Dielectric materials, Electrostatic boundary-value problems, Laplace's and Poisson's equations **12 Lecture**
Unit II:
Biot-Savart's law, Ampere's circuital law, Magnetic flux and magnetic flux density, Scalar and vector magnetic potentials. Magnetic dipole, Force due to Magnetic field on a differential current element, force between two differential current elements, Force and torque on a closed circuit, magnetic materials, Magnetic boundary conditions, Inductors and inductances, **10 Lecture**
Unit-III
Faraday's law, Displacement current, Maxwell's equations in point form, Maxwell's equations in integral form, EM waves in general, EM wave propagation in Lossy Dielectrics, Wave propagation in lossless dielectrics, Plane waves in free space, Plane waves in Good conductors, Power & Poynting Vector, Reflection of a plane wave at normal incidence. **10 Lecture**
Unit IV:
Polymeric Materials Mechanism and methods of polymerization, structure-activity relationship, Conducting Polymers: types (n- or p- doping) and applications, Polymeric fibre materials, Energy Storage and Sensing Devices: Fundamentals of Electrochemistry, types of electrodes, Reference electrodes, Ion-selective electrodes, Fuel cells, Batteries (Lithium-ion Batteries and EV Batteries), Renewable energy (Artificial photosynthesis), Solar cells, Sensors for IoT **10 Lecture**
Unit V:
Spectroscopic Methods for structural Analysis: Principle and applications (UV, IR, NMR, SEM and TEM) (9) 6 Chemistry of Electronic and Electrical Materials Semi-conductor and super conducting Materials, Carbon materials, Optical Materials (OLED), 2D Materials, Magnetic materials. **12 Lecture**
Books Name: 1. **The Elements of COORDINATE GEOMETRY Part-1 Cartesian Coordinates by S. L. Loney** 2. **Electricity & Magnetism, Sehgal DL, Chopra KL, Sehgal NK, Publisher: Sultan Chand & Sons** 3. **TEXTBOOK OF POLYMER SC by FRED W. BILLMEYER, JR. A Wiley-Interscience Publication John Wiley & Sons New York Chichest, New York** 4. **Spectra of Atoms and Molecules (4th Edition) Author(s) Bernath, Peter F. Publisher Oxford University Press**

ME-151E	IDEA Lab Workshop	L T P	Cr
		0 -0 -4	2

2024-28

COURSE OBJECTIVES

	Course Objective
1	To Familiar with CAD software and utilize as per own idea.
2	To provide exposure to the students with hands on experience on various basic engineering practices in Engineering.
3	To Study and practice the various operations that can be performed in lathe, shaper, drilling, milling machines etc. and to equip with the practical knowledge required in the core industries.
4	To Study and acquire knowledge on various basic machining operations in special purpose machines and its applications in real time manufacturing of components in the industries.
5	To identify tools, work material and measuring instruments useful for sheet metal, welding and carpentry.

COURSE OUTCOMES

	Course Outcome (CO)
CO 1	Study and practice on machine tools and their operations
CO 2	Practice on manufacturing of components using workshop trades including fitting, carpentry.
CO 3	Practice on manufacturing of components using workshop trades including Sheet metal.
CO 4	Welding operations for different types of joints.
CO 5	Practice on manufacturing of components using workshop trades including foundry.

COURSE CONTENT:

UNIT I: INTRODUCTION TO CAD SOFTWARE, 3-D PRINTING, AND PROTOTYPE DESIGN (8 Practical Hours)

Exercise 1: Learning about the user interface of CAD Software for Drawing Purposes.
Exercise 2: To understand the concept of Drawing Toolbar to develop different design.
Exercise 3: To sketch using CAD Software with the help of Dimension of objects as per your idea.

Unit II: MACHINE SHOP
STEP TURNING & TAPER TURNING OPERATION (4 Practical Hours)

Exercise 4: To obtain the required diameters (steps) on a cylindrical workpiece with the given lengths with help of Cutting, Facing, Step Turning & Taper Turning operation.
Exercise 5: To obtain the required diameters on a cylindrical workpiece with the given dimensions.

CARPENTRY SHOP (4 Practical Hours)
DOVE TAIL / LAP JOINT
Exercise 6: To make a Dovetail Joint to make use of it using your own IDEA.
Exercise 7: To make a Cross Half Lap Joint to make use of it using your own IDEA.

Unit III: SHEET METAL SHOP (8 Practical Hours)

Exercise 8: Make a Funnel or a Square Box using G.I. Sheet as per the dimensions provided.
Exercise 9: To make a desired shape using the G.I. Sheet as per your IDEA.

Unit IV: WELDING SHOP (8 Practical Hours)

Exercise 10: To make a single V-butt joint, using the given Mild Steel pieces by ARC Welding and make it usable.
Exercise 11: To make a T-joint using the given Mild Steel pieces by ARC welding and make it usable.

Unit V: FOUNDRY SHOP (8 Practical Hours)

Exercise 12: To prepare a mold of your own choice using Cope and Drag.

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

2nd Year

SEMESTER – III			
EC-201E	ANALOG ELECTRONIC CIRCUITS	L T P	CR
		3-1-0	4

Module-I:

BJT biasing circuits: Types, Q point, Bias stability, Stability factors, RC coupled amplifier and effect of various components, Concept of DC and AC load lines, Fixing of operating point, Classification of amplifiers.

BJT AC Analysis: BJT AC Analysis: BJT Transistor Modelling, The re transistor model, Common emitter fixed bias, Voltage divider bias, Emitter follower configuration. Darlington connection-DC bias; The Hybrid equivalent model, Approximate Hybrid Equivalent Circuit- Fixed bias, Voltage divider, Emitter follower configuration; Complete Hybrid equivalent model, Hybrid π Model.

Module-II:

High frequency equivalent circuits of BJT, Short circuit current gain, cutoff frequency, Miller effect, Analysis of high frequency response of CE, CB and CC amplifiers Wide band amplifier: Broad banding techniques, low frequency and high frequency compensation, Cascade amplifier.

Module-III:

Feedback amplifiers: Effect of positive and negative feedback on gain, frequency response and distortion, Feedback topologies and its effect on input and output impedance, Feedback amplifier circuits in each feedback topologies (no analysis required) Oscillators & Tuned Amplifiers: Classification of oscillators, Barkhausen criterion, Analysis of RC phase shift and Wien bridge oscillators, Working of Hartley, Colpitts and Crystal oscillators; Tuned amplifiers, synchronous and stagger tuning.

Module-IV:

Power amplifiers: Classification, Transformer coupled class A power amplifier, push pull class B and class AB power amplifiers, efficiency and distortion, Transformer-less class B and Class AB power amplifiers, Class C power amplifier (no analysis required) Switching Circuits: Simple sweep circuit, Bootstrap sweep circuit, Astable, Bistable, and Monostable multivibrators, Schmitt Trigger.

Module-V:

Transistor based voltage regulator: Design and analysis of shunt and series voltage regulator, load and line regulation, Short circuit protection MOSFET amplifiers: Biasing of MOSFET amplifier, DC analysis of single stage MOSFET amplifier, small signal equivalent circuit. Small signal voltage and current gain, input and output impedances of CS configuration, MOSFET Cascade amplifier.

EC-213E	DIGITAL SYSTEM DESIGN	L T P	CR
		3-1-0	4

Module-I:

Number systems- decimal, binary, octal, hexadecimal, base conversion 1's and 2's complement, signed number representation Binary arithmetic, binary subtraction using 2's complement, Binary codes (grey, BCD and Excess-3), Error detection and correcting codes: Parity (odd, even), Hamming code (7,4), Alphanumeric codes: ASCII

Module-II:

Logic expressions, Boolean laws, Duality, De Morgan's law, Logic functions and gates Canonical forms: SOP, POS, Realization of logic expressions using K- map (2,3,4 variables). Design of combinational circuits – adder, subtractor, 4-bit adder/subtractor, BCD adder, MUX, DEMUX, Decoder, BCD to 7 segment decoder, Encoder, Priority encoder, Comparator (2/3 bits).

Module-III:

Introduction to HDL : Logic descriptions using HDL, basics of modeling (only for assignments) Logic families and its characteristics: Logic levels, propagation delay, fan in, fan out, noise immunity, power dissipation, TTL subfamilies NAND in TTL (totem pole, open collector and tri-state), CMOS:NAND, NOR, and NOT in CMOS, Comparison of logic families (TTL,ECL,CMOS) in terms of fan-in, fan-out, supply voltage, propagation delay, logic voltage and current levels, power dissipation and noise margin Programmable Logic devices - ROM, PLA, PAL, implementation of simple circuits using PLA.

Module-IV:

Sequential circuits - latch, flip flop (SR, JK, T, D), master slave JK FF, conversion of FFs, excitation table and characteristic equations Asynchronous and synchronous counter design, mod N counters, random sequence generator.

Shift Registers - SIPO, SISO, PISO, PIPO, Shift registers with parallel LOAD/SHIFT, Shift register counter - Ring Counter and Johnson Counter.

Module-V:

Mealy and Moore models, state machine, notations, state diagram, state table, transition table, excitation table, state equations.

Construction of state diagram – up down counter, sequence detector, Synchronous sequential circuit design - State equivalence, State reduction – equivalence classes, implication chart.

EC-205E	SOLID STATE DEVICES	L T P	CR
		3-0-0	3

Module-I:

Elemental and compound semiconductors, Fermi-Dirac distribution, Equilibrium and steady state conditions, Equilibrium concentration of electrons and holes, Temperature dependence of carrier concentration ,Carrier transport in semiconductors, drift, conductivity and mobility, variation of mobility with temperature and doping, High Field Effects, Hall effect.

Module-II:

Excess carriers in semiconductors: Generation and recombination mechanisms of excess carriers, quasi-Fermi levels, diffusion, Einstein relations, Continuity equations, Diffusion length, Gradient of quasi-Fermi level.

Module-III:

PN junctions: Contact potential, Electrical Field, Potential and Charge density at the junction, Energy band diagram, Minority carrier distribution, Ideal diode equation, Electron and hole component of current in forward biased p-n junction, piecewise linear model of a diode effect of temperature on V-I characteristics.

Module-IV:

Diode capacitances, switching transients, Electrical Breakdown in PN junctions, Zener and avalanche break down (abrupt PN junctions only), Tunnel Diode basics only, Metal Semiconductor contacts, Ohmic and Rectifying Contacts, current voltage characteristics.

Module-V:

Bipolar junction transistor, current components, Minority carrier distributions, basic parameters, Evaluation of terminal currents (based on physical dimensions), Transistor action, Base width modulation.

Metal Insulator semiconductor devices: The ideal MOS capacitor, band diagrams at equilibrium, accumulation, depletion and inversion, surface potential, CV characteristics, effects of real surfaces, work function difference, interface charge, threshold voltage.

BS-203	NUMERICAL AND STATISTICAL METHODS	L T P	CR
		3-1-0	4

OBJECTIVE

- Derive appropriate numerical methods to solve algebraic and transcendental equations

Develop appropriate numerical methods to approximate a function

COURSE OUTCOMES:

1. Solve an algebraic or transcendental equation using an appropriate numerical method
2. Approximate a function using an appropriate numerical method

Module-I:

ERRORS AND APPROXIMATIONS, SOLUTION OF NONLINEAR EQUATIONS: Introduction to numbers and their accuracy; absolute, relative and percentage errors. Bisection method; Regular falsi method, secant method; fixed point iteration method, Newton- Raphson method; convergence criteria of methods.

Module-II:

SOLUTION OF SIMULTANEOUS LINEAR EQUATIONS: Gauss elimination method; Gauss-Jordan method, UV factorization method, Jacobi's iteration method, Gauss-Seidal iteration method.

Module-III:

INTERPOLATION AND CURVE FITTING: Introduction to interpolation, Newton's forward and backward interpolation formulae, Gauss's forward and backward interpolation formulae, Stirling formula, Lagrange interpolation, Newton's divided difference formula, Principle of least squares, curve fitting.

Module-IV:

NUMERICAL DIFFERENTIATION AND INTEGRATION: Numerical differentiation formulae: differentiation by using forward interpolation formula, backward interpolation formula, Stirling formula, Newton-Cotes formula for numerical integration: Trapezoidal rule, Simpson's rules, Boole's rule and Weddle's rule, Romberg' method.

Module-V:

Simple Correlation and Regression Analysis Correlation Analysis: Meaning and types of Correlation; Pearson's coefficient of correlation: computation and properties (proofs not required). Probable and standard errors, Rank correlation. Regression Analysis: Principle of least squares and regression lines, Regression equations and estimation, Properties of regression coefficients, Relationships between Correlation and Regression coefficients, Standard Error of Estimate.

TEXTBOOKS/REFERENCE BOOKS:

1. Grewal, B. S., "Numerical methods in Engineering and Science".
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, 6th Ed., New age International Publisher, India, 2007
3. Sastry, S.S., "Introductory Methods of Numerical Analysis".

Vohra, N. D. (2017). Business Statistics, New Delhi: McGraw-Hill Education India

MG-101E	BUSINESS ECONOMICS	L T P	CR
		3-0-0	3

Module-I:

Business Economics and its role in managerial decision making- meaning-scope-relevance-economic problems-scarcity Vs choice, Basic concepts in economics-scarcity, choice, resource allocation- Trade-off-opportunity cost-marginal analysis- marginal utility theory, Law of diminishing marginal utility -production possibility curve.

Basics of Microeconomics I Demand and Supply analysis- equilibrium-elasticity (demand and supply), Production concepts-average product-marginal product-law of variable proportions- Production function-Cobb Douglas function-problems.

Module-II:

Basics of Microeconomics II Concept of costs-marginal, average, fixed, variable costs-cost curves-shut down point-long run and short run, Break Even Analysis-Problem-Markets-Perfect Competition, Monopoly and Monopolistic Competition, Oligopoly-Cartel and collusion.

Module-III:

Basics of Macro Economics - Circular flow of income-two sector and multi-sector models- National Income Concepts-Measurement methods-problems-Inflation, deflation, Trade cycles-Money- stock and flow concept-Quantity theory of money-Fischer's Equation and Cambridge Equation -velocity of circulation of money-credit control methods-SLR, CRR, Open Market Operations-Repo and Reverse Repo rate-emerging concepts in money-bit coin.

Module-IV:

Business Decisions I-Investment analysis-Capital Budgeting-NPV, IRR, Profitability Index, ARR, Payback Period (5 Hrs.)- Business decisions under certainty-uncertainty-selection of alternatives-risk and sensitivity- cost benefit analysis-resource management.

Module-V:

Business Decisions II Balance sheet preparation-principles and interpretation-forecasting techniques (7 Hrs.)-business financing- sources of capital- Capital and money markets-international financing-FDI, FPI, FII-Basic Principles of taxation-direct tax, indirect tax-GST.

CS-201E	DATA STRUCTURE AND ALGORITHMS	L T P	CR
		3-1-0	4

Objective: To relay the theoretical and practical fundamental knowledge of most commonly used algorithms.

Course Outcomes:

CO1. Ability to analyze algorithms and algorithm correctness.
CO2. Ability to summarize searching and sorting techniques
CO3. Ability to describe stack, queue and linked list operation.
CO4. Ability to have knowledge of tree and graphs concepts.

Module-I:

Definition of data structures and abstract data types; linear vs. non-linear data structure; primitive vs. non-primitive data structure; static and dynamic implementations; arrays, 1,2-dimensional arrays, insertion & deletion in 1-D array; examples and real life applications. Time complexity; Big Oh notation; running times; best case, worst case, average case; factors depends on running time; introduction to recursion.

Module-II:

Stacks: definition, array based implementation of stacks,; examples: infix, postfix, prefix representation; conversions, applications; definition of queues, circular queue; array based implementation of queues.

Module-III:

Lists: different type of linked Lists, implementation of singly linked list, doubly linked list, linked list implementation of stacks and queues; implementation of circular linked list, applications.

Module-IV:

Definition of trees and binary trees; properties of binary trees and implementation; binary traversal pre-order, post-order, in-order traversal, Binary search trees: searching, insertion & deletion. Definition of undirected and directed graphs, array-based implementation of graphs, adjacency matrix; path matrix implementation, linked list representation of graphs; graph traversal: breadth first traversal, depth first traversal, implementations and applications.

Module-V:

Introduction, selection, insertions, bubble sort, efficiency of above algorithms; merge sort, merging of sorted arrays and algorithms; quick sort algorithm analysis, heap sort, searching algorithms: straight sequential search, binary search (recursive & non–recursive algorithms).

TEXT BOOK

1. A.K. Sharma – Data structure Using C, 2nd edition pearson 2013
2. Langsam, Augentem M.J. and Tenenbaum A. M., ―Data Structures using C & C++‖, Prentice Hall of India, 2009.

REFERENCE BOOKS

1. Aho A. V., Hopcroft J. E. and Ullman T. D., ―Data Structures and Algorithms‖, Original Edition, Addison-Wesley, Low Priced Edition, 1983.
2. Horowitz Ellis and S ahni S artaj, ―Fundamentals of Data Structures‖, Addison-Wesley Pub, 1984.
3. Horowitz, S ahni and Rajasekaran, ―Fundamentals of Computer Algorithms‖ 2007.
4. Kruse Robert, ―Data Structures and Program Design in C‖, Prentice Hall of India, 1994
5. Lipschetz Jr. Seymour, ―Theory & Problems of Data Structures‖, S chaum ‘s Outline, Tata McGraw Hill
6. Weiss Mark Allen, ―Data Structures and Algorithms Analysis in C‖, Pearson Education, 2000
7. Corm en T . H . et al., ―Introduction to Algorithms‖, 2nd Edition, Prentice Hall of India, 2001.
8. Dasgupta Sanjay, Christos P. and Vazirani Umesh, ―Algorithms‖, Tata McGraw Hill, 2008

WEB REFERENCES

http://www.cs.auckland.ac.nz/software/AlgAnim/ds_ToC.html

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

EC-251E	ANALOG ELECTRONIC CIRCUIT LAB	L T P	CR
		0-0-2	1

List of Experiments:

PART_A

(Do any 6 experiments)

1. VI Characteristics of rectifier and Zener diodes
2. RC integrating and differentiating circuits (Transient analysis with different inputs and frequency response)
3. Clipping and clamping circuits (Transients and transfer characteristics)
4. Full wave Rectifier -with and without filter- ripple factor and regulation
5. Simple Zener voltage regulator (load and line regulation)
6. Characteristics of BJT in CE configuration and evaluation of parameters
7. Characteristics of MOSFET in CS configuration and evaluation of parameters
8. RC coupled CE amplifier - frequency response characteristics
9. MOSFET amplifier (CS) - frequency response characteristics
10. Cascade amplifier – gain and frequency response

PART-B

(Do any 6 experiments)

11. Cascode amplifier -frequency response
12. Feedback amplifiers (current series, voltage series) - gain and frequency response
13. Low frequency oscillators –RC phaseshift, Wien bridge,
14. High frequency oscillators –Colpitt's and Hartley
15. Power amplifiers (transformer less) - Class B and Class AB
16. Transistor series voltage regulator (load and line regulation)
17. Tuned amplifier - frequency response
18. Bootstrap sweep circuit
19. Multivibrators -Astable, Monostable and Bistable
20. Schmitt trigger

EC-263E	DIGITAL SYSTEM DESIGN LAB	L T P	CR
		0-0-2	1

List of Experiments:

Part A (Any 5 Experiments)

1. Realization of functions using basic and universal gates (SOP and POS forms).

2. Design and realization of half adder, full adder, half subtractor and full subtractor using:

a) basic gates (b) universal gates.

3. Code converters: Design and implement BCD to Excess 3 and Binary to Gray code converters.

4. Design and implement 4 bit adder/subtractor circuit and BCD adder using IC7483.

5. Implementation of Flip Flops: SR, D, T, JK and Master Slave JK Flip Flops using basic gates.

6. Asynchronous Counter: Design and implement 3 bit up/down counter.

7. Asynchronous Counter: Realization of Mod N counters (At least one up counter and one down counter to be implemented).

8. Synchronous Counter: Realization of 4-bit up/down counter.

9. Synchronous Counter: Realization of Mod-N counters and sequence generators. (At least one mod N counter and one sequence generator to be implemented) .

10. Realization of Shift Register (Serial input left/right shift register), Ring counter and Johnson Counter using flipflops.

Part-B (All 5 Experiments)

1. Realization of Logic Gates and Familiarization of Verilog

(a) Familiarization of the basic syntax of Verilog

(b) Development of Verilog modules for basic gates and to verify truth tables.

(c) Design and simulate the HDL code to realize three and four variable Boolean

Functions

2: Half adder and full adder

(a) Development of Verilog modules for half adder in 3 modelling styles (dataflow/

structural/behavioural).

(b) Development of Verilog modules for full adder in structural modelling using half

adder.

3: Design of code converters

Design and simulate the HDL code for

(a) 4- bit binary to gray code converter

(b) 4- bit gray to binary code converter

4: Mux and Demux in Verilog

(a) Development of Verilog modules for a 4x1 MUX.

(b) Development of Verilog modules for a 1x4 DEMUX.

5: Adder/Subtractor

(a) Write the Verilog modules for a 4-bit adder/subtractor

(b) Development of Verilog modules for a BCD adder

CS-251E	DATA STRUCTURE AND ALGORITHMS USING C LAB	L T P	CR
		0-0-2	1

List of Experiments:-(Do at least 8 experiments in C)

1. Implementation of Polynomials and Sparse matrices using arrays.
2. Implementation of Stack, Queues, Priority Queues, DEQUEUE and Circular Queues using arrays
3. Application problems using stacks: Conversion of expression from one notation to another notation
4. Implementation of various linked list operations.
5. Implementation of stack, queue using linked list.
6. Implementation of trees using linked list
7. Representation of polynomials using linked list, addition and multiplication of polynomials.
8. Implementation of binary trees using linked lists and arrays- creations, insertion, deletion and traversal.
9. Implementation of binary search trees – creation, insertion, deletion, search.
10. Implementation of sorting algorithms – bubble, insertion, selection sort.
11. Implementation of searching algorithms – linear search, binary search.
12. Any application programs using trees.

2nd Year

SEMESTER – 4

EC-202E	NETWORK THEORY	L T P	CR
		3-1-0	4

Module 1 :

Mesh and Node Analysis: Mesh and node analysis of network containing independent and dependent sources. Super mesh and Super node analysis. Steady-state AC analysis using Mesh and Node analysis.

Module 2 :

Network Theorems: Thevenin's theorem, Norton's theorem, Superposition theorem, Reciprocity theorem, Maximum power transfer theorem. (applied to both dc and ac circuits having dependent source).

Module 3 :

Application of Laplace Transforms: Review of Laplace Transforms and Inverse Laplace Transforms, Initial value theorem & Final value theorem, Transformation of basic signals and circuits into s-domain.

Transient analysis of RL, RC, and RLC networks with impulse, step and sinusoidal inputs (with and without initial conditions). Analysis of networks with transformed impedance and dependent sources.

Module 4 :

Network functions: Network functions for the single port and two port network. Properties of driving point and transfer functions. Significance of Poles and Zeros of network functions, Time domain response from pole zero plot. Impulse Function & Response. Network functions in the sinusoidal steady state, Magnitude and Phase response.

Module 5 :

Two port network Parameters: Impedance, Admittance, Transmission and Hybrid parameters of two port network. Interrelationship among parameter sets. Series and parallel connections of two port networks. Reciprocal and Symmetrical two port network. Characteristic impedance, Image impedance and propagation constant (derivation not required).

EC-206E	SIGNAL AND SYSTEMS	L T P	CR
		3-1-0	4

Module 1 :

Elementary Signals, Classification and representation of continuous time and discrete time signals, Signal operations Continuous time and discrete time systems – Classification, Properties. Representation of systems: Differential equation representation of continuous time systems. Difference equation representation of discrete systems. Continuous time LTI systems and convolution integral. Discrete time LTI systems and linear convolution. Stability and causality of LTI systems. Correlation between signals, Orthogonality of signals.

Module 2 :

Frequency domain representation of continuous time signals - continuous time Fourier series and its properties. Continuous time Fourier transform and its properties. Convergence and Gibbs phenomenon ,Review of Laplace Transform, ROC of Transfer function, Properties of ROC, Stability and causality conditions, Relation between Fourier and Laplace transforms.

Module 3 :

Analysis of LTI systems using Laplace and Fourier transforms. Concept of transfer function, Frequency response, Magnitude and phase response. Sampling of continuous time signals, Sampling theorem for lowpass signals, aliasing.

Module 4 :

Frequency domain representation of discrete time signals, Discrete time Fourier series for discrete periodic signals. Properties of DTFS. Discrete time Fourier transform (DTFT) and its properties. Analysis of discrete time LTI systems using DTFT. Magnitude and phase response.

Module 5 :

Z transform, ROC , Inverse transform, properties, Unilateral Z transform. Relation between DTFT and Z-Transform, Analysis of discrete time LTI systems using Z transforms, Transfer function. Stability and causality using Z transform.

EC-204E	LINEAR INTEGRATED CIRCUITS	L T P	CR
		3-1-0	4

Module 1 :

Differential amplifiers: Differential amplifier configurations using BJT, Large and small signal operations, Input resistance, Voltage gain, CMRR, Non-ideal characteristics of differential amplifier. Frequency response of differential amplifiers.

Operational amplifiers: Introduction, Block diagram, Ideal op-amp parameters, Equivalent circuit, Voltage transfer curve, Open loop op-amp configurations, Effect of finite open loop gain, Bandwidth and slew rate on circuit performance.

Module 2 :

Op-amp with negative feedback: Introduction, Feedback configurations, Voltage series feedback, Voltage shunt feedback, Properties of practical op-amp. Op-amp applications: Inverting and non-inverting amplifier, DC and AC amplifiers, Summing, Scaling and averaging amplifiers, Instrumentation amplifier.

Module 3 :

Op-amp applications: Voltage to current converter, Current to voltage converter, Integrator, Differentiator, Precision rectifiers, Log and antilog amplifier, Phase shift and Wien bridge oscillators

Module 4 :

Astable and monostable multivibrators, Triangular and sawtooth wave generators, Comparators, Zero crossing detector, Schmitt trigger .Active filters: Advantages, First and second order low pass, High pass, Band pass and band reject filters, Design of filters using Butterworths approximations.

Module 5 :

Specialized ICs and its applications: Timer IC 555 : Astable and monostable operations, applications. Analog Multipliers: Introduction, Gilbert multiplier cell.

Data Converters: D/A converter, Specifications, Weighted resistor type, R-2R Ladder type.

A/D Converters: Specifications, Classification, Flash type, Counter ramp type, Successive approximation type, Single slope type, Dual slope type, Sample-and-hold circuits.

EC-208E	NANO ELECTRONICS	L T P	CR
		3-0-0	3

Module 1 :

Introduction to nanotechnology, Impacts, Limitations of conventional microelectronics, Trends in microelectronics and optoelectronics.

Mesoscopic physics, trends in microelectronics and optoelectronics, characteristic lengths in mesoscopic systems, Quantum mechanical coherence Classification of Nano structures, Low dimensional structures Quantum wells, wires and dots, Density of states and dimensionality.

Basic properties of two dimensional semiconductor nanostructures, square quantum wells of finite depth, parabolic and triangular quantum wells, Quantum wires and quantum dots, carbon nano tube, graphene.

Module 2 :

Introduction to methods of fabrication of nano-layers, different approaches, physical vapour deposition, chemical vapour deposition Molecular Beam Epitaxy, Ion Implantation, Formation of Silicon Dioxide- dry and wet oxidation methods. Fabrication of nano particle- grinding with iron balls, laser ablation, reduction methods, sol gel, self-assembly, precipitation of quantum dots.

Module 3 :

Introduction to characterization of nanostructures, tools used for of nano materials characterization, microscope-optical, electron, and electron microscope. Principle of operation of Scanning Tunnelling Microscope, Atomic Force Microscope, Scanning Electron microscope, Specimen interaction. Transmission Electron Microscope, X-Ray Diffraction analysis, PL & UV Spectroscopy, Particle size analyser.

Module 4 :

Two dimensional electronic system, two dimensional behaviour, MOSFET structures, Heterojunctions Quantum wells, modulation doped quantum wells, multiple quantum wells The concept of super lattices Kronig - Penney model of super lattice.

Module 5 :

Nanoelectronics devices- MODFETS, heterojunction bipolar transistors Resonant tunnel effect, RTD, RTT, Hot electron transistors Coulomb blockade effect and single electron transistor, CNT transistors Heterostructure semiconductor laser

Quantum well laser, quantum dot LED, quantum dot laser Quantum well optical modulator, quantum well sub band photo detectors, principle of NEMS.

EC-210E	PROBABILITY THEORY AND STOCHASTIC PROCESS	L T P	CR
		3-1-0	4

Module I:

Sets and set operations; Probability space; Conditional probability and Bayes theorem; Combinatorial probability and sampling models. Discrete random variables, probability mass function, probability distribution function, example

Module II:

Random variables and distributions; Continuous random variables, probability density function, Probability distribution function, example distributions.

Module III:

Joint distributions, functions of one and two random variables, moments of random variables; Conditional distribution, densities and moments; Characteristic functions of a random variable; Markov, Chebyshev and Chernoff bounds.

Module IV:

Random sequences and modes of convergence (everywhere, almost everywhere, probability, distribution and mean square); Limit theorems; Strong and weak laws of large numbers, central limit theorem.

Module V:

Random process. Stationary processes. Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Power spectral density.

EC-212E	BASIC AND ADVANCE EXCEL	L T P	CR
		2-0-0	2

Module I: Make a Start with Excel

Introduction to Spreadsheet, Excel Rows and Columns, Enter Text and numbers in a cell, editing text in a cell, centre text and numbers, Font Formatting, changing the colour of a cell, saving work in excel, Currency symbols in excel, How to Merge cells.

Module II: A more complex spreadsheet

How to use Auto fill in excel, Adding Simple Addition formula 3,The Sum Function in excel, Copy and Paste, How to use Paste Special 6 How to Multiply in excel, How to add a comment to a cell.

The SUM Function, How to multiply in excel , Subtract and Divide, Combine the Arithmetic Operators ,A Budget Spread Sheet.

The IF Function, Conditional Formatting in excel, Count IF, Count IFS, SUMIF, SUMIFS.

Module III: Microsoft Excel Charts

How to Sort data in excel 2,Create an excel chart, Move and Resize your chart 4 Charts Styles and Layouts, Chart Titles and Series Titles ,Chart Layout Panel in Excel ,The Format chart Panel, Create Pie chart in Excel ,Add Labels to a Pie Chart, Format Pie chart segments, Create a 2D line Chart in Excel, Format your Axis titles, Predict the future with a Trendline chart, Sparkline charts.

Module IV: Processing Data in Excel (Advanced Excel)

Flash Fill, Data Tables in Excel , A Second Data Table , Excel Scenarios, Goal Seek, Absolute Cell References , Named Ranges in Excel, Create a Custom Name in Excel , More on Named Ranges, Excel Pivot Tables, Reference other Worksheets, The LOOKUP Function, The VLOOKUP Function in Excel , Searching with MATCH and INDEX, Create a Business Invoice.

Module V: Advanced Excel

How to Create an Excel Template, Data Forms in Excel**,** Drop Down Lists in Excel**,** Add your own Error Messages**,** Array Formulas Intermediate Excel**,** Frequency Distribution Intermediate Excel, Hyperlinks in Excel**,** Object Linking and Embedding, Insert Drawing Objects.

EC-254E	LINEAR INTEGRATED CIRCUIT LAB	L T P	CR
		0-0-2	1

PART A

(Complete any 5 Experiments using LM741 Operational Amplifier)

1. Familiarization of Operational amplifiers - Inverting and Noninverting amplifiers, Adder, Integrator, Comparators.
2. Measurement of Op-Amp parameters- Input Offset Voltage, Input Offset Current, Input Bias current, Slew rate, CMRR.
3. Difference Amplifier and Instrumentation amplifier.
4. Schmitt trigger circuit using Op–Amps.
5. Astable and Monostable multivibrator using Op-Amps.
6. Waveform generators using Op-Amps - Triangular and saw tooth.
7. Wien bridge oscillator using Op-Amp.

PART-B

(Complete any 5 Simulations using software like NI Multisim/KiCad 8.0)

1. RC Phase shift Oscillator.
2. Active second order filters using Op-Amp (LPF, HPF, BPF and BSF).
3. Precision rectifiers using Op-Amp.
4. Astable and Monostable multivibrator using Timer IC NE555
5. A/D converters- counter ramp and flash type.
6. D/A Converters - R-2R ladder circuit

EC-256E	SIGNAL AND SYSTEM LAB	L T P	CR
		0-0-2	1

Complete any 10 experiments

1. Introduction to MATLAB using GNU Octave an opensource alternative to MATLAB software:
    i. To define & use variables, vectors, Matrices & its functions in MATLAB.
    ii. To study various arithmetic operators and mathematical functions in MATLAB.
    iii. To create & use m-files.
2. Basic plotting of signals: To study various MATLAB commands for creating two and three dimensional plots.
3. Write a MATLAB program to plot the following continuous time and discrete time Signals.
    i. Step Function
    ii. Impulse Function
    iii. Exponential Function
    iv. Ramp Function
    v. Sine Function
4. Write a MATLAB program to obtain linear convolution of the given sequences.
5. Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.
6. Write a MATLAB program to obtain Cross correlation of sequence x(n) and y(n) & autocorrelation of a sequence x (n) of the given sequences & verify the property.
7. Write a MATLAB program to generate Fourier series of a Square Wave.
8. Write a MATLAB program to Calculate and plot using MATLAB Fourier Transform and Z-Transform of a given signal.
9. Write a MATLAB program to find the impulse response and step response of a system from its difference equation.
10. Compute and plot the response of a given system to a given input.
11. Write a MATLAB program to plot magnitude and phase response of a given system.
12. Checking linearity/non-linearity of a system using SIMULINK Build a system that amplifies a sine wave by a factor of two.

3rd Year

SEMESTER – V

EC-301E	MICROPROCESSOR & MICROCONTROLLERS	L T P	CR
		3-1-0	4

Microprocessor & Microcontroller

Module 1 :

Microprocessors: Introduction, organization of a microprocessor based system, evolution of microprocessors, 8085 architecture and its operation, microprocessor initiated operations and bus organization, pin configuration and functions, generation of control signals for external operations- fetch, IO/M, read/write..

Module 2 :

Machine cycles and bus timings, Addressing modes, instruction set instruction classification. Overview/concept of peripheral IC interfacing with 8085 microprocessor (8251, 8253, 8255, 8279).Simple examples in assembly language programming for 8085 (only for internal examination) Introduction to development tools: IDE, cross assembler, builder, linker and debugger.

Module 3 :

Introduction to 8086 and comparison between 8086,80286,80386,80486 and Pentium.

Microcontrollers: Introduction, comparison between microprocessors and microcontrollers, microcontroller families, 8051- features, architecture, memory organization, registers, I/O ports, pin configuration and functions. Addressing modes, instruction set, instruction classification.

Assembly language programming examples for 8051.

Module 4 :

Interrupts in 8051: Types, interrupt source, interrupt handling and programming, Timer/Counter programming: Operating modes, time delay generation, Waveform generation. Serial communication: RS 232 interface, registers in UART, modes of operation, programming examples for serial data transmission and reception.

Module 5 :

Interfacing: Interfacing (block schematic and C programming) of DIP switch, stepper motor, ADC, DAC, LEDs and seven segment displays, alphanumeric LCD module with 8051.

EC-303E	Analog & Digital Communication	L T P	CR
		3 0 0	3

At the end of this course students will demonstrate the ability to
CO1: Analyze and compare different analog modulation schemes for their efficiency and bandwidth
CO2: Analyze the behaviour of a communication system in presence of noise
CO3: Investigate pulsed modulation system and analyze their system performance
CO4: Analyze different digital modulation schemes and can compute the bit error performance.CO5: Able to apply concept of random variables in communication.

Unit 1: Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

Unit 2: Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De-emphasis, Threshold effect in angle modulation.

Unit 3: Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation (PCM),Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.

Unit 4: Elements of Detection Theory, Optimum detection of signals in noise,Coherent communication with waveforms- Probability of Error evaluations. BasebandPulse Transmission- Inter symbol Interference and Nyquist criterion.Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying,Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.

Unit 5: Digital Modulation tradeoffs. Optimum demodulation of digital signals over band-limited channelsMaximum likelihood sequence detection (Viterbi receiver). Equalization Techniques. Synchronization and Carrier Recovery for Digital modulation.

Text/Reference Books: 1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill, 2001.

4.Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",John Wiley, 1965.

5. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication", Kluwer Academic Publishers, 2004.

6. Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	**3**	**2**	2	2	1	-	-	-	-	-	2	2	1	1
CO2	**2**	**3**	1	1	1	-	-	-	-	-	1	2	1	-
CO3	**3**	**2**	3	1	-	-	-	-	-	-	2	2	-	-
CO4	**1**	**2**	1	2	-	-	-	-	-	-	2	1	2	1
CO5	**2**	**3**	3	3	-	-	-	-	-	-	1	2	-	-

EC-305E	BIOMEDICAL ELECTRONICS	L T P	CR
		3 0 0	3

Module I:

Amplitude Modulation: Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side band modulation.

Module II:

Angle Modulation: Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Signal-Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM., Concept of Pre-emphasis and de-emphasis.

Module III:

Transmitters: Classification of Transmitters, AM Transmitters, FM Transmitters

Receivers: Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superheterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison of AM and FM Receivers.

Module IV:

Pulse Modulation: Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM.

Pulse Code Modulation: PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

Module V:

Digital Modulation Techniques: ASK- Modulator, Coherent ASK Detector, FSK- Modulator, Non- Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Principles of QPSK, Differential PSK and QAM.

Baseband Transmission and Optimal Reception of Digital Signal: A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, ISI, Eye Diagrams.

EC-309E	CMOS DESIGN	L T P	CR
		3 1 0	4

Module I:

Fundamentals of MOS technology: Introduction to IC technology; MOS Transistor - Enhancement and Depletion mode operations; Introduction to Fabrication; CMOS and BiCMOS Devices. Equivalent circuit for MOSFET.

Module II:

MOS transistor theory: MOS Device Design Equations; MOS Transistor; Evaluation aspects of MOS Transistor; Threshold voltage; MOS Transistor Trans- conductance; Figure of Merit; Determination of Pull-up to Pull-down Ratio for an n-MOS inverter driven by another n-MOS inverter and by one or more pass transistor; alternative forms of Pull-up; CMOS and Bi-CMOS-inverters. Latch up in CMOS circuitry and BiCMOS Latch up susceptibility.

Module III:

MOS circuits and logic design: Basic Physical Design of simple logic gates using n-MOS; p-MOS and CMOS; CMOS logic gate design considerations; CMOS logic structures.

Module IV:

Circuit characterization and performance estimation: Resistance estimation; Capacitance estimation; Inductance; Switching characteristics; Voltage Transfer Characteristics (VTC) of Resistor Load n-MOS and Comparison with CMOS Inverter, Noise Margin Estimation, CMOS Gate Transistor Sizing; Power Dissipation.

Design example using CMOS : Clocking Strategies, Incrementor/ Decremented; Left/Right Shift Serial/Parallel Register; Comparator for two n-bit number; a two-phase non-overlapping clock generator with buffered output on both phases; design of an event driven element for EDL system.

Module V:

VLSI fabrication: Extraction of Silicon from Sand/Silica, Purification, Crystal growth and Chemical Cleaning Processes, Wafer preparation and orientations; Epitaxy; Oxidation; Lithography; Etching; Diffusion; Dielectric and Poly-silicon Film Deposition; Ion Implantation; Metallization. Yield and Reliability.

EC-307E	ELECTROMAGNETIC THEORY	L T P	CR
		3 1 0	4

Module I:

Transmission Lines- Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss- less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements,

Module II:

Maxwell's Equations- Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface. Uniform Plane Wave- Uniform plane wave, Propagation of wave, Wave polarization, Poincare's Sphere, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor.

Module III:

Plane Waves at a Media Interface- Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary.

Module IV:

Wave propagation in parallel plane waveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide.

Module V:

Radiation: Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna.

EC-351E	MICROPROCESSOR AND MICROCONTROLLER LAB	L T P	CR
		0 0 2	1

PART- A

(All Experiments are Compulsory)

1. Use of 8085/8086 trainer kit and execution of programs. (Instruction set for simple Programs using 4 to 5 lines of instruction code under different addressing modes for data transfer, manipulation, Arithmetic operations)
2. Branching operations and logical operations in a given data.
3. Multiplication and division.
4. Single byte, multi byte Binary and BCD addition and subtraction
5. Code conversions.
6. Interface a stepper motor to 8086 using 8255 PPI
7. Interface a USART 8251 to 8086 for serial data transfer/Receive

Note: Use 8085/8086 kit or use keil micro vision 5 for assembly code and use Porteous software for simulation

PART- B

(All Experiments are Compulsory)

1. Familiarity and use of 8051/8052 Microcontroller development Board, and execution of programs.
2. Program to Interface 8051/8052 with DC motor through driver LM298.
3. Program to Interface 8051/8052 with Stepper motor through driver ULN2003A.
4. Program to Interface ADC interfacing with 8051/8052
5. Program to Interface LCD interfacing with 8051/8052.
6. Program to Interface Matrix Keyboard with 8051/8052
7. Program to demonstrate traffic signal control using 8051/8052.

Note: Use 8051/8052 kit along with keil micro vision 5 for C programming and use Porteous software for simulation

EC-353E	ANALOG AND DIGITAL COMMUNICATION LAB	L T P	CR
		0 0 2	1

Part-A

1. AM generation and detection.
2. FM generation and detection.
3. Pre emphasis and De-emphasis circuits.
4. Multiplexing Techniques (FDM and TDM)
5. Mixer Characteristics
6. Sampling , PAM, PWM, and PPM generation and detection
7. Generation and Detection of Analog and Pulse modulation techniques by using MATLAB/Simulink/Lab-view.

Part-B

1. PCM generation and detection
2. Data formats / channel encoding and decoding.
3. Linear and Adaptive Delta Modulation and Demodulation
5. ASK generation and Detection.
6. FSK and Minimum Shift Keying generation and Detection.
7. Phase shift keying methods (BPSK, QPSK) generation and Detection.
8. Generation and Detection of PCM, Delta modulation and Digital modulation Schemes (ASK. FSK, BPSK,QPSK) by using MATLAB/Simulink/Lab-view.

3rd Year

SEMESTER – 6

EC-308E	INTERNET OF THINGS	L T P	CR
		3 0 0	3

Module I: Overview of IoT

An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

Module II: Reference Architecture

IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

Module III: – IoT Data Link Layer & Network Layer Protocols

PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), WirelessHART,Z-Wave,Bluetooth, Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP.

Module IV: – Transport & Session Layer Protocols

Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT.

Module V: – Service Layer Protocols & Security

Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4, 6LoWPAN, RPL, Application Layer.

EC-306E	DIGITAL SIGNAL PROCESSING	L T P	CR
		3 1 0	4

Module I:

Basic Elements of a DSP system, Typical DSP applications, Finite-length discrete transforms, Orthogonal transforms – The Discrete Fourier Transform: DFT as a linear transformation (Matrix **r**elations), Relationship of the DFT to other transforms, IDFT, Properties of DFT and examples. Circular convolution, Linear Filtering methods based on the DFT, linear convolution using circular convolution, Filtering of long data sequences, overlap save and overlap add methods, Frequency Analysis of Signals using the DFT (concept only required)

Module II:

Efficient Computation of DFT: Fast Fourier Transform Algorithms-Radix-2 Decimation in Time and Decimation in Frequency FFT Algorithms, IDFT computation using Radix-2 FFT Algorithms, Application of FFT Algorithms, Efficient computation of DFT of Two Real Sequences and a 2N-Point Real Sequence.

Module III:

Design of FIR Filters - Symmetric and Anti-symmetric FIR Filters, Design of linear phase FIR filters using Window methods, (rectangular, Hamming and Hanning) and frequency sampling method, Comparison of design methods for Linear Phase FIR Filters. Design of IIR Digital Filters from Analog Filters (Butterworth), IIR Filter Design by Impulse Invariance, and Bilinear Transformation, Frequency Transformations in the Analog and Digital Domain.

Module IV:

Structures for the realization of Discrete Time Systems - Block diagram and signal flow graph representations of filters, FIR Filter Structures: Linear structures, Direct Form, CascadeForm, IIR Filter Structures: Direct Form, Transposed Form, Cascade Form and Parallel Form, Computational Complexity of Digital filter structures. Multi-rate Digital Signal Processing: Decimation and Interpolation (Time domain and Frequency Domain Interpretation), Anti-aliasing and anti-imaging filter.

Module V:

Computer architecture for signal processing: Harvard Architecture, pipelining, MAC, Introduction to TMS320C67xx digital signal processor, Functional Block Diagram. Finite word length effects in DSP systems: Introduction (analysis not required), fixed-point and floating-point DSP arithmetic, ADC quantization noise, Finite word length effects in IIR digital filters: coefficient quantization errors. Finite word length effects in FFT algorithms: Round off errors.

EC-304E	MACHINE LEARNING	L T P	CR
		3 0 0	3

Module-I:- (Overview of machine learning)

Machine learning paradigms-supervised, semi-supervised, unsupervised, reinforcement learning. Basics of parameter estimation - maximum likelihood estimation(MLE) and maximum a posteriori estimation(MAP). Introduction to Bayesian formulation.

Module-II:- (Supervised Learning)

Regression - Linear regression with one variable, Linear regression with multiple variables, solution using gradient descent algorithm and matrix method, basic idea of overfitting in regression. Linear Methods for Classification- Logistic regression, Naive Bayes, Decision tree algorithm ID3.

Module-III:- (Neural Networks (NN) and Support Vector Machines (SVM))

Perceptron, Neural Network - Multilayer feed forward network, Activation functions (Sigmoid, ReLU, Tanh), Backpropagation algorithm.

SVM - Introduction, Maximum Margin Classification, Mathematics behind Maximum Margin Classification, Maximum Margin linear separators, soft margin SVM classifier, non-linear SVM, Kernels for learning non-linear functions, polynomial kernel, Radial Basis Function(RBF).

Module-IV:- (Unsupervised Learning)

Clustering - Similarity measures, Hierarchical Agglomerative Clustering, K-means partitional clustering, Expectation maximization (EM) for soft clustering. Dimensionality reduction – Principal Component Analysis.

Module-V:- (Classification Assessment)

Classification Performance measures - Precision, Recall, Accuracy, F-Measure, Receiver Operating Characteristic Curve(ROC), Area Under Curve(AUC. Bootstrapping, Cross Validation, Ensemble methods, Bias-Variance decomposition. Case Study: Develop a classifier for face detection.

EC-302E	CONTROL SYSTEM	L T P	CR
		3 1 0	4

Module I:

Introduction: Basic Components of a Control System, Open-Loop Control Systems and Closed-Loop Control Systems, Examples of control system .Types of Control Systems, Linear versus Nonlinear Control Systems, Time-Invariant versus Time-Varying Systems. Mathematical modelling of control systems: Electrical Systems and Mechanical systems. **Transfer Function from Block Diagrams and Signal Flow Graphs:** impulse response and its relation with transfer function of linear systems. Block diagram representation and reduction methods, Signal flow graph and Mason's gain formula.

Module II:

Time Domain Analysis of Control Systems: Introduction- Standard Test signals, Time response specifications. Time response of first and second order systems to unit step input and ramp inputs, time domain specifications. Steady state error and static error coefficients.

Frequency domain analysis: Frequency domain specifications, correlation between time and frequency responses.

Module III:

Stability of linear control systems: Concept of BIBO stability, absolute stability, Routh Hurwitz Criterion, Effect of P, PI & PID controllers.

Root Locus Techniques: Introduction, properties and its construction, Application to system stability studies. Illustration of the effect of addition of a zero and a pole.

Module IV:

Nyquist stability criterion: Fundamentals and analysis Relative stability: gain margin and phase margin. Stability analysis with Bode plot.

Design of Compensators: Need of compensators, design of lag and lead compensators using Bode plots.

Module V:

State Variable Analysis of Linear Dynamic Systems: State variables, state equations, state variable representation of electrical and mechanical systems, dynamic equations, merits for higher order differential equations and solution.

Transfer function from State Variable Representation, Solutions of the state equations, state transition matrix. Concept of controllability and observability and techniques to test them - Kalman’s TesT

EC-310E	ROBOTICS	L T P	CR
		3 0 0	3

Module I:-

Introduction To Robotics: Introduction to Robotics and Automation, laws of robot, brief history of robotics, basic components of robot, robot specifications, classification of robots, human system and robotics, safety measures in robotics, social impact, Robotics market and the future prospects, advantages and disadvantages of robots.

Module II:-

Robot Anatomy And Motion Analysis: Anatomy of a Robot, Robot configurations: polar, cylindrical, Cartesian, and jointed arm configurations, Robot links and joints, Degrees of freedom: types of movements, vertical, radial and rotational traverse, roll, pitch and yaw, Wok volume/envelope, Robot kinematics: Introduction to direct and inverse kinematics, transformations and rotation matrix.

Module III:-

Robot Drives And End Effectors: Robot drive systems: Hydraulic, Pneumatic and Electric drive systems, classification of end effectors, mechanical grippers, vacuum grippers, magnetic grippers, adhesive gripper, gripper force analysis and gripper design, 1 DoF, 2 DoF, multiple degrees of freedom robot hand, tools as end effectors, Robot control types: limited sequence control, point-to-point control, playback with continuous path control, and intelligent control.

Module IV:-

Path Planning: Definition-Joint space technique, Use of P-degree polynomial-Cubic, polynomial-Cartesian space technique, parametric descriptions, straight line and circular paths, position and orientation planning.

Module V:-

Robotics Applications: Material Handling: pick and place, palletizing and depalletizing, machining loading and unloading, welding & assembly, Medical, agricultural and space applications, unmanned vehicles: ground, Ariel and underwater applications, robotic for computer integrated manufacturing. Types of robots: Manipulator, Legged robot, wheeled robot, aerial robots, Industrial robots, Humanoids, Robots, Autonomous robots, and Swarm robots

EC-312E	COMPUTER COMMUNICATION NETWORKS	L T P	CR
		3 0 0	3

Module I:-(Introduction and Physical Layer)

Introduction: Uses of computer networks, Network hardware, Network software. Reference models :The OSI reference model, The TCP/IP reference model, Comparison of OSI and TCP/IP reference models. Physical Layer: Modes of communication, Physical topologies, Signal encoding, Repeaters and hub, Transmission media overview. Performance indicators: Bandwidth, Throughput, Latency, Queuing time, Bandwidth–Delay product.

Module II:- (Data Link Layer)

Data link layer - Data link layer design issues, Error detection and correction, Sliding window protocols, High-Level Data Link Control(HDLC) protocol.

Medium Access Control (MAC) sublayer: Channel allocation problem, Multiple access protocols, Ethernet, Wireless LANs - 802.11, Bridges & switches : Bridges from 802.x to 802.y, Repeaters, Hubs, Bridges, Switches, Routers and Gateways.

Module III :-(Network Layer)

Network layer design issues. Routing algorithms: The Optimality Principle, Shortest path routing, Flooding, Distance Vector Routing, Link State Routing, Multicast routing, Routing for mobile hosts. Congestion control algorithms. Quality of Service (QoS): requirements, Techniques for achieving good QoS.

Module IV:- (Network Layer in the Internet)

IP protocol, IP addresses, Internet Control Message Protocol (ICMP), Address Resolution Protocol (ARP), Reverse Address Resolution Protocol (RARP), Bootstrap Protocol (BOOTP), Dynamic Host Configuration Protocol (DHCP). Open Shortest Path First(OSPF) Protocol, Border Gateway Protocol (BGP), Internet multicasting, IPv6, ICMPv6.

Module – 5 (Transport Layer and Application Layer)

Transport service : Services provided to the upper layers, Transport service primitives. User Datagram Protocol (UDP). Transmission Control Protocol (TCP): Overview of TCP, TCP segment header, Connection establishment &release, Connection management modelling, TCP retransmission policy, TCP congestion control.

Application Layer : File Transfer Protocol (FTP), Domain Name System (DNS), Electronic mail, Multipurpose Internet Mail Extension (MIME), Simple Network Management Protocol, (SNMP), World Wide Web(WWW):Architectural Overview.

EC-356E	DIGITAL SIGNAL PROCESSING LAB	L T P	CR
		0 0 2	1

All Experiments to be completed using MATLAB/OCTAVE

1. Verification of sampling theorem (use interpolation function).
2. Verification of DFT properties (like Linearity and Parseval's theorem, etc.)
3. Computation of N point DFT of a given sequence without using in built function and plot magnitude and phase spectrum (using that DFT equation and verify it by built-in function).
4. Compute Linear convolution of two sequences.
5. Compute Circular convolution of two sequences.
6. Compute Linear Convolution using Circular Convolution.
7. Perform Linear filtering using DFT-IDFT method of a given sequence.
8. Generation of Sine wave and standard test signals
9. Design and implementation of Low pass and High pass FIR filter to meet the desired specifications.
10. Design and implementation of a digital IIR filter (Low pass and High pass) to meet given specifications .

EC-358E	IOT LAB	L T P	CR
		0 0 2	1

All the experiments are Compulsory

1. Introduction to IoT concepts and Product development
2. Introduction to Arduino IDE V 2.x.x and its connectivity to IoT modules like ESP8266,ESP32 and Intel Edison IoT Module.
3. Introduction to basic sensors like Temperature sensor DHT-11,Ultrasonic sensors HC-SR04, Fire Sensor,MQ-5,MQ-135 gas sensor, PIR sensor HC-SR501,OLED display 1.3 inch I2C,Led Display(16x2),Heart rate and pulse oximeter(MAX 30102).
4. Getting the IoT modules connected to webservers.
5. Introduction to Clouds like Think Speak, Cayenne ,Blynk and Arduino Cloud.
6. Building basic Prototypes and getting connected to cloud.
7. Product designing and Implementation based on real life problems.

EC-364E	Mini Project Work	L T P	Cr
		0 0 4	2

Objective:

The student shall be capable of identifying a problem related to the program of study and carry out wholesome research on it leading to findings which will facilitate development of a new/improved product, process for the benefit of the society.

B.Tech projects should be socially relevant and research oriented ones. Student is expected to do an individual project or in group of 3 members. The project work is carried out in two phases – Minor Project in VI semester and Major Project in VII semester. Major project of the project work shall be in continuation of Minor Project only.

This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

1. Survey and study of published literature on the assigned topic;

2. Working out a preliminary Approach to the Problem relating to the assigned topic;

3. Conducting preliminary

Analysis/Modelling/Simulation/Experiment/Design/Feasibility;

4. Preparing a Written Report on the Study conducted for presentation to the

Department;

5. Final Seminar, as oral Presentation before a departmental committee.

At the completion of a project the student will submit a project report, which will be evaluated (end semester assessment) by duly appointed examiner(s). This evaluation will be based on the project report and a viva voce examination on the project. Student will be allowed to appear in the final viva voce examination only if he / she has submitted his / her project work in the form of paper for presentation / publication in a conference / journal and produced the proof of acknowledgement of receipt of paper from the organizers / publishers.

3nd Year

SEMESTER – 7

EC-401E	HIGH SPEED ELECTRONICS	L T P	CR
		3 0 0	3

Module I:-

Important parameters governing the high speed performance of devices and circuits:- Transit time of charge carriers, junction capacitances, ON-resistances and their dependence on the device geometry and size, carrier mobility, doping concentration and temperature. Contact resistance and interconnection/interlayer capacitances in the Integrated Electronic Circuits.

Silicon based MOSFET and BJT circuits for high speed operation and their limitations:- Emitter coupled Logic (ECL) and CMOS Logic circuits with scaled down devices. Silicon On Insulator (SOI) wafer preparation methods and SOI based devices and SOICMOS circuits for high speed low power applications.

Module II:-

Materials for high speed devices and circuits:- Merits of III –V binary and ternary compound semiconductors (GaAs, InP, InGaAs, AlGaAs ETC.), silicon-germanium alloys and silicon carbide for high speed devices, as compared to silicon based devices. Brief outline of the crystal structure, dopants and electrical properties such as carrier mobility, velocity versus electric field characteristics of these materials.

Module III:-

Metal semiconductor contacts and Metal Insulator Semiconductor and MOS devices: Native oxides of Compound semiconductors for MOS devices and the interface state density related issues. Metal semiconductor contacts, Schottky barrier diode. Thermionic Emission model for current transport and current-voltage (I-V) characteristics. Effect of interface states and interfacial thin electric layer on the Schottky barrier height and the I-V characteristics.

Module IV:-

Metal semiconductor Field Effect Transistors (MESFETs): Pinch off voltage and threshold voltage of MESFETs. D.C. characteristics and analysis of drain current. Velocity overshoot

effects and the related advantages of GaAs, InP and GaN based devices for high speed operation. Sub threshold characteristics, short channel effects and the performance of scaled down devices.
High Electron Mobility Transistors (HEMT): Hetero-junction devices. The generic Modulation Doped FET(MODFET) structure for high electron mobility realization. Principle of operation and the unique features of HEMT. InGaAs/InP HEMT structures.

Module V:-

Hetero junction Bipolar transistors (HBTs): Principle of operation and the benefits of hetero junction BJT for high speed applications. GaAs and InP based HBT device structure and the surface passivation for stable high gain high frequency performance. SiGe HBTs and the concept of strained layer devices.
High speed Circuits: GaAs Digital Integrated Circuits for high speed operation- Direct Coupled Field Effect Transistor Logic (DCFL), Schottky Diode FET Logic (SDFL), Buffered FET Logic(BFL). GaAs FET Amplifiers. Monolithic Microwave Integrated Circuits (MMICs).
High Frequency resonant – tunnelling devices. Resonant-tunnelling hot electron transistors and circuits.

EC-403E	INFORMATION THEORY AND CODING	L T P	CR
		3 1 0	4

Module I:- Entropy, Sources and Source Coding

Entropy, Properties of Entropy, Joint and Conditional Entropy, Mutual Information, Properties of Mutual Information. Discrete memoryless sources, Source code, Average length of source code, Bounds on average length, Uniquely decodable and prefix-free source codes. Kraft Inequality (with proof), Huffman code. Shannon's source coding theorem (both achievability and converse) and operational meaning of entropy.

Module 2 – Channels and Channel Coding

Discrete memoryless channels. Capacity of discrete memoryless channels. Binary symmetric channels (BSC), Binary Erasure channels (BEC). Capacity of BSC and BEC. Channel code. Rate of channel code. Shannon's channel coding theorem (both achievability and converse without proof) and operational meaning of channel capacity.

Modelling of Additive White Gaussian channels. Continuous-input channels with average power constraint. Differential entropy. Differential Entropy of Gaussian random variable. Relation between differential entropy and entropy. Shannon-Hartley theorem.

Inferences from Shannon Hartley theorem – spectral efficiency versus SNR per bit, power-limited and bandwidth-limited regions, Shannon limit, Ultimate Shannon limit.

Module 3 – Introduction to Linear Block Codes

Overview of Groups, Rings, Finite Fields, Construction of Finite Fields from Polynomial rings, Vector spaces.

Block codes and parameters. Error detecting and correcting capability. Linear block codes. Two simple examples -- Repetition code and single parity-check code. Generator and parity-check matrix. Systematic form.

Maximum likelihood decoding of linear block codes. Bounded distance decoding. Syndrome. Standard array decoding.

Module 4 – A Few Important Classes of Algebraic codes

Cyclic codes. Polynomial and matrix description. Interrelation between polynomial and matrix view point. Systematic encoding. Decoding of cyclic codes.(Only description, no decoding algorithms) Hamming Codes, BCH codes, Reed-Solomon Codes.

Module 5 – Convolutional and LDPC Codes

Convolutional Codes. State diagram. Trellis diagram. Maximum likelihood decoding. Viterbi algorithm. Low-density parity check (LDPC) codes. Tanner graph representation. Message-passing decoding for transmission over binary erasure channel.

EC-405E	INTEGRATED COMPUTER VISION	L T P	CR
		3 1 0	4

Module I:-

Review of image processing techniques : filtering, thresholding Mathematical morphology, Texture Binary shape analysis, connectedness, object labelling and counting Boundary descriptors.

Module II:-

Monocular and binocular imaging system, Orthographic & Perspective Projection, Camera models, Camera Calibration, Stereo vision: introduction; concept of disparity and its relationship with depth.

Module III:-

Image Processing for Feature Detection and Image Synthesis, Edge detection, Corner detection, Harris corner detection algorithm, Line and curve detection, Hough transform, SIFT operator, Mosaics, snakes.

Module IV:-

Shape from X - Shape from shading, Photometric stereo, Texture, Occluding contour detection. Motion Analysis- Regularization theory, Optical Flow: brightness constancy equation, aperture problem, Horn-Shunck method, Lucas- Kanade method Structure from motion.

Module V:-

Object recognition: Hough transforms and other simple object recognition methods Shape correspondence and shape matching, Principal Component Analysis Shape priors for recognition. Application: Photo album, Face detection, Face recognition, Eigen faces, Active appearance and 3D shape models of faces Application: In-vehicle vision system: locating roadway, road markings, identifying road signs, locating pedestrians.

EC-407E	Embedded System	L T P	CR
		3 1 0	4

Course Objectives

To introduce the Building 1.Blocks of Embedded System

2. To Educate in Various Embedded Development Strategies
3. To Introduce Bus Communication in processors, Input/output interfacing.
4. To impart knowledge in various processor scheduling algorithms.
5. To introduce Basics of Real time operating system and example tutorials to discuss on one real time operating system tool

Course Outcomes

CO1: Acquire a basic knowledge about programming and system control to perform aspecific task.
CO2: Acquire knowledge about devices and buses used in embedded networking CO3: Develop programming skills in embedded systems for various applications. CO4: Acquire knowledge about basic concepts of circuit emulators.
CO5: Acquire knowledge about Life cycle of embedded design and its testing

UNIT I INTRODUCTION TO EMBEDDED CONCEPTS

Introduction to embedded systems, Application Areas, Categories of embedded systems, Overview of embedded system architecture, Specialties of embedded systems, recent trends in embedded systems, Architecture of embedded systems, Hardware architecture, Software architecture, Application Software, Communication Software.

UNIT II OVERVIEW OF ARM AND CORTEX-M3

Background of ARM Architecture, Architecture Versions, Processor Naming, Instruction Set Development, Thumb-2 and Instruction Set Architecture. Cortex-M3 Basics: Registers, General Purpose Registers, Stack Pointer, Link Register, Program Counter, Special Registers, Operation Mode, Exceptions and Interrupts, Vector Tables, Stack Memory Operations, Reset Sequence. Cortex-M3Instruction Sets: Assembly Basics, Instruction List, Instruction Descriptions.Cortex-M3 Implementation Overview: Pipeline, Block Diagram, Bus. Interfaces on Cortex-M3, I-Code Bus, D Code Bus, System Bus, External PPB and DAP Bus

UNIT III CORTEX EXCEPTION HANDLING AND INTERRUPTS

Exceptions: Exception Types, Priority, Vector Tables, Interrupt Inputs and Pending Behavior, Fault Exceptions, Supervisor Call and Pendable Service Call. NVIC: Nested Vectored Interrupt Controller Overview, Basic Interrupt Configuration, Software Interrupts and SYSTICK Timer. Interrupt Behavior: Interrupt/Exception Sequences, Exception Exits, Nested Interrupts, Tail-Chaining Interrupts, Late Arrivals and Interrupt Latency

UNIT IV CORTEX-M3/M4 PROGRAMMING

Cortex-M3/M4 Programming: Overview, Typical Development Flow, Using C, CMSIS (Cortex Microcontroller Software Interface Standard), Using Assembly. Exception
Programming: Using Interrupts, Exception/Interrupt Handlers, Software Interrupts, Vector Table Relocation. Memory Protection Unit and other Cortex-M3 features: MPU Registers,
Setting Up the MPU, Power Management, Multiprocessor Communication.

UNIT V CORTEX-M3/M4 DEVELOPMENT AND DEBUGGING TOOLS

STM32L15xxx ARM Cortex M3/M4 Microcontroller: Memory and Bus Architecture, Power Control, Reset and Clock Control. STM32L15xxx Peripherals: GPIOs, System Configuration Controller, NVIC, ADC, Comparators, GP Timers, USART. Development & Debugging Tools: Software and Hardware tools like Cross Assembler, Compiler, Debugger, Simulator, In-Circuit Emulator (ICE), Logic Analyzer etc.

REFERENCE BOOKS

1. Joseph Yiu, " The definitive Guide to the ARM Cortex-M3", Second Edition, Elsevier Inc. 2010.
2. Andrew N Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide Designing andOptimizing System Software" Elsevier Publications, 2006.
3. Steve Furber, "ARM System-on-Chip Architecture", 2nd Edition, Pearson Education, India,ISBN:9788131708408, 8131708403, 2015.
4. Dr. K. V. K> Prasad, "Embedded/Real-Time Systems: Concepts, Design and Programming Black Book", New ed (MISL-DT) Paperback – 12 Nov 2003.
5. David Seal "ARM Architecture Reference Manual", Addison Wesley, England; Morgan Kaufmann Publishers, 2001.
6. Cortex-M series-ARM Reference Manual
7. Cortex-M3 Technical Reference Manual (TRM)
8. STM32L152xx ARM Cortex M3 Microcontroller Reference Manual 5/97

EC-409E	VLSI DESIGN	L T P	CR
		3 0 0	3

UNIT I INTRODUCTION TO MOS TRANSISTOR

MOS Transistor, CMOS logic, Inverter, Pass Transistor, Transmission gate, Layout Design Rules, Gate Layouts, Stick Diagrams, Long-Channel I-V Charters tics, C-V Charters tics, Non ideal I-V Effects, DC Transfer characteristics, RC Delay Model, Elmore Delay, Linear Delay Model, Logical effort, Parasitic Delay, Delay in Logic Gate, Scaling.

UNIT II COMBINATIONAL MOS LOGIC CIRCUITS

Circuit Families: Static CMOS, Ratioed Circuits, Cascode Voltage Switch Logic, Dynamic Circuits, Pass Transistor Logic, Transmission Gates, Domino, Dual Rail Domino, CPL, DCVSPG, DPL, Circuit Pitfalls.

Power: Dynamic Power, Static Power, Low Power Architecture.

UNIT III SEQUENTIAL CIRCUIT DESIGN

Static latches and Registers, Dynamic latches and Registers, Pulse Registers, Sense Amplifier Based Register, Pipelining, Schmitt Trigger, Monostable Sequential Circuits, Astable Sequential Circuits.Timing Issues : Timing Classification Of Digital System, Synchronous Design.

UNIT IV DESIGN OF ARITHMETIC BUILDING BLOCKS AND SUBSYSTEM

Arithmetic Building Blocks: Data Paths, Adders, Multipliers, Shifters, ALUs, power and speed tradeoffs, Case Study: Design as a tradeoff.Designing Memory and Array structures: Memory Architectures and Building Blocks, Memory Core, Memory Peripheral Circuitry.

UNIT V IMPLEMENTATION STRATEGIES AND TESTING

FPGA Building Block Architectures, FPGA Interconnect Routing Procedures. Design for Testability: Ad Hoc Testing, Scan Design, BIST, IDDQ Testing, Design for Manufacturability, Boundary Scan.

TEXT/REFERENCE BOOKS:

1. Neil H.E. Weste, David Money Harris ―CMOS VLSI Design: A Circuits and Systems Perspective‖, 4th Edition, Pearson , 2017 (UNIT I,II,V)

2. Jan M. Rabaey ,Anantha Chandrakasan, Borivoje. Nikolic, ‖Digital Integrated Circuits:A Design perspective‖, Second Edition , Pearson , 2016.

REFERENCES

1. M.J. Smith, ―Application Specific Integrated Circuits‖, Addisson Wesley, 1997

2. Sung-Mo kang, Yusuf leblebici, Chulwoo Kim ―CMOS Digital Integrated Circuits:Analysis & Design,4th edition McGraw Hill Education,2013

3. Wayne Wolf, ―Modern VLSI Design: System On Chip‖, Pearson Education, 2007

4. R.Jacob Baker, Harry W.LI., David E.Boyee, ―CMOS Circuit Design, Layout and Simulation, Prentice Hall of India 2005.

CS-403E	DEEP LEARNING	L T P	CR
		3 0 0	3

Module I:-

Artificial Neural Networks- The Neuron-Expressing Linear Perceptrons as Neurons-Feed-Forward Neural Networks- Linear Neurons and Their Limitations, Sigmoid, Tanh and ReLU Neurons -SoftMax Output Layers ,Training Feed-Forward Neural Networks,Gradient Descent-Delta Rule and Learning Rates- Gradient Descent with Sigmoidal Neurons.

Module II:-

The Backpropagation Algorithm-Stochastic and Minibatch Gradient Descent, Test Sets Validation Sets and Overfitting, Preventing Overfitting in Deep Neural Networks, Implementing Neural Networks in TensorFlow.

Module III:-

Local Minima in the Error Surfaces of Deep Networks, Model Identifiability, Spurious Local Minima in Deep Networks- Flat Regions in the Error Surface, Momentum-Based Optimization, Learning Rate Adaptation.

Module. IV:-

Convolutional Neural Networks(CNN), Architecture, Accelerating Training with Batch Normalization, Building a Convolutional Network using TensorFlow- Visualizing Learning in Convolutional Networks, Embedding and Representation Learning Autoencoder Architecture, Implementing an Autoencoder in TensorFlow, Denoising Sparsity in Autoencoders Models for Sequence Analysis.

Module. V:-

Recurrent Neural Networks(RNN, Vanishing Gradients Long Short-Term Memory (LSTM) Units, TensorFlow Primitives for RNN Models-Augmenting Recurrent Networks with Attention.

EC-459E	VLSI DESIGN LAB	L T P	CR
		0 0 2	1

PART A

All Experiments to be completed using Cadence Virtuoso V6.15/V6.17

1. Nmos characteristics: using gpdk 180 or gpdk90
   i. Simulate Nmos characteristics Id Vs Vds .
   ii. Simulate Nmos characteristics Id Vs Vgs .
2. Pmos characteristics : using gpdk 180 or gpdk90
   i. Simulate Pmos characteristics Id Vs Vds .
   ii. Simulate Pmos characteristics Id Vs Vgs .
3. Propagation Delay : using gpdk 180 or gpdk90
   i. Simulate Nmos propagation delay t_{PHL} & t_{PLH} .
   ii. Simulate Nmos propagation delay t_{PHL} & t_{PLH} .
4. Design an Inverter with given specifications, and completing the design flow mentioned below:
   a) Draw the Schematic and verify the following:
      i. DC analysis ii. Transient analysis
   b) Draw the layout and verify the DRC
5. Design an Op-Amp with given specifications, and completing the design flow mentioned below:
   a) Draw the Schematic and verify the following:
      i. DC analysis ii. AC Analysis iii. Transient analysis
   b) Draw the layout and verify the DRC

PART B

All Experiments to be completed using Quartus II software on Intel DE2i-150 Development kit

1. Realization of Logic Gates and Familiarization of FPGAs.
2. Adders in Verilog:
    a. Development of Verilog/VHDL modules for half adder in 3 modelling styles (dataflow/structural/ behavioural).
    b. Development of Verilog/VHDL modules for full adder in structural modelling using half adder.
3. Mux and Demux in Verilog/VHDL
    a. Development of Verilog/VHDL modules for a 4x1 MUX.
    b. Development of Verilog/VHDL modules for a 1x4 DEMUX.
4. Flipflops and counters
    a. Development of Verilog/VHDL modules for SR and JK flipflops.
    b. Development of Verilog/VHDL modules for a binary decade/Johnson/Ring counter
5. Asynchronous and Synchronous Counters in FPGA
    a. Make a design of a 4-bit up down ripple counter using T-flip-lops in the previous experiment, implement and test them on the FPGA board.
    b. Make a design of a 4-bit up down synchronous counter using T-flip- lops in the previous experiment, implement and test them on the FPGA board.
6. BCD to Seven Segment Decoder in FPGA
    a. Make a gate level design of a seven-segment decoder, write to FPGA and test its functionality.
    b. Test it with switches and seven segment display. Use output ports for connection to the display.

EC-457E	EMBEDDED SYSTEMS LAB	L T P	CR
		0 0 2	1

PART A

All Experiments to be completed using MP Lab and PIC Controller 16F877A

1. Write a embedded C code to perform LED Blinking and demonstrate the simulations using Proteus software V8.13.
2. Write a embedded C code to interface an LCD display in 4-bit mode and 8-bit mode to display a message and demonstrate the simulations using Proteus software V8.13.
3. Write a embedded C code to interface an LCD to a matrix Keyboard to display values when pressed and demonstrate the simulations using Proteus software V8.13.
4. Write a embedded C code to interface a stepper motor / DC motor using driver ICs and demonstrate the simulations using Proteus software V8.13.
5. Write a embedded C code to interface two 7-segment display to demonstrate a timer 0 to 99 with one second delay and demonstrate the simulations using Proteus software V8.13.

PART B

All Experiments to be completed using CUBE IDE and STM32F446RE/STM32F401RE development board

7. Introduction to the Bare metal programming concepts using Arm Cortex M processor.
8. Interfacing LED with STM32F446RE using CMSIS file.
9. Interfacing LCD with STM32F446RE in 8 bit and 4 bit Data Mode.
10. Implementing Time delay with Systick Timer.
11. Using Timers of STM32F4 for generating accurate time delays.

EC-491E	Major Project Phase -1	L T P	Cr
		0-0-8	4

OBJECTIVE

The project involves in-depth study on the topic, design, development, analysis fabrication and/or experimental work – Hardware and/or Software. It is intended to give an opportunity to a student to apply his knowledge to solve real-life problem. The student has to select a project work based on a topic of interest.

OPERATION

Major Project shall comprise of Phase-I and Phase II, spread over Semester VI and VII respectively. The students may work jointly (small group) or individually. The project work is to enable the student to take up investigative study in the broad field of Electronics & Communication Engineering, either fully theoretical/practical or involving both theoretical and practical work under the guidance of a Supervisor. This is expected to provide a good initiation for the students in R&D work.

3nd Year

SEMESTER – 8

		L T P	CR
EC-402E	**Wireless Sensor Network**	**3 0 0**	**3**

UNIT I – FUNDAMENTALS OF SENSOR NETWORKS
Introduction to computer and wireless sensor networks and Overview of the syllabus Motivation for a network of Wireless Sensor nodes- Sensing and sensors-challenges and constraints - node architecture-sensing subsystem, processor subsystem communication interfaces- prototypes, Application of Wireless sensors- Introduction of Tiny OS Programming and TOSSIM Simulator.

UNIT II – COMMUNICATION CHARACTERISTICS AND DEPLOYMENT MECHANISMS
Wireless Transmission Technology and systems-Radio Technology Primer-Available Wireless Technologies - Hardware-
Time Synchronization Clock and the Synchronization Problem - Basics of time synchronization-Time synchronization protocols
Localization- Ranging Techniques- Range based Localization-Range Free Localization-Event driven Localization

UNIT III - MAC LAYER
Overview-Wireless Mac Protocols, Characteristics of MAC protocols in Sensor networks; Contention free MAC Protocols- characteristics, Traffic Adaptive Medium Access-Y-MAC, Low energy Adaptive Clustering; Contention based MAC Protocols - Power Aware Multi-Access with signaling, Sensor MAC-Timeout MAC-Data gathering MAC; Case study – Implementation and Analysis of MAC player protocol in TinyOS.

UNIT IV - ROUTING IN WIRELESS SENSOR NETWORKS
Design Issues in WSN routing, Data Dissemination and Gathering, Routing Challenges in WSN; Flooding-Flat Based Routing, SAR, Directed Diffusion, Hierarchical Routing-LEACH, PEGASIS; Query Based Routing, Negotiation Based Routing, Geographical Based Routing;
Transport layer- Transport protocol Design issues Performance of Transport Control Protocols.

UNIT V - MIDDLEWARE AND SECURITY ISSUES WSN middleware principles-Middleware architecture -Existing middleware - operating systems for wireless sensor networks-performance and traffic management - Fundamentals of network security-challenges and attacks - Protocols and mechanisms for security.

TEXTBOOKS/REFERENCES

1. Waltenegus Dargie, Christian Poellabauer , “Fundamentals of Wireless Sensor Networks, Theory and Practice”, Wiley Series on wireless Communication and Mobile Computing, 2011
2. Kazem Sohraby, Daniel manoli , “Wireless Sensor networks- Technology, Protocols and Applications”, Wiley InterScience Publications 2010.
3. Bhaskar Krishnamachari , “ Networking Wireless Sensors”, Cambridge University Press, 2005
4. C.S Raghavendra, Krishna M.Sivalingam, Taiebznati , “Wireless Sensor Networks”, Springer Science 2004.

EC-404E	MECHATRONICS	L T P	CR
		3 0 0	3

Unit 1: Introduction to Mechatronics

Definition and Scope of Mechatronics Historical Development and Evolution Applications in Various Industries (Automotive, Aerospace, Consumer Electronics, etc.) Mechatronics vs. Traditional Engineering Disciplines Overview of Mechatronics Systems

Unit 2: Fundamentals of Mechanical Systems

Basic Concepts of Mechanics Kinematics and Dynamics Statics and Strength of Materials Mechanical Components ,Gears, Bearings, and Springs Levers, Linkages, and Mechanisms Introduction to CAD (Computer-Aided Design)

Unit 3: Electrical and Electronic Systems

Basic Electrical Concepts Voltage, Current, Resistance, and Power Ohm's Law and Kirchhoff's Laws Electronic Components Resistors, Capacitors, Inductors, Diodes, Transistors Operational Amplifiers and Integrated Circuit Introduction to Electrical Circuits and Circuit Analysis

Unit 4: Sensors and Transducers

Types of Sensors Temperature, Pressure, Position, Speed, Acceleration Proximity, Light, and Force Sensor sensor Characteristics Sensitivity, Range, Accuracy, Precision, Linearity Signal Conditioning Filtering, Amplification, Analog-to-Digital Conversion (ADC)

Unit 5: Actuators and Mechanisms

Types of Actuators Electrical (DC Motors, Stepper Motors, Servo Motors) Hydraulic and Pneumatic Actuators,principle of operation, Selection criteria and application

EC-483E	Major Research Project	L T P	Cr
		0-0-32	**16**

Course Objective:-

- To enhance employ ability skills and become job ready along with real corporate exposure.
- To enhance students' knowledge in core study.
- To Increase self-confidence of students and helps in finding their own proficiency
- To cultivate student's leadership ability and responsibility to perform or execute the given task.
- To provide knowledge of a real job situation.

Course Outcomes:-

CO1. Capability to acquire and apply fundamental principles of engineering.
CO2. Become updated with all the latest changes in technological world
CO3. To be a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills
CO4. Ability to identify, formulate and model problems and find engineering solution based on a systems approach
CO5. Awareness of the social, cultural, global and environmental responsibility as an engineer.
CO6. Capability and enthusiasm for self-improvement through continuous professional development and life-long learning

EC-484E	Seminar	L T P	Cr
		0-0-2	**1**

Course Outcomes:-

CO1. Learn to demonstrate awareness of the ethics involved in doing an internship

CO2 Learn to describe, analyze, and synthesize their learning experience in the internship in the form of presentation

CO3 Articulate new learning from the internship experience in the form of an oral presentation.

CO4 Learn to present understanding and assess the challenges carrying out an internship CO5 Learn to demonstrate meaningful and practical experience in their 6month duration of real industrial training.