MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act,1956

B. Tech - Electronics and Communication Engineering
Course Structure (MLRS-BT25)
Applicable From 2025-26 Admitted Batch
Structure Breakup

S. No	Category	Breakup of Credits (total 164 credits)
1	Humanities and Social Sciences (HSMC), including Management.	12
2	Basic Science Courses (BSC) including Mathematics, Physics and Chemistry	19
3	Engineering Science Courses (ESC), including Workshop, Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering.	22
4	Professional Core Courses (PCC), relevant to the chosen specialization /branch.	60
5	Professional Elective Courses (PEC), relevant to the chosen specialization / branch.	18
6	Open Elective Courses (OEC), from other technical and / or emerging areas.	06
7	Experiential Learning/ Skill Development Courses (SDC) / Field Based Project/ Internship/ Project work	25
8	Mandatory Courses (MC)	2
TOTAL		**164**

I YEAR I SEMESTER (I SEMESTER)

S. No.	Course Code	Course Name	Course Area	Hours per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIA)	External (SEE)	Total
		Theory Courses								
1	2510001	Matrices and Calculus	BS	3	1	0	4	40	60	100
2	2510008	Advanced Engineering Physics	BS	3	0	0	3	40	60	100
3	2510501	Programing for Problem Solving	ES	3	0	0	3	40	60	100
4	2510203	Introduction to Electrical Engineering	ES	2	0	0	2	40	60	100
5	2510010	English for Skill Enhancement	HS	3	0	0	3	40	60	100
		Laboratory Courses								
6	2510071	Advanced Engineering Physics Lab	BS	0	0	2	1	40	60	100
7	2510571	Programing for Problem Solving Lab	ES	0	0	2	1	40	60	100
8	2510073	English Language and Communications Skills Lab	HS	0	0	2	1	40	60	100
9	2510371	Engineering Workshop	ES	0	0	2	1	40	60	100
		Value Added Course								
10		Foreign Language*	VAC	0	0	0	0	-	-	-
		Induction Program	-	-	-	-	-	-	-	-
Total Credits				**14**	**1**	**8**	**19**	**360**	**540**	**900**

*Students can choose any one of the foreign languages from the given list:

1. **25X0FL1**: French
2. **25X0FL2:** German
3. **25X0FL3:** Spanish
4. **25X0FL4:** Korean

I YEAR II SEMESTER (II SEMESTER)

S. No.	Course Code	Course Name	Course Area	Hours per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIA)	External (SEE)	Total
		Theory Course								
1	2520002	Ordinary Differential Equations and Vector Calculus	BS	3	0	0	3	40	60	100
2	2520009	Engineering Chemistry	BS	3	0	0	3	40	60	100
3	2520401	Electronic Devices and Circuits	ES	3	0	0	3	40	60	100
4	2520507	Object Oriented Programming through Java	ES	3	0	0	3	40	60	100
5	2520204	Network Analysis and Synthesis	ES	3	0	0	3	40	60	100
6	2520301	Engineer Drawing and Computer Aided Drafting	ES	2	0	2	3	40	60	100
		Laboratory Course								
7	2520072	Engineering Chemistry Lab	BS	0	0	2	1	40	60	100
8	2520471	Electronic Devices and Circuits Lab	ES	0	0	2	1	40	60	100
9	2520578	Object Oriented Programming through Java Lab	ES	0	0	2	1	40	60	100
10	2520273	Electrical Engineering Lab	ES	0	0	2	1	40	60	100
		Value Added Course								
1	2520026	Yoga & Inner Engineering	VAC	0	0	0	0	-	-	-
Total Credits				**17**	**0**	**10**	**22**	**400**	**600**	**1000**

II YEAR I SEMESTER (III SEMESTER)

S. No.	Course Code	Course Name	Course Area	Hours per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIA)	External (SEE)	Total
		Theory Course								
1	2530402	Signals and Systems	PC	3	0	0	3	40	60	100
2	2530403	Probability Theory and Stochastic Processes	PC	3	0	0	3	40	60	100
3	2530404	Digital Logic Design	PC	2	0	0	2	40	60	100
4	2530504	Data Structures	PC	3	0	0	3	40	60	100
5	2530405	Control Systems Engineering	PC	2	0	0	2	40	60	100
6	2530EXL 3	Innovation and Entrepreneurship	PS	2	0	0	2	40	60	100
		Laboratory Course								
7	2530472	Modelling and Simulation Lab	PC	0	0	2	1	40	60	100
8	2530574	Data Structures Lab	PC	0	0	2	1	40	60	100
9	2530473	Digital Logic Design Lab	PC	0	0	2	1	40	60	100
		Skill Develop								
10	2530576	Applied Python Programming Lab	SD	0	1	2	2	40	60	100
		Mandatory Courses								
11	2530021	Environmental Science	MC	1	0	0	1	40	60	100
Total Credits				**16**	**0**	**8**	**21**	**440**	**660**	**1100**

ExL: Experiential Learning

II YEAR II SEMESTER (IV SEMESTER)

S. No.	Course Code	Course Name	Course Area	Hours per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIA)	External (SEE)	Total
		Theory Course								
1	2540003	Numerical Methods and Complex Variables	BS	3	0	0	3	40	60	100
2	2540406	Electromagnetic Fields and Transmission Lines	PC	3	0	0	3	40	60	100
3	2540407	Analog and Digital Communications	PC	3	0	0	3	40	60	100
4	2540408	Electronic Circuit Analysis	PC	3	0	0	3	40	60	100
5	2540409	Linear and Digital IC Applications	PC	3	0	0	3	40	60	100
		Laboratory Course								
6	2540075	Computational Mathematics Lab	BS	0	0	2	1	40	60	100
7	2540474	Analog and Digital Communications Lab	PC	0	0	2	1	40	60	100
8	2540475	Electronic Circuit Analysis Lab	PC	0	0	2	1	40	60	100
9	2540476	Linear and Digital IC Applications Lab	PC	0	0	2	1	40	60	100
		Skill Development Course								
10	2546676	Web and Shell Applications	SD	0	0	2	1	40	60	100
Total Credits				**15**	**0**	**10**	**20**	**400**	**600**	**1000**

III YEAR I SEMESTER (V SEMESTER)

S. No.	Course Code	Course Name	Course Area	Hours per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIA)	External (SEE)	Total
		Theory Course								
1	2550410	Digital Signal Processing	PC	3	0	0	3	40	60	100
2	2550411	RISC and Microcontroller architectures	PC	3	0	0	3	40	60	100
3	2550412	CMOS VLSI Design	PC	3	0	0	3	40	60	100
4		Professional Elective – I	PE	3	0	0	3	40	60	100
5		Open Elective – I	OE	2	0	0	2	40	60	100
		Laboratory Course								
6	2550477	RISC and Microcontroller architectures Interfacing Lab	PC	0	0	2	1	40	60	100
7	2550478	CMOS VLSI Design Lab	PC	0	0	2	1	40	60	100
8	2556679	Digital Signal Processing Lab	PC	0	0	2	1	40	60	100
		Project								
9	2550450	Field Based Research Project*	PS	0	0	4	2	100	-	100
		Skill Development Course								
10	2550447	FPGA based System Design	SD	0	0	2	1	40	60	100
11	2550028	Indian Knowledge System	HS	1	0	0	1	40	60	100
Total Credits				**15**	**0**	**12**	**21**	**500**	**600**	**1100**

*Students must complete Field Based Research Project during 2-2 semester break (minimum 2 weeks)

III YEAR II SEMESTER (VI SEMESTER)

S. No.	Course Code	Course Name	Course Area	Hours per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIA)	External (SEE)	Total
		Theory Course								
1	2560413	Antennas and Wave Propagation	PC	3	0	0	3	40	60	100
2	2560414	IoT Architectures and Protocols	PC	3	0	0	3	40	60	100
3	2570016	Business Economics and Financial Analysis	HS	3	0	0	3	40	60	100
4		Professional Elective - II	PE	3	0	0	3	40	60	100
5		Open Elective – II	OE	2	0	0	2	40	60	100
		Laboratory Course								
6	2560480	Advanced Communications Lab	PC	0	0	2	1	40	60	100
7	2560481	IoT Architectures and Protocols Lab	PC	0	0	2	1	40	60	100
8	2560482	VLSI Design Verification Lab	PC	0	0	2	1	40	60	100
9	2560074	English for Employability Skills Lab	HS	0	0	2	1	40	60	100
		Skill Development Course								
10	2550448/ 2550453/ 2550454	5G Practical Lab/Robotics Lab/Drone Lab	SD	0	0	2	1	40	60	100
		Mandatory Course								
11	2560022/ 2560025	Gender Sensitization*/Human Values and Professional Ethics*	MC	1	0	0	0.5+0.5	40	60	100
Total Credits				**15**	**0**	**10**	**20**	**440**	**660**	**1100**

***Note: For the courses Gender Sensitization Lab and Human Values and Professional Ethics -** one hour of instruction will be conducted on alternate weeks. For example, if a one-hour class for Gender Sensitization Lab is conducted this week, then a one-hour class for Constitution of India will be conducted in the following week.

IV YEAR I SEMESTER (VII SEMESTER)

S. No.	Course Code	Course Name	Course Area	Hours per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIA)	External (SEE)	Total
		Theory Course								
1	2570415	Microwave and Optical Communications	PC	3	0	0	3	40	60	100
2	2570416	Embedded System Design	PC	3	0	0	3	40	60	100
3	2570018	Fundamentals of management for Engineers	HS	3	0	0	3	40	60	100
4		Professional Elective – III	PE	3	0	0	3	40	60	100
5		Professional Elective – IV	PE	3	0	0	3	40	60	100
6		Open Elective – III	OE	2	0	0	2	40	60	100
		Laboratory Course								
7	2570483	Microwave and Optical Communications Lab	PC	0	0	2	1	40	60	100
8	2570484	Embedded System Design Lab	PC	0	0	2	1	40	60	100
		Project								
9	2570451	Industry Oriented Mini Project/Internship	PS	0	0	4	2	100	-	100
Total Credits				**17**	**0**	**08**	**21**	**360**	**540**	**900**

*Students must complete Industry Oriented Mini Project/Internship during 3-2 semester break (minimum 2 weeks)

IV YEAR II SEMESTER (VIII SEMESTER)

S. No.	Course Code	Course Name	Course Area	Hours per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
		Theory Course								
2		Professional Elective - V	PE	3	0	0	3	40	60	100
3		Professional Elective - VI	PE	3	0	0	3	40	60	100
		Project								
2	2580452	Major Project Work	PS	0	0	42	14	40	60	100
Total Credits				**6**	**0**	**42**	**20**	**120**	**180**	**300**

Professional Elective (PE) Courses Applicable For 2025-26 Admitted Batch

PE I - Professional Elective I

S. No.	Course Code	Course Title
1	2550417	Sustainability for Electronics
2	2550418	CMOS Fabrication and Technology
3	2550419	Data Communications and Computer Networks
4	2556608	Computer Organization and Operating Systems
5	2550522	Introduction to Data Science

PE II - Professional Elective II

S. No.	Course Code	Course Title
1	2560420	5G Communications
2	2560421	Electronic Measurements and Instrumentation
3	2560422	Low Power VLSI Design
4	2566423	Image and Video Processing
5	2560528	Block Chain Technology

PE III - Professional Elective III

S. No.	Course Code	Course Title
1	2570424	Biomedical Signal and Image Processing
2	2570425	Wireless Communication Networks
3	2570426	Design for Testability
4	2570427	Unmanned Aerial Vehicles and Satellite Imaging
5	2570513	Machin Learning

PE IV - Professional Elective IV

S. No.	Course Code	Course Title
1	2570518	Deep Learning
2	2570428	Satellite Communications
3	2570429	Analog and Mixed Signal IC Design
4	2570430	Biomedical Instrumentation
5	2570431	Microwave Photonics

PE V - Professional Elective V

S. No.	Course Code	Course Title
1	2580432	AI for Signal and Image Processing
2	2580433	Radar Systems
3	2580434	Intelligent e - Computer Aided Design
4	2580517	Cryptography and Network Security
5	2580435	Speech Signal Processing

PE VI - Professional Elective VI

S. No.	Course Code	Course Title
1	2580436	DSP Processors and Architectures
2	2580437	Quantum Technologies
3	2580438	RF Circuit Design
4	2580439	Model Based System Engineering
5	2580440	Global Navigation Satellite System

Open Elective (OE) Courses Applicable For 2025-26 Admitted Batch

S. No	Open Elective	Course Code	Course Title
1	Open Elective - I	2550441	Principles of Communication
		2550442	Fundamentals of Cyber Physical Systems
2	Open Elective – II	2560443	Fundamentals of Image Processing
		2560444	Automotive Electronics
3	Open Elective - III	2570445	Introduction to Wireless Communications
		2570446	Electronics for Health Care

Note: Students should take Open Electives from the list of Open Electives offered by other Departments/Branches only.

I-I

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2510001: MATRICES AND CALCULUS

I Year B.Tech. I Sem	**L T P C**
(CSE, CSD, CSM, ECE, EEE, MECH, CIVIL)	**3 1 0 4**

Pre-requisites: Mathematics courses of 10+2 year of study.

Course Objectives: The student will try to learn

- Types of matrices and their properties, concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigen values, eigen vectors and reduction of quadratic form to canonical form by orthogonal transformation.
- Geometrical approach to the mean value theorems and their application to the mathematical problems. Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative and finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications.

Course outcomes: After successful completion of the course, students should be able to

CO1: Recall the concepts of rank, Echelon form, Normal form, and the properties of non singular matrices.

CO2: Explain the process of finding eigenvalues and eigenvectors of a matrix and their role in diagonalization.

CO3: Relate Beta and Gamma functions to standard integrals and solve related problems.

CO4: Apply Euler's theorem and compute total derivatives for multivariable functions.

CO5: Understand the methods for changing variables in double and triple integrals, including transformations to polar, spherical, and cylindrical coordinates.

UNIT-I: Matrices **8L**

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations, L-U decomposition method.

UNIT-II: Eigen values and Eigen vectors **10L**

Eigen values, Eigen vectors and their properties (without proof), Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III: Calculus 10L

Mean value theorems: Rolle's Theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series (without proofs).

Beta and Gamma functions and their applications (properties without proof).

UNIT-IV: Multivariable Calculus (Partial Differentiation and applications) 10L

Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence-independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V: Multivariable Calculus (Integration) 10L

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals, Change of variables (Cartesian to polar) for double and triple integrals (Cartesian to Spherical and Cylindrical polar coordinates). Applications: Areas (by double integrals) and volumes (by triple integral).

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5thEditon, 2016.

REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9thEdition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dassand Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

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25X0008: ADVANCED ENGINEERING PHYSICS

(CIVIL, EEE, MECH, ECE, CSE, CSM & CSD)

I Year B.Tech. I/II SEM	L	T	P	C
	3	0	0	3

Pre-requisites:10+2 Physics.

Course Objectives: The student will try to

1. Understand fundamental concepts of quantum mechanics and their applications in solids.
2. Study the basics of quantum computing, quantum gates and quantum algorithms.
3. Classify the crystal structures, defects and material characterization techniques like XRD and SEM.
4. Learn the properties and applications of magnetic as well dielectric materials.
5. Explore the working likewise applications of lasers and fibre optics in modern technology.

Course outcomes: After successful completion of the course, students should be able to

CO1: Illustrate the concepts of quantum mechanics for explaining particle behavior and energy band formation in solids.

CO2: Understand quantum computing concepts, quantum gates and basic quantum algorithms.

CO3: Identify crystal structures, defects and XRD and SEM techniques for material characterization.

CO4: Classify magnetic and dielectric materials and their applicability in engineering contexts.

CO5: Explain the principles of lasers and fibre optics and their applications across various fields in scientific practices.

UNIT-I: Quantum Mechanics

Introduction to quantum physics, Blackbody radiation (Qqualitative), Photoelectric effect, de-Broglie Hypothesis, Matter waves, Heisenberg uncertainty principle, Eigen values and Eigen functions, Schrödinger's time independent wave equation, Physical significance of wave function, Particle in a 1D box, Bloch's theorem (qualitative), Kronig-Penney model (qualitative), Effective mass of electron.

UNIT-II: Quantum Computing

Introduction, Concept of quantum computer, Linear algebra for quantum computation, Dirac's Bra and Ket notation and their properties, Hilbert space, Classical bits, Qubits: single and multiple Qubit system, Bloch's sphere, Entanglement, Quantum gates, Evolution of quantum systems, Quantum measurements, Challenges and advantages of quantum computing over classical computation, Quantum computing system for information processing, Quantum algorithms: Deutsch-Jozsa, Grover.

UNIT-III: Crystallography & Materials Characterization

Introduction, Unit cell, space lattice, basis, lattice parameters, Crystal structures, Bravais lattices, Packing factor: SC, BCC, FCC; Miller indices, Inter-planar distance, Defects in crystals (Qualitative): point defects, line defects, surface defects and volume defects.

Bock diagram and working principle of X-ray diffraction (XRD), Scanning electron microscopy (SEM).

UNIT-IV: Magnetic and Dielectric Materials

Introduction to magnetic materials, Origin of magnetic moment, Classification of magnetic materials, Hysteresis, Weiss domain theory of ferromagnetism, soft and hard magnetic materials, Magneto Resistance, Synthesis of magnetic materials using sol-gel method, Applications: Magnetic hyperthermia for cancer treatment, Magnets for EV, Giant Magneto Resistance (GMR) device.

Introduction to dielectric materials, Types of polarization (qualitative): Electronics, ionic & orientation, Ferroelectric, Piezoelectric, Pyro electric materials and their applications: Ferroelectric Random-Access Memory (Fe-RAM) and fire sensor.

UNIT-V: Laser and Fibre Optics

Introduction to Laser, three quantum processes - Stimulated Absorption, Spontaneous emission, Stimulated Emission Characteristics of laser, Einstein coefficients and their relations, Meta stable state, Population inversion, Pumping, Lasing action, Ruby laser, He-Ne laser, Semiconductor diode laser, Applications: Bar code scanner.

Introduction to fibre optics, Total internal reflection, Construction of optical fibre, Acceptance angle, Numerical aperture, Classification of optical fibres, Losses in optical fibre, Applications: Optical fibre for communication system, Sensor for structural health monitoring.

TEXT BOOKS:

1. TVS Arun Murthy & MN Avadhanulu," Advanced Engineering Physics", S. Chand Publications.
2. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2ndEdition, 2022.
3. Shatendra Sharma and Jyotsna Sharma, "Engineering Physics", Pearson Publication, 2019.
4. A.P. Siva Kumar, Y Subba Reddy, "Introduction to Quantum Technologies and applications".
5. M. N. Avadhanulu, P. G. Kshirsagar& TVS Arun Murthy "A Text book of Engineering Physics", S. Chand Publications, 11th Edition 2019.
6. S O Pillai "Solid State Physics", New Age International Private Limited, 8th Edition, 2018.

REFERENCE BOOKS:

1. Quantum Physics, H.C.Verma, TBS Publication, 2nd Edition 2012.
2. Elementary Solid-State Physics, S.L.Gupta and V.Kumar, PragathiPrakashan, 2019.
3. A.K. Bhandhopadhya -Nano Materials, NewAgeInternational,1st Edition,2007.
4. Engineering Physics, S P Basavaraj, 2005 Edition.
5. Engineering Physics by Gupta and Gour, DhanpatRai Publications, 2016 (Reprint).
6. Vishal Sahani, Quantum Computing, McGraw Hill Education, 2007 Edition.

E-sources

- https://shijuinpallotti.wordpress.com/wp-content/uploads/2019/07/optical-fiber-communications-principles-and-pr.pdf
- https://www.geokniga.org/bookfiles/geokniga-crystallography_0.pdf
- https://dpbck.ac.in/wp-content/uploads/2022/10/Introduction-to-Solid-State-PhysicsCharles-Kittel.pdf
- https://www.thomaswong.net/introduction-to-classical-and-quantum-computing-1e4p.pdf
- https://www.fi.muni.cz/usr/gruska/qbook1.pdf
- https://profmcruz.wordpress.com/wp-content/uploads/2017/08/quantum-computation-and- quantum-information-nielsen-chuang.pdf

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25X00501 : PROGRAMMING FOR PROBLEM SOLVING

L	T	P	C
3	0	0	3

Course Objectives:

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of the C programming language.
4. To learn the usage of structured programming approaches in solving problems.

Course Outcomes: The student will be able to

1. Illustrate the fundamental elements as variables, control structures, loops, and functions to interpret program flow in solving engineering problem statements.
2. Develop programs using arrays, strings, and modular programming, recursive functions, structures concepts to implement data processing tasks in business applications.
3. Summarize the concepts of pointers, scope of variables, and parameter passing mechanisms in the role of system-level programming.
4. Demonstrate file handling techniques, searching, and sorting algorithms to manage real-time database operations.
5. Organize multidimensional arrays, string operations, and user-defined data types in multidisciplinary applications.

UNIT - I: Overview of C:C Language Elements, Variable Declarations and Data Types, Executable Statements, General Form of a C Program, Arithmetic Expressions, Formatting Numbers in Program Output.

Selection Structures: Control Structures, Conditions, if Statement, if Statements with Compound Statements, Decision Steps in Algorithms.

Repetition and Loop Statements: Repetition in Programs, Counting Loops and the while Statement, Computing a Sum or Product in a Loop, for Statement, Conditional Loops, Loop Design, Nested Loops, do-while Statement.

UNIT - II: Top-Down Design with Functions: Building Programs from Existing Information, Library Functions, Top-Down Design and Structure Charts, Functions without Arguments, Functions with Input Arguments.

Pointers and Modular Programming: Pointers and the Indirection Operator, Functions with Output Parameters, Multiple Calls to a Function with Input/ Output Parameters, Scope of Names, Formal Output Parameters as Actual Arguments.

UNIT - III: Arrays: Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Using Array Elements as Function Arguments, Array Arguments, Searching and Sorting an Array, Parallel Arrays and Enumerated Types, Multidimensional Arrays.

Strings: String Basics, String Library Functions: Assignment and Substrings, Longer Strings: Concatenation and Whole-Line Input, String Comparison, Arrays of Pointers.

UNIT - IV: Recursion: The Nature of Recursion, Tracing a Recursive Function, Recursive

Mathematical Functions, Recursive Functions with Array and String Parameters
Structure and Union Types: User-Defined Structure Types, Structure Type Data as Input and Output Parameters, Functions with Structured Result Values, Union Types.

UNIT - V: Text and Binary File Pointers: Input/ Output Files - Review and Further Study, Binary Files, Searching a Database.
Searching and Sorting: Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms).

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B. Koffman, Problem solving and Program Design in C 7th Edition, Pearson.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill.
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB.
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

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2510203: INTRODUCTION TO ELECTRICAL ENGINEERING (ECE)

I Year B.Tech I Sem **L T P C**
2 0 0 2

Prerequisite: Mathematics

Course Objectives:

- To understand the basic laws of simple DC networks.
- To learn the fundamentals of single-phase AC circuits and three-phase systems.
- To understand the working principles of transformers and performance parameters.
- To study the operation and characteristics of DC machines, induction motors, and synchronous generators.
- To understand electrical installation components and perform calculations related to switchgear, earthing, and batteries.

Course Outcomes: After completion of this course the student will be able to

- Analyze DC circuits using KVL, KCL, and Thevenin's and Norton's theorems.
- Elucidate single-phase and three-phase AC circuits.
- Evaluate transformer parameters, equivalent circuit, losses, voltage regulation, and efficiency.
- Analyze DC shunt machine performance, torque-slip characteristics of induction motors, and operation of synchronous generators.
- Perform electrical calculations for energy consumption and identify installation components.

MODULE–I

D.C. Circuits: Introduction to R, L and C elements, Independent voltage and current sources, KVL & KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

MODULE–II

A.C. Circuits: Introduction to sinusoidal waveforms, phasor representation, the concept of power and power factor, Analysis of 1-phase RLC series and parallel circuits, resonance in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

MODULE–III

Transformers: Principle of operation, equivalent circuit, losses, regulation and efficiency. Introduction to Auto-transformer.

MODULE –IV

Electrical Machines: Principle of operation of DC machine, performance characteristics of dc shunt machine. Principle of operation of a 3-phase induction motor, torque-slip characteristics. Principle of operation of synchronous generator.

MODULE –V

Electrical Installations: Components of LT Switchgear: SFU, MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, and Characteristics. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition,2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition,2008.

REFERENCE BOOKS:

1. P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, "Basic Electrical Engineering", S. Chand, 2nd Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

Course code	Course name	L	T	P	C
25X0010	English for Skill Enhancement	3	0	0	3
	Common to B. Tech I Year I/II Sem Civil, EEE, Mech, ECE, CSM & CSD				

Introduction

The course, aligned with the National Education Policy 2020, aims to develop students' proficiency in English by focusing on Listening, Speaking, Reading, and Writing (LSRW) skills. It emphasizes clear and effective communication for academic, personal, and professional needs while promoting cultural and value-based learning. Through a structured syllabus, interactive teaching methods, and authentic learning materials, students will enhance vocabulary, grammar, comprehension, and writing skills for lifelong learning.

Prerequisites: Language Comprehension

CourseObjectives: This course will enable the students to:

a. Improve their vocabulary.

b. Use appropriate sentence structures in their oral and written communication.

c. Develop their reading and study skills.

d. Equip students to write paragraphs, essays, précis and draft letters.

e. Acquire skills for technical report writing.

CourseOutcomes: After successfulcompletionof thecourse, students shouldbeableto:

1. Identify appropriate vocabulary in their oral and written communication.
2. Demonstrate their understanding of the rules of functional grammar and sentence structures.
3. Develop comprehension skills from known and unknown passages.
4. Construct paragraphs, essays, précis, and draft letters.
5. Utilize abstracts and reports in various contexts

MODULE–I

Theme: **Perspectives**

Lesson on 'The Generation Gap' by Benjamin M. Spock from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Words Often Misspelt - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Parts of Speech particularly Articles and Prepositions – Degrees of Comparison

Reading: Reading and Its Importance- Sub Skills of Reading – Skimming and Scanning.

Writing: Sentence Structures and Types -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing Precisely –Nature and Style of Formal Writing.

MODULE–II

Theme: **Digital Transformation**

Lesson on '*Emerging Technologies*' from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.

Vocabulary: Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Reading Strategies-Guessing Meaning from Context – Identifying Main Ideas –

Exercises for Practice

Writing: Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence – Linkers and Connectives - Organizing Principles in a Paragraph – Defining- Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence - Essay Writing - Writing Introduction and Conclusion.

MODULE–III

Theme: **Attitude and Gratitude**

Poems on '*Leisure*' by William Henry Davies and '*Be Thankful*' - Unknown Author from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-Skills of Reading – Identifying Topic Sentence and Providing Supporting Ideas - Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Job Application with CV/Resume –Difference between Writing a Letter and an Email - Email Etiquette.

MODULE–IV

Theme: **Entrepreneurship**

Lesson on '*Why a Start-Up Needs to Find its Customers First*' by Pranav Jain from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.

Vocabulary: Standard Abbreviations in English – Inferring Meanings of Words through Context – Phrasal Verbs – Idioms.

Grammar: Redundancies and Clichés in Written Communication – Converting Passive to Active Voice and Vice-Versa.

Reading: Prompt Engineering Techniques– Comprehending and Generating Appropriate Prompts - Exercises for Practice

Writing: Writing Practices- Note Making-Précis Writing.

MODULE–V

Theme: **Integrity and Professionalism**

Lesson on '*Professional Ethics*' from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.

Vocabulary: Technical Vocabulary and their Usage– One Word Substitutes – Collocations.

Grammar: Direct and Indirect Speech **-** Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) – Inferring the Meaning and Evaluating a Text- Exercises for Practice

Writing: ***Report Writing - Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Technical Report.***

<u>**Note**</u>: ***Listening and Speaking skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.***

- (**Note**: As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is* ***Open-ended***, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.)

Prescribed Textbook

1. **Board of Editors. *2025. English for the Young in the Digital World.* Orient BlackSwan Pvt. Ltd.**

<u>References:</u>

1. Swan, Michael. (2016). *Practical English Usage.* Oxford University Press. New Edition.
2. *Karal, Rajeevan. 2023. English Grammar Just for You.* Oxford University Press. New Delhi
3. 2024. *Empowering with Language: Communicative English for Undergraduates.* Cengage Learning India Pvt. Ltd. New Delhi
4. Sanjay Kumar & Pushp Lata. 2022. *Communication Skills – A Workbook.* Oxford Univeristy Press. New Delhi
5. Wood,F.T. (2007). *Remedial English Grammar.* Macmillan.
6. Vishwamohan, Aysha. (2013). *English for Technical Communication for Engineering Students.* Mc Graw-Hill Education India Pvt. Ltd.

Useful Links

- https://owl.purdue.edu/owl/general_writing/grammar/index.html?utm_source=chatgpt.com
- https://www.ego4u.com/?utm_source=chatgpt.com
- https://www.eslfast.com/?utm_source=chatgpt.com
- https://learnenglish.britishcouncil.org/skills/reading?utm_source=chatgpt.com

25X0071: ADVANCED ENGINEERING PHYSICS LAB

(Civil, EEE, Mech, ECE, CSE, CSM & CSD**)**

	L	T	P	C
I Year B.Tech. I/II SEM	**0**	**0**	**2**	**1**

Pre-requisites:10+2 Physics

Course Objectives: The student will try to

1. Capable of handling instruments related to the Hall effect Experiment and their measurements.
2. Understand the characteristics of various devices such as solar cell, lasers and optical fiber.
3. Apply the analytical techniques & graphical analysis for Stewart Gees, B-H curve.
4. Synthesize and study the physical properties of materials like semiconductors ferromagnetic and ferroelectric substances.
5. Develop intellectual communication skills through discussion on basic principles of scientific concepts in a group.

Course outcomes: After successful completion of the course, students should be able to

CO1: Demonstrate the Planck's constant using Photo electric effect and Apply the Hall effect and band gap measurement techniques to examine semiconductor properties.

CO2: Determine key electrical, magnetic and optical properties of semiconductors and other functional materials.

CO3: Describe the steps involved in the Synthesis of magnetic nanomaterials using chemical methods.

CO4: Compare the variation of magnetic and electric field and the behaviors of hysteresis curve. Interpret data analysis.

CO5: Demonstrate working of laser systems, optical fiber and solar cell parameters through experimental study.

List of Experiments: (Any 8 experiments are to be performed)

1. Determination of work function and Planck's constant using photo electric effect
2. Determination of Hall coefficient and carrier concentration of a given semiconductor
3. Determination of energy gap of a semiconductor
4. Synthesis of magnetic (Fe_3O_4) nanoparticles using sol-gel method.
5. Study of B-H curve of a ferromagnetic material
6. Determination of magnetic field induction along the axis of a current carrying coil.
7. Determination of dielectric constant of a given material.
8. Study of V-I and P-I characteristics of solar cell.
9. Determination of wavelength of a laser using diffraction grating and to study of V-I & 55L-I characteristics of a given laser diode
10. Determination of numerical aperture of a given optical fibre and to determination of bending losses of a given optical fibre.

Open Ended Experiments: (Any 2 experiments are to be performed)

1. To calculate the concentration of charge carriers in the sample using Hall effect - NITK, Surathkal Virtual Lab.
2. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss - IIT Kanpur Virtual Lab.
3. To calculate the beam divergence and spot size of the given laser beam - Amritha Viswa Vidya Peetham Virtual Lab
4. To study various crystals structures - Amritha Viswa Vidya Peetham Virtual Lab

References / E-sources:

1. Kittel, Charles, and Paul McEuen. Introduction to solid state physics. John Wiley & Sons, 2018. https://ph1-nitk.vlabs.ac.in/exp/hall-effect/references.html.
2. Kasap S O., Principles of Electronic Materials and Devices, 3rd Ed, Mcgraw Hill, 2006). https://bop2-iitk.vlabs.ac.in/exp/hysteresis-loss/references.html.
3. Koechner, Walter. Solid-State Laser Engineering. Berlin: Springer, 2006. https://lo-amrt.vlabs.ac.in/exp/laser-beam-divergence/references.html.
4. Pillai, SO. Solid State Physics, City: New Age Publications (Academic), India, 2005. https://ssp-amrt.vlabs.ac.in/exp/crystal-structure/references.html.

25X0571 : PROGRAMMING FOR PROBLEM SOLVING LAB

L	T	P	C
0	0	2	1

Course Objectives: The students will learn the following:

1. To work with an IDE to create, edit, compile, run and debug programs
2. To analyze the various steps in program development.
3. To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
4. To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
5. To Write programs using the Dynamic Memory Allocation concept.
6. To create, read from and write to text and binary files

Course Outcomes: The candidate is expected to be able to:

1. Implement C programs using control structures and loops to solve real-time numerical and logical problems.
2. Develop modular programs with functions, arrays, and strings to handle structured data in application development.
3. Apply the use of pointers, parameter passing, and file operations to design system-level solutions for data storage and retrieval.
4. Demonstrate searching and sorting algorithms on arrays to perform efficient database operations.
5. Make use of recursive programming techniques and user-defined data structures to address computational problems in scientific applications.

PRACTICE SESSIONS:

Simple numeric problems:

a) Write a program for finding the max and min from the three numbers.
b) Write the program for the simple, compound interest.
c) Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
   5 x 1 = 5
   5 x 2 = 10
   5 x 3 = 15
d) Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

a) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).

b) Write a program that finds if a given number is a prime number.
c) Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
d) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

Arrays, Pointers and Functions:

a) Write a C program to find the minimum, maximum and average in an array of integers.
b) Write a C program that uses functions to perform the following:
   I. Addition of Two Matrices
   II. Multiplication of Two Matrices
c) Write a program for reading elements using a pointer into an array and display the values using the array.
d) Write a program for display values reverse order from an array using a pointer.

Files:

a) Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

Strings:

a) Write a C program that uses functions to perform the following operations:
   I. To insert a sub-string into a given main string from a given position.
   II. To delete n Characters from a given position in a given string
b) Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
c) Write a C program that displays the position of a character ch in the string S or – 1 if S doesn’t contain ch.
d) Write a C program to count the lines, words and characters in a given text.

Sorting and Searching:

a) Write a C program that uses non-recursive function to search for a Key value in a given list of integers using linear search method.
b) Write a C program that uses non-recursive function to search for a Key value in a given sorted list of integers using binary search method.
c) Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.
d) Write a C program that sorts the given array of integers using selection sort in descending order
e) Write a C program that sorts the given array of integers using insertion sort in ascending order
f) Write a C program that sorts a given array of names.

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum’s Outline of Programming with C, McGraw-Hill

Course code	Course name	L	T	P	C
2510073	**English Language and Communication Skills (ELCS)Lab** **Common to B. Tech I Year I/II Sem** **Civil, EEE, Mech, ECE, CSM & CSD**	0	0	2	1

The **English Language and Communication Skills (ELCS) Lab** focuses on listening and speaking skills, particularly on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Objectives: This course will enable the students to:

1. enable students, develop their active listening skills
2. equip students with necessary training in listening, so that they can comprehend the speech of people from different linguistic backgrounds
3. improve their pronunciation and neutralize accent
4. enable students express themselves fluently and appropriately
5. practice speaking in social and professional contexts

CourseOutcomes:

After successful completion of the course, student will be able to:

1. **Identify** key information while listening to spoken texts.
2. **Interpret** the speaker's intention from the speech.
3. **Apply** pronunciation techniques to improve intelligibility.
4. **Demonstrate** fluency, clarity, and confidence while speaking.
5. **Use** English effectively in real-life situations.

Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:

a. **Computer Assisted Language Learning (CALL) Lab which focusses on listening skills**
b. **Interactive Communication Skills (ICS) Lab which focusses on speaking skills**

The following course content is prescribed for the **English Language and Communication Skills Lab**.

Exercise – I

CALL Lab:

Instruction: Speech Sounds-Listening Skill - Importance – Purpose - Types- Barriers- Active Listening

Practice: Listening to Distinguish Speech Sounds (Minimal Pairs) - Testing Exercises

ICS Lab:

- Diagnostic Test – Activity titled 'Express Your View'

Instruction: Spoken and Written language - Formal and Informal English - Greetings - Introducing Oneself and Others

Practice: Any Ice-Breaking Activity

Exercise – II

CALL Lab:

Instruction: Listening vs. Hearing - Barriers to Listening

Practice: Listening for General Information - Multiple Choice Questions - Listening Comprehension Exercises (It is essential to identify a suitable passage with exercises for practice.)

ICS Lab:

Instruction: Features of Good Conversation – Strategies for Effective Communication

Practice: Role Play Activity - Situational Dialogues –Expressions used in Various Situations –Making Requests and Seeking Permissions – Taking Leave - Telephone Etiquette

Exercise - III

CALL Lab:

Instruction: Errors in Pronunciation – Tips for Neutralizing Mother Tongue Influence (MTI)

Practice: Differences between British and American Pronunciation –Listening Comprehension Exercises

ICS Lab:

Instruction: Describing Objects, Situations, Places, People and Events

Practice: Picture Description Activity – Looking at a Picture and Describing Objects, Situations, Places, People and Events (A wide range of Materials / Handouts are to be made available in the lab.)

Exercise – IV

CALL Lab:

Instruction: Techniques for Effective Listening

Practice: Listening for Specific Details - Listening - Gap Fill Exercises - Listening Comprehension Exercises

(It is essential to identify a suitable passage with exercises for practice.)

ICS Lab:

Instruction: How to Tell a Good Story - Story Star- Sequencing-Creativity

Practice: Activity on Telling and Retelling Stories - Collage

Exercise – V

CALL Lab:

Instruction: Identifying the literal and implied meaning

Practice: Listening for Evaluation - Write the Summary – Listening Comprehension Exercises

(It is essential to identify a suitable passage with exercises for practice.)

ICS Lab:

Instruction: Understanding Non-Verbal Communication

Practice: Silent Speech - Dumb Charades Activity

- Post-Assessment Test on 'Express Your View'

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab:

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

i) Computers with Suitable Configuration

ii) High Fidelity Headphones

1. Interactive Communication Skills (ICS) Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo – audio & video system and camcorder etc.

- **Note: English Language Teachers are requested to prepare Materials / Handouts for each Activity for the Use of those Materials in CALL & ICS Labs.**

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10th Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).

References:

- Shobha, KN &Rayen, J. Lourdes. (2019). Communicative English – A workbook. Cambridge University Press
- Board of Editors. (2016). ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities. Orient BlackSwan Pvt. Ltd.
- Mishra, Veerendra et al. (2020). English Language Skills: A Practical Approach. Cambridge University Press
- (2022). English Language Communication Skills – Lab Manual cum Workbook. Cengage Learning India Pvt. Ltd.
- Ur, Penny and Wright, Andrew. 2022. Five Minute Activities – A Resource Book for Language Teachers. Cambridge University Press.

*** *** ***

2510371: ENGINEERING WORK SHOP

L	T	P	C
0	0	2	1

B.Tech. I Year I Sem

Course Objectives:

1. To Study of different hand operated power tools, uses and their demonstration.
2. To gain a good basic working knowledge required for the production of various engineering products.
3. To provide hands on experience about use of different engineering materials, tools, equipment's and processes those are common in the engineering field.
4. To develop a right attitude, team working, precision and safety at work place.
5. It explains the construction, function, use and application of different working tools, Equipment and machines

Course Outcomes:

1. Explain the design and model different prototypes in the carpentry trade such as Cross lap joint, Dove tail joint. (L4)
2. Demonstrate the design and model various basic prototypes in the trade of fitting such as Straight fit, V- fit. (L4)
3. Understand to make various basic prototypes in the trade of Tin smithy such as rectangular tray, and open Cylinder. (L4)
4. Demonstrate the design and model various basic prototypes in the trade of Welding. (L4)
5. Explain to make various basic prototypes in the trade of Black smithy such as J shape, and S shape. (L4)
6. Understand to perform various basic House Wiring techniques such as connecting one lamp with one switch, connecting two lamps with one switch, connecting a fluorescent tube, Series wiring, Go down wiring. (L4)

UNIT I - CARPENTRY & FITTING

- **Carpentry** – Introduction, Carpentry tools, sequence of operations and applications (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
- **Fitting** – Introduction, fitting tools, sequence of operations and applications (V- Fit, Dovetail Fit & Semi-circular fit)

Learning Outcomes: Students should be able to,

- Understand the trade of carpentry and fitting. (L2)
- Explain the tools involved in manufacturing operations. (L3)

- Evaluate the applications of carpentry and fitting. (L4)

UNIT II - TIN SMITHY AND BLACKSMITHY

- **Tin-Smithy** –Introduction, Tin smithy tools, sequence of operations and applications (Square Tin, Rectangular Tray & Conical Funnel).
- **Blacksmith**-Introduction, Blacksmith tools, sequence of operations and applications (Round to Square, Fan Hook and S-Hook)

Learning Outcomes: Students should be able to,

- Understand the oldest manufacturing methods. (L2)
- Describe the sequence of operations involved. (L3)
- Explain the safety precautions and tools usage. (L4)

UNIT III - HOUSE WIRING AND WELDING

- **House-wiring** – Introduction, Electrical wiring tools, sequence of operations and applications (Parallel & Series, Two-way Switch and Tube Light)
- **Welding Practice** – Introduction, electrode, welding tools, and sequence of operations. Advantages and applications (Arc Welding)

Learning Outcomes:

- Students should be able to,
- Discuss the topic of House Wiring(L3)
- Explain Safety precautions of welding (L4)

Text Books:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

References:

1. Work shop Manual – P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP

I-II

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

2520002: ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

I Year B.Tech. II – Sem	**L T P C**
(CSE, CSD, CSM, ECE, EEE, MECH, CIVIL)	**3 0 0 3**

Pre-requisites: Mathematics courses of 10+2 year of study.

Course Objectives: The student will try to learn

- Methods of solving the differential equations of first order and first degree.
- Concept of higher order liner differential equations.
- Concept, properties of Laplace transforms, solving ordinary differential equations by using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions.
- The basic properties of vector valued functions and their applications to line, surface and volume integrals.

Course outcomes: After successful completion of the course, students should be able to

CO1: Utilize the methods of differential equations for solving Newton's law of cooling and Law of Natural growth and decay.

CO2: Understand the solutions of linear differential equations with constant coefficients.

CO3: Explain the concept of the Laplace transforms and its significance in solving differential equations and evaluating integrals.

CO4: Interpret the vector differential operators and their relationships for solving engineering problems.

CO5: Apply the integral transformations to line, surface and volume of different geometrical models.

UNIT-I: First Order ODE **8L**

Exact differential equations, equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT-II: Ordinary Differential Equations of Higher Order **10L**

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, sin ax, cos ax, polynomials in x, e^{ax} V(x) and x V(x), method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Cauchy-Euler equation, Legendre's equation.

UNIT-III: Laplace transforms **10L**

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function (All without proof), Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

UNIT-IV: Vector Differentiation **10L**

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT-V: Vector Integration **10L**

Line, Surface and Volume Integrals, Theorems of Green's, Gauss and Stokes's (without proof) and their applications.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dassand Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

2510009: ENGINEERING CHEMISTRY

B.Tech. I Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives:

1. To develop adaptability to new advances in Engineering Chemistry and acquire the essential skills to become a competent engineering professional.
2. To understand the industrial significance of water treatment, fundamental principles of battery chemistry, and the impact of corrosion, along with its control methods for structural protection.
3. To impart foundational knowledge of various energy sources and their practical applications in engineering.
4. To equip students with an understanding of smart materials, biosensors, and analytical techniques applicable in engineering, industrial, environmental, and biomedical fields.

Course Outcomes:

CO1: Understand the fundamental properties of water and its applications in both domestic and industrial purposes.

CO2: Acquire the knowledge of electrochemical processes and their relevance to corrosion and its control methods.

CO3: Determine the significance and practical applications of batteries and various energy sources, enhancing their potential as future engineers and entrepreneurs.

CO4: Understand the basic concepts and properties of polymers and other engineering materials.

CO5: Apply the medicinal values in daily life

UNIT-I: Water and its treatment: [8]

Introduction- Hardness, types, degree of hardness and units. Estimation of hardness of water by complexometric method - Numerical problems. Potable water and its specifications (WHO) - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break-point chlorination.

Boiler troubles: Scales, Sludges and Caustic embrittlement. Internal treatment of boiler feed water - Calgon conditioning, Phosphate conditioning, Colloidal conditioning. External treatment methods - Softening of water by ion-exchange processes. Desalination of brackish water – Reverse osmosis.

UNIT-II: Electrochemistry and Corrosion: [8]

Introduction- Electrode potential, standard electrode potential, Nernst equation (no derivation), electrochemical cell - Galvanic cell, cell representation, EMF of cell - Numerical problems. Types of electrodes, reference electrodes - Primary reference electrode - Standard Hydrogen Electrode (SHE), Secondary reference electrode - Calomel electrode. Construction, working and determination of pH of unknown solution using SHE and the Calomel electrode.

Corrosion: Introduction- Definition, causes and effects of corrosion – Theories of corrosion, chemical and electrochemical theories of corrosion, Types of corrosion: galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion - Nature of the metal, Nature of the corroding environment. Corrosion control methods - Cathodic protection Methods - Sacrificial anode and impressed current methods.

UNIT–III: Energy sources: [8]

Batteries: Introduction – Classification of batteries - Primary, secondary and reserve batteries with examples. Construction, working and applications of Zn-air and Lithium-ion battery. Fuel Cells – Differences between a battery and a fuel cell, Construction and applications of Direct Methanol Fuel

Cell (DMFC).

Fuels: Introduction and characteristics of a good fuel, Calorific value – Units - HCV, LCV- Dulongs

formula - Numerical problems.

Fossil fuels: Introduction, Classification, Petroleum - Refining of Crude oil, Cracking - Types of cracking - Moving bed catalytic cracking. LPG and CNG composition and uses.

Synthetic Fuels: Fischer-Tropsch process, Introduction and applications of Hythane and Green Hydrogen.

UNIT - IV: Polymers: [8]

Definition - Classification of polymers: Based on origin and tacticity with examples – Types of polymerization - Addition (free radical addition mechanism) and condensation polymerization.

Plastics, Elastomers and Fibers: Definition and applications (PVC, Buna-S, Nylon-6,6). Differences between thermoplastics and thermo setting plastics, Fiber reinforced plastics (FRP).

Conducting polymers: Definition and Classification with examples - Mechanism of conduction in trans-poly-acetylene and applications of conducting polymers.

Biodegradable polymers: Polylactic acid and its applications.

UNIT-V- Advanced Functional Materials: [8]

Smart materials: Introduction, Classification with examples - Shape Memory Alloys – Nitinol, Piezoelectric materials – quartz and their engineering applications.

Biosensor - Definition, Amperometry Glucose monitor sensor.

Cement: Portland cement, its composition, setting and hardening.

Lubricants: Definition and characteristics of a good lubricant — thin film mechanism of lubrication, properties of lubricants - viscosity, cloud and pour point, flash and fire point.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010.
2. Engineering Chemistry by Rama Devi, Dr. P. Aparna and Rath, Cengage learning, 2025.

REFERENCE BOOKS:

1. Engineering Chemistry: by Thirumala Chary Laxminarayana & Shashikala, Pearson Publications (2020)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi 2011.
3. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi 2015.
4. Engineering Analysis of Smart Material Systems by Donald J. Leo, Wiley, 2007.
5. Challenges and Opportunities in Green Hydrogen by Editors: Paramvir Singh, Avinash Kumar Agarwal, Anupma Thakur, R.K Sinha.
6. Raman Spectroscopy in Human Health and Biomedicine, https://www.worldscientific.com/doi/epdf/10.1142/13094

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2520401: ELECTRONIC DEVICES AND CIRCUITS

I Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course introduces fundamental semiconductor devices and their behavior, including diodes, BJTs, and FETs. It covers their characteristics, applications, and the analysis of basic electronic circuits. The course also explores rectifiers, voltage regulation, amplifier design, and advanced semiconductor technologies like FinFETs and CNTFETs. Emphasis is placed on developing a strong foundation for analog circuit design and understanding modern device technologies in electronics.

Pre-requisites: Knowledge on Basic Electrical Engineering and Semiconductor Device Physics

Course Objectives:
The students will try to learn
- Characteristics of semiconductor diodes, their models, and applications
- Structure, operation, and characteristics of Bipolar Junction Transistors (BJT) in various configurations, along with the determination of h-parameters
- Need for transistor biasing, load line analysis, operating point selection, and various biasing techniques with emphasis on stabilization and prevention of thermal runaway
- The design and analysis of transistor-based small-signal amplifiers using h-parameters in CE, CB, and CC configurations with approximate models
- Principles, operation, and characteristics of special-purpose diodes, FET devices, and advanced transistors like FinFETs and CNTFETs

Course Outcomes:
After successful completion of the course, students shall be able to
- Analyze the electrical characteristics and models of semiconductor diodes and apply them in rectifier and clipping circuits
- Evaluate the operation and configurations of Bipolar Junction Transistors (BJTs) and analyze their input and output characteristics
- Design appropriate biasing networks for BJTs and determine the operating point for amplifier applications
- Analyze transistor amplifier circuits using h-parameter models and assess performance for various configurations
- Analyze the structure, working, and characteristics of JFETs, MOSFETs, and advanced devices like FinFETs and CNTFETs, and compare modern device technologies.

Module – I: Diode Characteristics and Applications 7L
PN junction diode – I-V characteristics, Diode resistance and capacitance, Diode models (Ideal, Simplified, Piecewise Linear), Rectifiers – Half-wave, Fullwave (Center-tap and bridge), Capacitor filter for rectifiers, Clippers and clampers, Zener diode – I-V characteristics and voltage regulation.

Module – II: Bipolar Junction Transistor (BJT) 6L
Structure and working principle of BJT, Current components and transistor action, Configurations: Common Base (CB), Common Emitter (CE), Common Collector (CC), Input and output characteristics, Determination of h-parameters from transistor characteristics.

Module – III: BJT Biasing **6L**

Need for biasing and stabilization, Load line and operating point, Biasing techniques: Fixed bias, Collector-to-base bias, Voltage divider bias, Stability factors and thermal runaway

Module – IV: Transistor Amplifiers **6L**

Transistor as a small-signal amplifier, h-parameter equivalent circuit, CE, CB, CC amplifier analysis using h-parameters, Approximate CE model – with and without emitter bypass capacitor.

Module – V: Special Purpose Diodes, Field Effect Transistors and Advanced Devices **10L**

Special Purpose Diodes: Principle of Operation of – SCR, Tunnel Diode, Varactor Diode, Photo Diode, Solar Cell, LED and Schottky Diode.

Field Effect Transistors and Advanced Devices: JFET: Structure, operation, and characteristics, MOSFET: Enhancement and Depletion modes – Structure, operation, and characteristics, Advanced Devices: FinFETs - 3D structure, Scaling advantages, CNTFETs - Structure, ballistic transport, fabrication, Comparison: CMOS vs. FinFET vs. CNTFET.

TEXT BOOKS:

1. Millman, Jacob, and Christos C. Halkias. Electronic Devices and Circuits. 3rd edition, Tata McGraw-Hill, 2010.
2. Boylestad, Robert L., and Louis Nashelsky. Electronic Devices and Circuit Theory, 11th edition, Pearson, 2013.

REFERENCES:

1. Bell, David A. Electronic Devices and Circuits. Oxford University Press, 5th ed., 2008.
2. Neamen, Donald A. Electronic Circuit Analysis and Design. McGraw-Hill, 2nd ed., 2001.
3. Salivahanan, S., and N. Suresh Kumar. Electronic Devices and Circuits. McGraw-Hill Education, 4th ed., 2017.

MLRS - BT25 - Department of Computer Science and Engineering
25X0507 : Object Oriented Programming Through Java

L	T	P	C
3	0	0	3

Course Objectives:

1. To Understand the basic object-oriented programming concepts and apply them in problem solving.
2. To Illustrate inheritance concepts for reusing the program.
3. To Demonstrate multitasking by using multiple threads and event handling
4. To Develop data-centric applications using JDBC.
5. To Understand the basics of java console and GUI based programming

Course Outcomes:

1. Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
2. Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
3. Use multithreading concepts to develop inter process communication.
4. Understand the process of graphical user interface design and implementation using AWT or swings.
5. Develop applets that interact abundantly with the client environment and deploy on the server.

UNIT - I

Object oriented thinking and Java Basics- Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, nested and inner classes, exploring String class.

UNIT - II

Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super keyword uses, using final keyword with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT - III

Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads.

UNIT - IV

Exploring String class, Object class, Exploring java.util package, Exploring java.io package
Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. graphics, layout manager - layout manager types – border, grid, flow, card and grid bag.

UNIT - V

Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing-JFrame and JComponent, JLabel, ImageIcon, JTextField, JButton, JCheckBox, JRadioButton, JList, JComboBox, Tabbed Panes, Scroll Panes, Trees, and Tables. Menu Basics, Menu related classes - JMenuBar, JMenu, JMenuItem, JCheckBoxMenuItem, JRadioButtonMenuItem, JSeperator. creating a popup menu

TEXT BOOKS:

1. Java the complete reference, 13th edition, Herbert schildt, Dr. Denny Coward, Mc Graw Hill.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson education.

REFERENCE BOOKS:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley & sons.
2. An Introduction to OOP, third edition, T. Budd, Pearson education.
3. Introduction to Java programming, Y. Daniel Liang, Pearson education.
4. An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education
7. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.
8. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.
9. Maurach's Beginning Java2 JDK 5, SPD.

MARRI LAXMAN REDDY
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2520204: NETWORK ANALYSIS AND SYNTHESIS
(ECE)

I Year B.Tech II Sem **L T P C**
3 0 0 3

Prerequisite: Introduction to Electrical Engineering

Course Objectives:

- To understand the fundamentals of network topology and magnetic circuits.
- To analyze transient and steady-state responses of RC, RL, and RLC circuits.
- To learn various two-port network parameters and network function analysis for impedance matching.
- To understand the classification, design of filters and attenuator networks.
- To master network synthesis techniques to design driving-point and transfer functions using positive real functions.

Course Outcomes: After completion of this course the student will be able to

- Analyze network topology and magnetically coupled circuits using dot convention.
- Determine transient responses, resonance, and damping behavior of RLC circuits by applying root locus methods.
- Understand two-port network parameters, calculate key impedances and network functions.
- Design and study constant-k, m-derived filtersand attenuators networks.
- Synthesize LC, RC, and RL networksbased on driving-point impedance and transfer functions.

MODULE - I

Network Topology: Basic cutset and tie set matrices for planar networks, Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

MODULE -II

Transient and Steady state analysis: RC, RL and RLC Circuits, Sinusoidal, Step and Square responses. RC Circuits as integrator and differentiators. 2nd order series and parallel RLC Circuits, Root locus, damping factor, over damped, under damped, critically damped cases, quality factor and bandwidth for series and parallel resonance, resonance curves.

MODULE -III

Two port network parameters: Z, Y, ABCD, h and g parameters, Characteristic impedance, Image transfer constant, image and iterative impedance, network function, driving point and transfer functions – using transformed (S) variables, Poles and Zeros. Standard T,Π, L Sections, Characteristic impedance, image transfer constants, Design of Attenuators, impedance matching network.

MODULE -IV

Filters: Classification of Filters, Filter Networks, Constant-K Filters-Low pass, high pass, Band pass, band-stop filters, M-derived Filters- T and π filters- Low pass, high pass Attenuators: Types – T, π , L, Bridge T and lattice ,Asymmetrical Attenuators T, π , L Equalizers- Types- Series, Shunt, Constant resistance, bridge T attenuation, bridge T phase, Lattice attenuation, lattice Phase equalizers

MODULE -V

Network Synthesis: Driving point impedance and admittance, transfer impedance and admittance, network functions of Ladder and non ladder networks, Poles, Zeros analysis of network functions, Hurwitz polynomials, Positive Real Functions, synthesis of LC, RC and RL Functions by foster and causer methods.

TEXT BOOKS:

1. Van Valkenburg -Network Analysis, 3rd Ed., Pearson, 216.
2. JD Ryder - Networks, Lines and Fields, 2nd Ed., PHI, 1999.

REFERENCE BOOKS:

1. J. Edminister and M. Nahvi - Electric Circuits, Schaum's Outlines, Mc Graw Hills Education,1999.
2. A. Sudhakar and Shyammohan S Palli - Networks & Circuits, 4th Ed., Tata McGraw- Hill Publications
3. William Hayt and Jack E. Kimmerley - Engineering Circuit Analysis, 6th Ed., William Hayt and Jack E. Kimmerley, McGraw Hill Company

2510301: ENGINEERING DRAWING AND COMPUTER AIDED DRAFTING

I YEAR II SEM

L	T	P	C
2	0	2	3

Course Overview:
Engineering Drawing and Computer Aided Drafting is a fundamental subject that trains students in the visualization and representation of engineering objects using both conventional methods and modern CAD tools. It begins with geometrical constructions, scales, and engineering curves such as conic sections and cycloidal curves. Students then progress to orthographic projections of points, lines, planes, and solids, including auxiliary and sectional views. The subject also introduces development of surfaces and isometric projections, enabling conversion between 2D and 3D representations. Overall, it builds essential skills in technical drawing, spatial visualization, and CAD, preparing learners for advanced design applications.

Prerequisite: Nil

Course Objective: The students will try to learn
1. To introduce the fundamentals of engineering drawing and projection systems.
2. To develop skills in constructing orthographic, isometric, and sectional views.
3. To train students in interpreting and creating technical drawings using CAD tools.
4. To familiarize students with dimensioning standards and drafting conventions.
5. To bridge manual drafting techniques with computer-aided drafting practices.

Course Outcomes: After successful completion of the course, students should be able to
1. Understand and apply the principles of orthographic and isometric projections.
2. Create sectional views and dimensioned drawings using BIS standards.
3. Use CAD software to generate 2D engineering drawings.
4. Visualize and construct solid models from 2D views.
5. Interpret and produce engineering drawings of mechanical components and assemblies for practical and industrial applications.

Module-I: Introduction to Engineering Graphics (Conventional) [12]

Principles of Engineering Graphics and their Significance, Geometrical Constructions, Scales, Plain and Diagonal, Conic Sections (Ellipse, Parabola and Hyperbola) General method only. Cycloid, Epicycloid and Hypocycloid.

Module-II: Orthographic Projections (Conventional and Computer Aided) [14]
Principles of Orthographic Projections, Conventions, Projections of Points and Lines, Projections of Plane regular geometric figures. Planes inclined one Plane. Computer aided orthographic projections, points, lines and planes. Introduction to Computer aided drafting, views, commands.

Module-III: Projections of Regular Solids (Conventional and Computer Aided) [12]
Auxiliary Views, Sections or Sectional views of Right Regular Solids, Prism, Cylinder, Pyramid, Cone, Auxiliary views, Computer aided projections of solids, sectional views.

Module-IV: Development of Surfaces (Conventional) [10]
Prism, Cylinder, Pyramid and Cone.

Module-V: Isometric Projections (Conventional and Computer Aided) [12]
Principles of Isometric Projection, Isometric Scale, Isometric Views, Conventions, Isometric Views of Lines, Plane Figures, Conversion of Isometric Views to Orthographic Views and Vice- versa, Conventions. Conversion of orthographic projection into isometric view.

Note:
1. The End Semester Examination will be in conventional mode.
2. CIE – I will be in conventional mode.
3. CIE – II will be using Computer.

Text Books:
1. Engineering Drawing, N. D. Bhatt, Charotar, 54th Edition, 2023.
2. Engineering Drawing and graphics Using AutoCAD, T. Jeyapoovan and Vikas, S. Chand and company Ltd., 3rdEdition,2010.

Reference Books:
1. Engineering Drawing, Basant Agrawal and C.M. Agrawal, McGraw Hill, 3rd Edition, 2019.
2. Engineering Graphics and Design, WILEY, John Wiley and Sons Inc, 3rdEdition, 2020.
3. Engineering Drawing, M. B. Shah and B.C. Rane, Pearson, 2nd Edition, 2009.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford, 1st Edition, 2015.
5. Computer Aided Engineering Drawing, K. Balaveera Reddy, CBS Publishers, 2nd Edition, 2015.

2510072: ENGINEERING CHEMISTRY LAB

B.Tech. I Year I Sem.

L	T	P	C
0	0	2	1

Course Description: The course includes experiments based on fundamental principles of chemistry essential for engineering students, aiming to develop practical skills and reinforce theoretical concepts.

Course Objectives

1. Students will understand and perform experiments based on core chemical principles relevant to engineering applications.
2. Students will learn to estimate the hardness of water to assess its suitability for drinking purposes.
3. Students will acquire the ability to perform acid-base titrations using instrumental methods such as conductometry, potentiometry, and pH metric.
4. Students will gain hands-on experience in synthesizing polymers like Bakelite and Nylon – 6, 6 in the laboratory.
5. Students will learn to determine the unknown concentration of potassium permanganate (KMnO4) using a calibration curve.

Course Outcomes:

CO1: Develop the practical skills through hands-on chemistry experiments relevant to engineering.
CO2: Determine the important parameters such as water hardness and the corrosion rate of mild steel under various conditions.
CO3: Apply the techniques like conductometry, potentiometry, and pH metric to determine concentrations or equivalence points in acid base reactions.
CO4: synthesize the polymers such as Bakelite and Nylon-6,6.
CO5: Determine the unknown concentration of strong acid with strong base by Potentiometry using quinhydrone

List of Experiments:

I. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometric method.

II. **Conductometry:**
1. Estimation of the concentration of strong acid by Conductometry.
2. Estimation of the concentration of strong and weak acid in an acid mixture by Conductometry.

III. **Potentiometry:**
1. Estimation of concentration of Fe^{+2}ion by Potentiometry using $KMnO_4$.
2. Estimation of concentration of strong acid with strong base by Potentiometry using quinhydrone

IV. **pH Metry:** Determination of an acid concentration using pH meter.

V. **Preparations:**
1. Preparation of Bakelite.
2. Preparation Nylon – 6, 6.

VI. **Corrosion:** Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

VI **Lubricants:**
1. Estimation of acid value of given lubricant oil.
2. Estimation of viscosity of lubricant oil using Ostwald's Viscometer.

VII Virtual lab experiments:

1. Construction of Fuel cell and it's working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications.

OPEN ENDED EXPERIMENTS:

1. Aspirin
2. Paracetamol

REFERENCE BOOKS:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

2510009: ENGINEERING CHEMISTRY

UNIT 1 (1%)

Nalgonda Technique -- is removed from the JNTUH R25 prescribed syllabus

UNIT II

Total all topics are retained from JNTUH R25 prescribed syllabus

UNIT III

Total topics retained from JNTUH R25 prescribed syllabus

UNIT IV

Total topics retained from JNTUH R25 prescribed syllabus

UNIT V

Interpretative spectroscopic applications of UV-Visible spectroscopy for the Analysis of pollutants in the dye industry, IR spectroscopy in night vision security, Pollution Under Control- CO sensor (Passive Infrared detection), Raman spectroscopy (application) - Tumor detection in medical applications. — are removed from the JNTUH R25 prescribed syllabus and inserted

Cement: Portland cement, its composition, setting and hardening.
Lubricants: Definition and characteristics of a good lubricant — thin film mechanism of lubrication, properties of lubricants - viscosity, cloud and pour point, flash and fire point.

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2510072: ENGINEERING CHEMISTRY LAB

All experiments are retained except

Colorimetry: Verification of Lambert-Beer's law using KMnO4. Removed and included the two more experiments

Lubricants:

1. Estimation of the Acid Value of the given Lubricant oil.
2. Estimation of Viscosity of Lubricant Oil Using Ostwald's Viscometer.

Included Open open-ended experiment to improve the skill enhancement

1. Aspirin
2. Paracetamol

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2520471: ELECTRONIC DEVICES AND CIRUITS LABORATORY

I Year B.Tech. ECE II – Sem.

L	T	P	C
0	0	2	1

Couse Overview:
This laboratory course aims to provide hands-on experience and simulation-based learning of semiconductor devices and basic electronic circuits. Students will analyze the characteristics and applications of diodes, BJTs, and FETs, design rectifiers and amplifiers, and simulate modern electronic circuits using software tools. The course bridges theoretical concepts with practical implementation, developing foundational skills essential for analog electronics and circuit analysis.

Course Objectives:
The students will try to learn

- The practical behavior of PN junction and Zener diodes through I–V characteristics, rectifiers, voltage regulation, and waveform shaping applications.
- Biasing and amplification characteristics of BJTs in different configurations, along with their input-output parameters and stability aspects.
- The design, implementation, and evaluation of rectifier circuits with and without filters to understand ripple factor and DC supply performance.
- The simulation and analysis of transistor- and FET-based circuits, including CE amplifiers, JFETs, MOSFETs, and CMOS inverters, for analog and digital applications.
- utilization of modern circuit simulation tools to validate experimental results, analyze device characteristics, and design low-power, high-performance electronic circuits.

Course Outcomes:
After successful completion of the course, students shall be able to

- Analyze the I–V characteristics of semiconductor devices such as diodes, BJTs, and FETs.
- Design and evaluate basic rectifier, clipper, clamper, and voltage regulation circuits.
- De Demonstrate biasing techniques for BJTs and determine their operating point using DC load line analysis.
- Design and analyze transistor amplifier circuits in various configurations using h-parameter models.
- Simulate and interpret electronic circuits using appropriate simulation tools.

List of Experiments:

A. Hardware-Based Experiments (7):

1. Study the I–V characteristics of a PN junction diode in forward and reverse bias to determine cut-in voltage and dynamic resistance.
2. Examine the reverse bias characteristics of a Zener diode and demonstrate its application as a voltage regulator under varying conditions.
3. Design and analyze half-wave and full-wave rectifiers (center-tap and bridge) with and without capacitor filters to evaluate ripple factor and output voltage.
4. Implement clipper and clamper circuits to observe waveform shaping through positive, negative, and biased configurations.

5. Plot the input and output characteristics of a BJT in common emitter configuration to determine input/output resistance and current gain.
6. Design and test fixed bias and voltage divider bias circuits to establish a stable operating point for a BJT amplifier and study DC load line behavior.
7. Construct and analyze a Common Base (CB) configuration of a BJT to study input-output characteristics and determine current gain (α) and input/output resistance.

B. Software-Based Simulation Experiments (7):

1. Simulate a full-wave bridge rectifier with capacitor filter to analyze waveform smoothing and ripple reduction in DC power supply design.
2. Simulate a Zener diode-based voltage regulator to study voltage stabilization against varying supply voltages and load resistances.
3. Simulate a common emitter amplifier with and without emitter bypass capacitor to analyze the effect on voltage gain and signal amplification.
4. Simulate BJT operation as a switch and small-signal amplifier to understand its dual functionality in digital and analog applications.
5. Simulate the output and transfer characteristics of a JFET to determine parameters such as pinch-off voltage, drain resistance, and transconductance.
6. Simulate the characteristics of a MOSFET and design a CMOS inverter to study digital switching behavior and low-power logic design.
7. Simulate the transfer and output characteristics of an enhancement-mode NMOS transistor to analyze threshold voltage, drain current, and switching behavior.

Open Ended Experiments

1. Measurement of Ripple factor and Efficiency of Rectifiers and filters, leads to designing of voltage regulators.
2. Finding the bandwidth of amplifiers leads to the designing of Amplifiers.

Hardware Requirements:

1. Regulated DC Power Supply (0–30V)
2. Function Generator
3. Digital Multimeter
4. Cathode Ray Oscilloscope (CRO) or DSO
5. Breadboards and Connecting Wires
6. Resistors, Capacitors, Diodes (1N4007, Zener Diodes)
7. BJTs (e.g., BC107, 2N2222), JFETs (e.g., J201), MOSFETs (e.g., IRF540N)
8. Trainer Kits (optional but preferred for ease)

Software Requirements (Any one of the listed tools or equivalent):

1. LTSpice (Free from Analog Devices)
2. NI Multisim (Academic License or Student Version)
3. Proteus Design Suite (Simulation and PCB Design)
4. TINA-TI (Free from Texas Instruments)
5. PSPICE for TI or OrCAD Lite
6. Windows PC or Laptop with minimum 4GB RAM and i3 processor or better

MLRS - BT25 - Department of Computer Science and Engineering

25X0578 : Object Oriented Programming Through Java Lab

L	T	P	C
0	0	2	1

Course Objectives:

1. To write programs using abstract classes.
2. To write programs for solving real world problems using the java collection framework.
3. To write multithreaded programs.
4. To write GUI programs using swing controls in Java.
5. To introduce java compiler and eclipse platform.
6. To impart hands-on experience with java programming.

Course Outcomes:

1. Able to write programs for solving real world problems using the java collection framework.
2. Able to write programs using abstract classes.
3. Able to write multithreaded programs.
4. Able to write GUI programs using swing controls in Java.

Note:

1. Use LINUX and MySQL for the Lab Experiments. Though not mandatory, encourage the use of the Eclipse platform.

2. The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed.

List of Experiments:

1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.

2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.

3.
   A) Develop an applet in Java that displays a simple message.
   B) Develop an applet in Java that receives an integer in one text field, and computes its factorial

4. Value and returns it in another text field, when the button named “Compute” is clicked.

5. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.

6. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread

computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.

7. Write a Java program for the following:
   Create a doubly linked list of elements.
   Delete a given element from the above list.
   Display the contents of the list after deletion.

8. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “Stop” or “Ready” or “Go” should appear above the buttons in the selected color. Initially, there is no message shown.

9. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

10. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas.
11. Write a java program to display the table using Labels in Grid Layout.

12. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).

13. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint:use hash tables).

14. Write a Java program that correctly implements the producer – consumer problem using the
15. concept of inter thread communication.

16. Write a Java program to list all the files in a directory including the files present in all its subdirectories.

TEXT BOOKS:

1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.

REFERENCE BOOKS

1. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.
2. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson.

2520273: ELECTRICAL ENGINEERING LAB
(ECE)

I Year B.Tech II Sem **L T P C**
0 0 2 1

Prerequisite: Introduction to electrical engineering.

Course Objectives:

- Understand and verify the fundamental electrical laws and theorems governing DC circuits through practical experiments.
- Develop analytical skills in applying circuit analysis methods and network theorems to determine loop currents and voltages.
- Explore the behavior of RLC series circuits and determine their impedance and resonance characteristics using simulation.
- Investigate the resonance conditions in parallel RLC circuits and analyze waveform parameters such as RMS and average values using simulation.
- Measure and evaluate active and reactive power for different electrical loads through simulations.

Course Outcomes: After going through this lab the student will be able to

- Verify fundamental electrical laws and theorems such as KVL, KCL, Ohm's Law, Thevenin's and Norton's theorems through practical experiments.
- Demonstrate network theorems by applying the Superposition theorem and mesh analysis
- Analyze impedance and frequency response characteristics of RLC series circuits using simulation.
- Evaluate resonance conditions and waveform parameters in RLC circuits using simulation.
- Evaluate active and reactive power for various types of electrical loads using simulation.

From the below 12 experiments minimum 10 experiments are required to be conducted as compulsory experiments:

1. Verification of Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL)
2. Verification of Ohm's Law
3. Verification of Thevenin's Theorem and Norton's Theorem
4. Verification of Superposition Theorem
5. Transient Response of Series RL and RC circuits for DC excitation
6. Computation and Verification of Impedance in RLC Series Circuits using digital simulation
7. Study of Resonance in Series RLC Circuit using digital simulation
8. Study of Resonance in Parallel RLC Circuit using digital simulation
9. Determination of RMS and Average values of a Sinusoidal Waveform using digital simulation
10. Measurement of Active and Reactive Power for different Loads (R and RL) using digital simulation
11. Simulate Kirchhoff's voltage law using basic series DC Circuit - 4 with resistors.
    Where Vs= 6 V, R1 = 100 Ω, R2 = 220 Ω, R3 = 1k Ω.
12. Simulate Kirchhoff's current law using basic parallel DC Circuits - 5 with resistors.
    Where Vs = 6V, R1 = 100 Ω, R2 = 220 Ω, R3 = 1k Ω.

Proposed open ended experiments:

1. Verification of current division in circuits by using digital simulation.
2. Verification of voltage division in circuits by using digital simulation.

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition, 2008.

REFERENCE BOOKS:

1. P. Ramana, M. Suryakalavathi, G.T.Chandrasheker, "Basic Electrical Engineering", S. Chand, 2nd Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

II-I

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2530402: SIGNALS AND SYSTEMS

II Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This syllabus covers fundamental concepts in signal analysis and system behavior, including Fourier, Laplace, and Z-transforms. It explores signal representation, transmission through linear systems, and filtering techniques. Emphasis is also placed on sampling theory, signal reconstruction, and correlation methods for signal detection.

Pre-requisites: Basics of Mathematics

Course Objectives:
The students will try to learn
- Mathematical foundations of signal representation using orthogonal functions and to classify different types of signals and systems.
- Fourier series and Fourier transform for analyzing periodic and non-periodic signals in the frequency domain.
- Behavior of linear systems and their response to various signals, emphasizing the concept of convolution and filtering.
- Laplace transforms and correlation techniques for system analysis, signal detection, and spectral analysis.
- Principles of signal sampling and the application of Z-transforms in analyzing discrete-time systems.

Course Outcomes:
After successful completion of the course, students shall be able to
- Represent and approximate signals using orthogonal functions and identify different classes of signals and systems.
- Analyze signals in the frequency domain using Fourier series and Fourier transforms, including their properties and applications.
- Determine the output of linear systems using convolution and understand system characteristics like bandwidth and distortion.
- Apply Laplace transforms and correlation methods for system analysis, energy/power spectral estimation, and signal detection in noise.
- Understand sampling concepts and apply Z-transform techniques for analyzing and reconstructing discrete-time signals and systems.

Module – I: Signal Analysis **8L**
Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Classification of Signals, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function. Basic operations on signals.

Module – II: Fourier series, Fourier Transforms **9L**
Fourier series: Representation of Fourier series, Continuous time periodic signals, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Properties of Fourier Series.

Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal and standard signals, Fourier Spectrum, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Introduction to Hilbert Transform.

Module – III: Signal Transmission through Linear Systems 9L

Classification of systems: Linear Time Invariant (LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Impulse response, Response of a Linear System, Concept of convolution, Graphical representation of Convolution, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time.

Module – IV: Laplace Transforms, Correlation 10L

Laplace Transforms: Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of standard signals.

Correlation: Auto Correlation and Cross Correlation Functions, Relation between Convolution and Correlation, Properties of Correlation Functions, Energy Density Spectrum, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Parseval's Theorem.

Module – V: Sampling theorem, Z–Transforms 8L

Sampling theorem: Graphical and analytical proof of Sampling Theorem for Base band/Band Limited Signals, Types of Sampling: Impulse Sampling, Natural and Flattop Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing,

Z–Transforms: Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

TEXT BOOKS:

1. Signals, Systems & Communications -B.P. Lathi, BS Publications.
2. Signals and Systems-A. Anand Kumar, PHI, 2nd edition, 2010.

REFERENCES:

1. Signals and Systems – Allan. V. Oppenheim, Allan. S. Willsky with S. Hamid. Nawab, 2nd Ed. Pearson
2. Signals and Systems–Simon Haykin, Barry Van Veen, 2nd Ed., Wiley.
3. Signals and Systems – A. Rama Krishna Rao, 2008, TMH.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

25030403: PROBABILITY THEORY AND STOCHASTIC PROCESSES

Year B.Tech. ECE I – Sem. **L T P C**

3 0 0 3

Course Overview:
This course provides a rigorous foundation in probability theory, random variables, and random processes with applications in communications and signal processing. It covers statistical properties, temporal and spectral characteristics of random process and noise modeling. Students will gain analytical skills to model, analyze and interpret stochastic systems in Engineering.

Pre-requisite: Knowledge on probability and integration

Course Objectives:
The students will try to learn
- Fundamental concepts of probability and random variable models used in Engineering
- Operations, transformations and properties of a single random variable, variances, and transformations of random variables
- Joint distribution, independence, and operations on multiple random variables
- Classification, ergodicity, and correlation properties of random process
- Spectral properties of random process and noise models in communication systems

Course Outcomes:
After successful completion of the course, students shall be able to
- Apply probability theorems and standard distributions to solve problems
- Compute expected values, variances, and transformations of random variable
- Analyze joint. Marginal and conditional distributions of multiple random variables
- Evaluate temporal characteristics and correlation function of random process
- Apply power spectral density and noise components in system analysis

Module- I: Probability **9L**
Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events. Random Variables-Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, and their properties.

Module – II: Operations on single Random Variable **9L**
Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Characteristic Function, Moment Generating Function, Monotonic and Non-monotonic Transformations of Continuous and Discrete Random Variable.

Module – III: Multiple random variables and Operations on Multiple random variables **9L**
Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of two Random Variables, Central Limit Theorem (Proof not expected).
Expected Value of a Function of Random Variables- Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables.

Module – IV: Random processes – Temporal characteristics 9L

The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationary and Statistical Independence. First-Order Stationary Processes, Second Order and Wide- Sense Stationary, (N-Order) and Strict-Sense Stationary, Time Averages and Ergodicity, Mean- Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross- Correlation Function and Its Properties, Random Signal Response of Linear Systems: System Response – Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

Module – V: Random processes – Spectral characteristics 9L

The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function, Power Density Spectrum of System Response, Cross-Power Density Spectrums of Input and Output.

Noise sources: Resistive / Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Narrow Band noise, Quadrature representation of narrow band noise & its properties.

TEXT BOOKS:

1. Peyton Z. Peebles - Probability, Random Variables & Random Signal Principles - TMH, 4th Edition
2. Murray R Spiegel, John Schiller, R Alu Srinivasan. – Probability and Statistics – Schaum's Outlines, 2nd Edition, TMH

REFERENCES:

1. P Ramesh Babu - Probability Theory and Random Processes – McGraw Hill Education
2. Athanasios Papoulis and S. Unnikrishna Pillai - Probability, Random Variables and Stochastic Processes – McGraw Hill Education, 4th Edition
3. K. N. Hari Bhat, K. Anitha Sheela and Jayant Ganguly - Probability Theory and Stochastic Processes for Engineers - Pearson, 1st Edition, 2011

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2530404: DIGITAL LOGIC DESIGN

II Year B.Tech. ECE I – Sem.

L	T	P	C
2	0	0	2

Couse Overview:

This course provides a comprehensive foundation in digital logic design, beginning with Boolean algebra and simplification methods. It explores the systematic analysis and design of combinational and sequential circuits, along with memory elements. The course also introduces programmable logic devices, equipping students with the skills to design and implement complex digital systems.

Course Objectives:

The students will try to learn

- Fundamentals of number systems, Boolean algebra, and logic simplification.
- The ability to design and implement combinational logic circuits.
- Strong foundation in sequential logic through the study of latches and flip-flops.
- Skills in designing synchronous sequential circuits for digital applications.
- Programmable logic devices for modern digital system design.

Course Outcomes:

After successful completion of the course, students shall be able to

- Apply Boolean algebra and minimization techniques to simplify Boolean functions
- Design combinational circuits using logic gates
- Analyze latches and flip-flops to design sequential logic circuits
- Construct synchronous sequential circuits combining flip-flops and logic gates
- Utilize programmable logic devices in digital system design

Module – I: Number Systems, Boolean Algebra and Logic Gates 10**L**

Number Systems: Binary, Octal, Decimal, Hexadecimal, Fixed-point and Floating-point Number Representations, Complements of Numbers: 1's and 2's Complement, Error Detection and Correction Codes: Parity Check, Hamming Code.

Boolean Algebra and Logic Gates: Axiomatic definitions, basic theorems and properties, Boolean Functions: Canonical and standard forms, Digital Logic Gates Overview.

Module – II: Gate-Level Minimization Techniques **8L**

Karnaugh maps: 2, 3, and 4 variables, Sum-of-products (SOP) and product-of-sums (POS) simplification, don't care conditions, Implementation using NAND and NOR gates.

Module – III: Combinational Logic Circuits **7L**

Analysis and design procedures, Binary adder-subtractor and BCD adder, magnitude comparator, decoders, encoders, multiplexers and demultiplexers.

Module – IV: Sequential Logic Circuits **7L**

Gated latches, Flip-flops: Clocked S-R, D, T, JK, Master-Slave JK, Design of synchronous and asynchronous counters, Shift registers: types and applications.

Module – V: Synchronous Sequential Logic, Programmable Logic Devices **6L**

Moore and Mealy state machines, State diagrams, state tables, and state reduction, Case studies: sequence detector, traffic light controller, vending machine.

Programmable Logic Devices: Memory devices - RAM, ROM, Programmable Logic Arrays (PLA), Programmable Array Logic (PAL).

TEXT BOOKS:

1. M. Morris Mano, Michael D. Ciletti, Digital Design with an Introduction to the Verilog HDL, 6th Edition, Pearson Education/PHI, 2017.
2. Switching and Finite Automata Theory- Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge.

REFERENCES:

1. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, Digital Systems: Principles and Applications, 10th Edition, Pearson Education.
2. Charles H. Roth Jr., Larry L. Kinney, Fundamentals of Logic Design, 6th Edition, Cengage Learning.
3. Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3rd Ed,John Wiley & Sons Inc.

25X0504 : DATA STRUCTURES

L	T	P	C
3	0	0	3

Prerequisites: A course on “Programming for Problem Solving

Course Objectives

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
- Introduces sorting and pattern matching algorithms.

Course Outcomes

1. Make use of linear data structures lists, stacks, and queues in algorithmic problem formulation.
2. Implement binary trees and balanced trees to support efficient database indexing operations.
3. Interpret heap structures and searching methods in memory allocation techniques.
4. Develop programs using graph representations and traversal algorithms for network routing applications.
5. Utilize hashing methods and file organization techniques to construct solutions for information retrieval systems.

UNIT – I

Introduction to Data Structures: Basic Terminology, Classification of Data Structures, Operation on Data Structures, abstract data types, selecting a Data Structure, Linear list — Introduction, singly linked list, Circular Linked Lists, Doubly Linked List, Stacks- Operations, Stack algorithm, Stack ADT, Stack applications, Queues- operations, Queue Algorithm, Queue ADT, Queue Applications.

UNIT - II

Trees: Introduction, Types of Trees, creating a Binary Tree from a General Tree, traversing a Binary Tree, Binary Search Trees (BST), BST Operations- Searching, Insertion and Deletion, BST ADT, BST Applications, Threaded Binary Trees, AVL Trees, Red –Black Trees, Splay Trees

UNIT – III

Multi way Search Trees: Introduction, B Trees, B Trees ADT, 2-3 Trees, 2-3- Tree, B* Tree, B+ Trees Heaps: Binary Heaps, Binomial heaps, Fibonacci heaps, Comparison of Various Heaps, Applications Searching: Introduction, Interpolation Search, Jump search

UNIT - IV

Graphs: Introduction, Directed Graphs, Bi connected Components, Representation of Graphs, Graph Traversal Algorithms, Graph ADT, Applications of Graphs

Sorting: Radix Sort, Heap sort, Shell Sort, Tree Sort,

UNIT – V

Hashing and Collision: Introduction, Hash Tables, Hash Functions, Different Hash Functions: Division Method, Multiplication Method, Mid-square Method, Folding Method; collisions:

Collision Resolution by Open Addressing, Collision Resolution by Chaining
Files and their Organization: Introduction, Data hierarchy, File Attributes, Text and Binary Files, Basic File Operations, File Organization, Indexing

TEXTBOOKS:

1. Data Structures: A Pseudocode Approach with C, 2 nd Edition, R. F. Gilberg and B.A.Forouzan, Cengage Learning
2. Data Structure using C– Reema Thareja, 3rd Edition, Oxford University Press.

REFERENCE:

1. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2530405: CONTROL SYSTEM ENGINEERING

II Year B.Tech. ECE I – Sem.

L	T	P	C
2	0	0	2

Course Overview:
This course provides the foundation of control system analysis and design in both classical and modern approaches. It emphasizes mathematical modeling, time and frequency domain techniques, stability analysis, and controller design. Students gain skills to analyze, model, and design control systems for practical engineering applications.

Pre-requisite: Linear Algebra and Calculus, Ordinary Differential Equations and Multivariable Calculus Laplace Transforms, Numerical Methods and Complex variables.

Course Objectives:
The students will try to learn

- Fundamentals of control systems, classifications, and mathematical modeling
- System responses in both time and frequency domains and assess stability
- Root locus, Nyquist, and Bode techniques for system analysis and design
- Compensators and controllers for performance improvement
- State-space analysis for modern control theory.

Course Outcomes:
After successful completion of the course, students shall be able to

- Describe open- and closed-loop systems, and develop mathematical models using block diagrams and signal flow graphs
- Analyze time response of second-order systems using time-domain specifications, and assess stability using Routh-Hurwitz criterion and root locus techniques
- Analyze frequency response plots including Bode, Polar, and Nyquist plots, and investigate System stability
- Design compensators and controllers to meet specific performance criteria in control systems.
- Apply the state-variable approach and analyze controllability and observability.

Module- I Control System Fundamentals **6L**
Classification of control systems, Open and Closed loop systems. Mathematical modeling of mechanical systems. Effects of Feedback, Block diagram reduction techniques and Signal flow graphs.

Module II – Time Response Analysis & Root Locus **10L**
Transfer function and Impulse response, types of input. Transient response of first order and second order system for step input. Time domain specifications. Static error coefficients, Routh-Hurwitz criterion for stability. Root locus techniques: Analysis of typical systems using root locus techniques.

Module III – Frequency Response Analysis **8L**
Frequency domain specifications, Polar plot and bode plots, Gain margin and Phase Margin, Nyquist criterion for stability.

Module IV – Compensators and Controllers **7L**
Introduction to compensators, Lag compensator, Lead compensator, Lag-Lead compensator, Introduction to controllers, P, I, D, PI, PD, PID controllers.

Module V – State Space Representation **7L**

Concept of state and state variables. State models of linear time invariant systems, Transfer function from state model, State transition matrix, Solution of state equations. Controllability and observability.

TEXT BOOKS:

1. I.J. Nagrath and M. Gopal, Control System Engineering, 5ed., New Age Publishers, 2009.
2. Benjamin C. Kuo, Automatic Control Systems, 7ed., PHI, 2010.

REFERENCE BOOKS:

1. K. Ogata, Modern Control Engineering, 2ed, Prentice Hall, 2010.
2. M. Gopal, Control Systems: Principles and Design, Tata McGraw-Hill, 1997.
3. Norman S. Nise, Control Systems Engineering, 5ed., John Wiley & Sons, 2007.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2530EXL3: INNOVATION AND ENTREPRENEURSHIP

II Year B.Tech. ECE I – Sem.

L	T	P	C
2	0	0	2

Couse Overview:
This course introduces the fundamental concepts of innovation and entrepreneurship, highlighting their role in fostering economic development and creating start-ups. Students will learn to identify problems and opportunities, generate and validate ideas, develop prototypes, and plan business models. Emphasis is placed on financial planning, go-to-market strategies, and the role of intellectual property rights (IPR) in entrepreneurship.

Course Objectives:
The students will try to learn

- Basic concepts of innovation, entrepreneurship, and their importance
- Problem-opportunity identification, market segmentation, and idea generation techniques
- Prototype development and understand the concept of a minimum viable product
- initial business and financial planning along with go-to-market strategies
- Knowledge on establishing start-ups, venture pitching, and intellectual property rights (IPR)

Course Outcomes:
After successful completion of the course, students shall be able to

- Understand entrepreneurship, the entrepreneurial process, and its significance in economic development
- Assess industry problems and generate solutions using design thinking principles
- Evaluate market competition, estimate market size, and develop prototypes
- Analyze business and financial planning models and go-to-market strategies
- Build a start-up, register intellectual property, and identify funding opportunities

Module – I: Fundamentals of Innovation and Entrepreneurship 10L
Innovation: Introduction, need, features, types, innovations in manufacturing and service sectors, fostering a culture of innovation, planning for innovation. Entrepreneurship: Introduction, types, attributes, mindset of entrepreneurial and intrapreneurial leadership, role of entrepreneurs in economic development, women entrepreneurship, importance of on-campus startups, building entrepreneurial mindset and networks while on campus.Core Teaching Tool: Simulation, Game, Industry Case Studies, Venture Activity.

Module – II: Problem and Customer Identification 10L
Identification of gaps and problems, industry perspective, real-world problems, market and customer segmentation, validation of customer-problem fit, iterating problem-customer fit, competition and industry trends mapping, Porter's Five Force Model.
Idea generation techniques: Brainstorming, Brain writing, Round robin, SCAMPER; Design thinking principles. Core Teaching Tool: Class activities, games, Gen AI, 'Get out of the Building', Venture Activity.

Module – III: Opportunity Assessment and Prototype Development 8L
Global competitors, industry trends, market sizing (TAM, SAM, SOM), assessing scope and potential. Understanding prototyping and MVP, developing, testing, and validating prototypes. Core Teaching Tool: Venture Activity, no-code innovation tools, class activity.

Module – IV: Business & Financial Models **9L**

Business Model introduction and types, Lean Canvas (9-block model), business planning (sales, people, financial), financial planning (costs, templates, unit economics, economies of scale), financial performance analysis. Go-to-Market (GTM) approach: channel selection, digital presence, customer acquisition strategy. Core Teaching Tool: Founder Case Studies, class discussions, venture activities.

Module – V: Startups and IPR **8L**

Startup requirements, founding teams, mentors, pitch preparation, registration process, funding opportunities, institutional support, startup lifecycle, documentation, legal aspects, venture pitching, National Innovation Startup Policy (NISP).

IPR: Patents, designs, patentability, procedure for grants, Indian and international scenarios, patent rights scope, copyright, trademark, geographical indications, licensing, and technology transfer. Core Teaching Tool: Expert talks, case studies, class activities, venture activities.

TEXT BOOKS:

1. John R. Bessant, Joe Tidd, Innovation and Entrepreneurship, 4E, Wiley, Latest Edition.
2. Ajay Batra, The Startup Launch Book: A Practical Guide for Launching Customer-Centric Ventures, Wiley, 2020.

REFERENCES:

1. Poornima M. Charantimath, Entrepreneurship Development and Small Business Enterprises, 3E, Pearson, 2018.
2. D.F. Kuratko and T.V. Rao, Entrepreneurship: A South-Asian Perspective, Cengage Learning, 2013.
3. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha, Entrepreneurship, McGrawHill, 11th Edition, 2020.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2530472: MODELLING AND SIMULATION LABORATORY

II Year B.Tech. ECE I – Sem.

L	T	P	C
0	0	2	1

Couse Overview:

This comprehensive set of experiments offers hands-on exposure to signal processing, systems analysis, probability theory, stochastic processes, and control systems. Students will generate and manipulate standard and nonstandard signals, analyze system behaviors through transforms and correlation techniques, and explore real-world applications such as noise reduction, waveform synthesis, and PID control. Additionally, practical simulations using Simulink and Python equip students with critical skills in modeling, analysis, and system design.

Course Objectives:

The students will try to learn

- Generation and manipulation of standard and nonstandard continuous/discrete-time signals
- Analytical skills for understanding system properties, convolution and transform techniques.
- The Fourier, Laplace, and Z-Transform methods for spectral analysis, waveform synthesis, and pole-zero analysis in time and frequency domains.
- Concepts of stochastic processes and probability theory, including random variable generation.
- Modeling and simulation of control systems using Simulink, including solving differential equations, analyzing RLC circuits, and implementing PID controllers.

Course Outcomes:

After successful completion of the course, students shall be able to

- Generate various standard and nonstandard signals, analyze their properties, and perform signal operations and synthesis in both time and frequency domains
- Capable of evaluating system responses using convolution, testing system characteristics like linearity and time-invariance, and analyzing LTI systems through impulse and sinusoidal inputs.
- Perform spectral analysis using Fourier, Laplace, and Z-transforms, and interpret magnitude-phase spectra and pole-zero plots in s- and z-domains.
- Demonstrate the ability to simulate random processes, analyze statistical properties of Gaussian noise, and apply correlation techniques for noise removal and signal extraction.
- Proficient in modeling and simulating dynamic systems in Simulink, including RLC circuit behavior and PID control, as well as assessing controllability and observability of systems.

Note: • All the experiments are to be simulated using MATLAB or equivalent software • Minimum of 12 experiments are to be completed / simulated.

List of Experiments:

1. Write the code / script for generating various standard viz: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc and Nonstandard Signals and Sequences generated from these standard signals /sequences using Waveform synthesis. Also for perform different operations viz: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power on them.

2. Write the code / script for finding the Even and Odd parts of Signal / Sequence and Real and Imaginary parts of Signal.
3. Write the code / script for finding the output of a System for a given input and Impulse Response and finding Auto Correlation and Cross Correlation of Signals / sequences
4. Write the code / script for Verifying whether a given Continuous/Discrete System is Linear, Time Invariant, Stable and Physically Realizable
5. Write the code / script for obtaining Sinusoidal response and Impulse response of a given Continuous / Discrete LTI System.
   a) Plot the Real and Imaginary part and
   b) Magnitude and Phase Plot of the response
6. Write the code / script for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Fourier Transform by using the properties where ever required.
7. Write the code / script for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Laplace Transform by using the properties where ever required. Also plot pole-zero diagram in S-plane
8. Write the code/ script for finding and plotting the Magnitude and Phase Spectrum of any given Sequence by finding its Z-Transform by using the properties wherever required. Also plot pole – zero diagram in Z-plane
9. Design a Simulink or equivalent model for
   a) Solving Differential Equations
   b) Finding the response of any RLC Circuit with different initial Conditions for AC and DC inputs and plot the corresponding responses
10. Gibbs Phenomenon and waveform synthesis

Probability Theory and Stochastic Processes (Minimum 3 Experiments)

11. Write the code / script for generating various Random Variables with different CDFs/ PDFs
12. Write the code / script for generating Gaussian noise and for finding its mean, Skewness, Kurtosis, PDF and PSD.
13. Write the code / script for Verifying Sampling theorem for different sampling rates, Sampling types and Duty Cycles and for plotting the sampled and reconstructed Signals.
14. Write the code / script for Removal of noise from the signal using Cross correlation.
15. Write the code / script for Extraction of Periodic Signal masked by noise using Auto
16. Correlation

Control Systems (Minimum 2 Experiments)

17. Build and Simulate a DC Motor using Simulink
18. Implementation of a PID Controller from equations using Simulink
19. Controllability and Observability

Note: For the experiments with code/scripts written in MATLAB or equivalent (1-8, 11-15), the student can design a user interface or app using MATLAB App Designer or equivalent.

<u>Application on Real Time signals</u>

1. Application of Autocorrelation: GPS Synchronization Satellite communication toolbox is required for this experiment.
   Generate the GPS signal.
   Visualize the GPS signal. Plot of autocorrelation of C/A code and visualize the spectrum of GPS signals. For exact steps, go through the following page:

https://www.mathworks.com/help/satcom/ug/gps-waveform-generation.html

2. Sampling of Speech Signals

Record and play speech in MATLAB. For steps, go through the following page:
https://in.mathworks.com/help/matlab/import_export/record-and-play-audio.html
Change the sampling rate of the recorded speech signal and play back to see the effect of aliasing. For steps, go through the following page:
https://in.mathworks.com/help/signal/ug/changing-signal-sample-rate.html

25X0574 : DATA STRUCTURES LAB

L	T	P	C
0	0	2	1

Prerequisites: 1. A Course on "Programming for problem solving".

Course Objectives:

1. It introduces searching and sorting algorithms
2. It provides an understanding of data structures such as stacks and queues.

Course Outcomes:

1. Implement linear data structures (lists, stacks, and queues) in real-time data processing problems**.**
2. Develop tree and balanced tree operations to handle database indexing tasks**.**
3. Construct heap structures and apply searching algorithms to design memory management solutions**.**
4. Use graph representations and traversal techniques to build network path-finding applications**.**
5. Illustrate hashing and file organization methods in information storage and retrieval**.**

List of Experiments

1. Write a program that uses functions to perform the following operations on singly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a program that implement stack (its operations) using
   i) Arrays ii) ADT
5. Write a program that implement Queue (its operations) using
   i) Arrays ii) ADT
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
   i) Radix Sort, ii) Heap sort, iii) Shell Sort, iv) Tree Sort
7. Write a program to implement the tree traversal methods (Recursive and Non-Recursive).
8. Write a program to implement
   i) Binary Search tree ii) B Trees iii) B+ Trees iv) AVL trees v) Red - Black trees
9. Write a program to implement the graph traversal methods.
10. Write a program to implement the following Hash Functions: i) Division Method, ii) Multiplication Method, iii) Mid-square Method, iv) Folding Method

TEXT BOOKS:

1. Fundamentals of Data Structures , 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

REFERENCE BOOK:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2530473: DIGITAL LOGIC DESIGN LABORATORY

II Year B.Tech. ECE I – Sem.

L	T	P	C
0	0	2	1

Couse Overview:
This laboratory course offers practical experience in designing, analyzing, and simulating digital circuits. Students start with basic hardware implementation using logic gate ICs, covering Boolean simplification, arithmetic circuits, code converters, and other combinational modules. The course then progresses to Verilog HDL-based design, introducing dataflow, behavioral, and structural modeling with simulation tools. Emphasis is placed on strengthening core logic concepts while developing skills for modern digital system design.

Course Objectives:
The students will try to learn
- Practical skills in analyzing and simplifying Boolean expressions.
- Hands-on experience in designing combinational and sequential logic circuits.
- Digital system modeling using Verilog HDL.
- Simulating and verifying designs with EDA tools.
- Construction of modular digital systems such as counters, FSMs, and shift registers.

Course Outcomes:
After successful completion of the course, students shall be able to
- Analyze and simplify Boolean expressions and implement them using logic gates and ICs.
- Design and realize combinational and sequential logic circuits using logic gate hardware.
- Model digital systems in Verilog HDL using dataflow, behavioral, and structural styles.
- Simulate and verify digital designs using industry-standard EDA tools and testbenches.
- Build modular and hierarchical designs such as counters, FSMs, and shift registers.

List of Experiments:

A. Realization in Hardware Laboratory (Using Logic ICs)
These are fundamental hands-on experiments conducted using logic ICs such as AND, OR, NOT, NAND, NOR, XOR gates, flip-flops, multiplexers, and decoders.
1. Realize and minimize Boolean functions using basic gates and universal gates (NAND/NOR) in SOP/POS form.
2. Design and implement Half Adder, Full Adder using logic gates.
3. Design and implement Half Subtractor, and Full Subtractor using logic gates.
4. Construct and analyze basic logic gates (AND, OR, NOT, XOR, XNOR) using only NAND and NOR gates.
5. Design and implement code converters such as Binary to Gray, Gray to Binary, using gates.
6. Design and implement simple combinational circuits: 2-to-1 multiplexer, 1-bit comparator

B. Verilog HDL-Based Digital Design Experiments (Simulation-Based)

These experiments are implemented using Verilog HDL with different modeling styles (dataflow, behavioral, structural) and simulated using tools like Vivado/ModelSim/Xilinx ISE/cadence/ any equivalent.
1. Design and simulate a 2-bit comparator using dataflow modeling; extend it to 4-bit using structural

modeling.
2. Implement a 2:1 multiplexer using dataflow modeling and design an 8:1 multiplexer using structural modeling.
3. Design a 2-to-4 decoder using dataflow modeling and realize a 3-to-8 decoder using structural modeling.
4. Implement a given Boolean function using a decoder-based approach in behavioural modeling.
5. Design and simulate a universal n-bit shift register (left, right, hold, parallel load) using behavioural modeling.
6. Design a synchronous MOD-n counter using behavioural modeling with D or JK flip-flops.
7. Design and simulate an asynchronous (ripple) counter for a custom sequence using structural modeling.
8. Implement a sequence detector for a given binary pattern using FSM (Moore/Mealy) in behavioural modeling.

Open Ended Experiments

1. Implementation of binary multiplier
2. Design and simulation of Registers
3. Implementation of binary counter and simulate using simulation tool

NOTE: Minimum 5 experiments from each PART to be conducted.

25X0576 : APPLIED PYTHON PROGRAMMING LAB

L	T	P	C
0	**0**	**2**	**1**

Course Outcomes: Upon completing this course, the students will be able to

1. Develop structured and modular Python programs in efficient problem-solving techniques.
2. Implement programs using Python's built-in data structures as lists, tuples, dictionaries, sets for data storage and manipulation tasks.
3. Illustrate the use of Python libraries and modules through experiments in scientific and business applications.
4. Develop programs incorporating file handling, exception handling, and object-oriented features in robust software solutions.
5. Construct Python-based applications for automation, data processing, and real-world problem-solving.

LIST OF EXPERIMENTS:

Cycle - 1

1. Downloading and Installing Python and Modules
   a) Python 3 on Linux
   Follow the instructions given in the URL
   https://docs.python- guide.org/starting/install3/linux/
   b) Python 3 on Windows
   Follow the instructions given in the URL
   https://docs.python.org/3/using/windows.html (Please remember that Windows installation of Python is harder!)
   c) pip3 on Windows and Linux
   Install the Python package installer by following the instructions given in the URL https://www.activestate.com/resources/quick-reads/how-to-install-and-use-pip3/
   d) Installing numpy and scipy
   You can install any python3 package using the command pip3 install <packagename>
   e) Installing jupyter lab
   Install from pip using the command pip install jupyter lab
2. Introduction to Python3
   a) Printing your biodata on the screen
   b) Printing all the primes less than a given number
   c) Finding all the factors of a number and show whether it is a *perfect* number, i.e., the sum of all its factors (excluding the number itself) is equal to the number itself
3. Defining and Using Functions
   a) Write a function to read data from a file and display it on the screen
   b) Define a boolean function *is palindrome*(<input>)
   c) Write a function *collatz(x)* which does the following: if *x* is odd, *x = 3x + 1*; if *x* is even, then *x = x/2*. Return the number of steps it takes for *x* = 1
   d) Write a function $N(m, s) = exp(-(x-m)^2/(2s^2))/sqrt(2\pi)s$ that computes

the Normal distribution

4. The package numpy
   a) Creating a matrix of given order *m x n* containing *random numbers* in the range 1 to 99999
   b) Write a program that adds, subtracts and multiplies two matrices. Provide an interface such that, based on the prompt, the function (addition, subtraction, multiplication) should be performed
   c) Write a program to solve a system of *n* linear equations in *n* variables using matrix inverse
5. The package scipy and pyplot
   a) Finding if two sets of data have the same *mean* value
   b) Plotting data read from a file
   c) Fitting a function through a set a data points using *polyfit* function
   d) Plotting a histogram of a given data set
6. The strings package
   a) Read text from a file and print the number of lines, words and characters
   b) Read text from a file and return a list of all *n* letter words beginning with a vowel
   c) Finding a secret message hidden in a paragraph of text
   d) Plot a histogram of words according to their length from text read from a file

Cycle -2

7. Installing OS on Raspberry Pi
   a) Installation using PiImager
   b) Installation using image file
      - Downloading an Image
      - Writing the image to an SD card
        - using Linux
        - using Windows
      - Booting up

   Follow the instructions given in the URL https://www.raspberrypi.com/documentation/computers/getting-started.html
8. Accessing GPIO pins using Python
   a) Installing GPIO Zero library.
      First, update your repositories list:
      sudo apt update
      Then install the package for Python 3:
      sudo apt install python3-gpiozero
   b) Blinking an LED connected to one of the GPIO pin
   c) Adjusting the brightness of an LED
   d) Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wavelength.
9. Collecting Sensor Data
   a) DHT Sensor interface

- Connect the terminals of DHT GPIO pins of Raspberry Pi.
- Import the DHT library using *import Adafruit_DHT*
- Read sensor data and display it on screen.

ENVIRONMENTAL SCIENCE

(COMMON TO CIVIL.EEE, MECH, ECE, CSE AND IT)

B.Tech. I Year syllabus.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**0**

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations
- Understanding the importance of natural resources
- Understanding the different standards of environmental pollution

Course Outcomes: Based on this course, the Engineering graduate will

- Understand the technologies on the basis of ecological principles
- Apply the environmental regulations which in turn helps in sustainable development.
- Understand the various classifications of ecosystems and natural resources.
- Apply environmental regulations to different acts.
- Evaluate the values of social, ethical and aesthetic.

UNIT-I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, Field visits.

Learning Outcomes:

- Understand the importance of ecosystem.
- Explain the various classifications.
- Apply to different cycles.
- Analyse the importance field visit.
- Evaluate the flow of energy.

UNIT-II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams:benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

Learning Outcomes:

- Understand the importance of natural resources.
- Explain the various classifications of natural resources.
- Apply to different renewable resources.
- Analyse the usage of resources.

- Evaluate the value of renewable and non renewable energy sources.

UNIT-III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

Learning Outcomes:

- Understand the importance of Biodiversity.
- Explain the types of Biodiversity.
- Apply to different Biotic Resources.
- Analyse the importance Biodiversity And Biotic Resources.
- Evaluate the values of social, ethical and aesthetic.

UNIT-IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types ofpollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:**Wastewater Treatment methods: Primary, secondary and Tertiary.Overview of air pollution control technologies, Concepts of bioremediation. **GlobalEnvironmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

Learning Outcomes:

- Understand the importance of Pollution and control technologies.
- Explain the classifications of pollutions.
- Apply to environment.
- Analyse the importance waste management.
- Evaluate the value of Ozone depletion and Ozone depleting substances.

UNIT-V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects.Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building.

Learning Outcomes:

- Understand the importance of Environmental Policy, Legislation.

- Explain the various acts.
- Apply to different Environmental Management Plan.
- Analyse the importance of environmental education.
- Evaluate the value of green building.

TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Studies by Anubha Kaushik, 4^{th} Edition, New age international publishers.

II-II

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2540003: NUMERICAL METHODS AND COMPLEX VARIABLES

II Year B.Tech. I Sem (ECE, EEE)

L	T	P	C
3	0	0	3

Course Overview

Numerical methods are techniques used to approximate mathematical processes that cannot be solved analytically or are intractable, like integrals, differential equations and nonlinear equations. Complex analysis provides easy methods for computing rigid integrals. Numerical methods are paramount in modern product engineering and scientific research. Complex analysis is applicable in two-dimensional fluid flow, Laplace transforms.

Pre-requisites: Mathematics courses of first year of study.

Course Objectives: The student will try to learn

- Various numerical methods to find roots of polynomial and transcendental equations and to estimate the value for the given data using interpolation.
- Evaluation of derivatives and integrals using numerical techniques and solving ordinary differential equations of first order using numerical techniques.
- The Fourier series Expansion and Bessel's functions.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem and Expansion of complex functions using Taylor's and Laurent's series.

Course outcomes: After learning the contents of this paper the student must be able to

CO1: Find the root of a given Algebraic and transcendental equations and estimate the value for the given data using interpolation.

CO2: Apply the concept of numerical integration and differentiation to the real-world problems and find the solutions for a given first order ODE's.

CO3: Understand the various Properties of curves through Fourier series expansions.

CO4: Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems

CO5: Apply the Cauchy's residue theorem for various integrals and write the Taylor's and Laurent's series expansions for complex function.

UNIT-I: Numerical Methods-I **10L**

Solution of polynomial and transcendental equations: Bisection method, Iteration Method, Newton-Raphson method and Regula-Falsi method. Methods for solving linear systems of equations: Gauss Jacobi method and Gauss Seidel Iteration Method. Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae, Lagrange's method of interpolation.

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UNIT-II: Numerical Methods-II **8L**

Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8th rules.
Ordinary differential equations: Taylor's series, Picard's method, Euler and modified Euler's methods, Runge-Kutta method of fourth order for first order ODE

UNIT-III: Fourier series and Bessel's functions **10L**

Fourier series - Dirichlet's Conditions - Half-range Fourier series.
Bessel function- properties of Bessel function, Recurrence relations, Generating function and Orthogonality of Bessel function (without proof) Trigonometric expansions involving Bessel function.

UNIT-IV: Complex Differentiation **10L**

Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne Thomson methods, analytic functions, harmonic functions, finding harmonic conjugate, Conformal mappings, Mobius transformations.

UNIT-V: Complex Integration **10L**

Line integrals, Cauchy's theorem, Cauchy's Integral formula, zeros of analytic functions, singularities, Taylor's series, Laurent's series, Residues, Cauchy Residue theorem and their properties (all theorems without proof).

TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI, 4th Edition, 2005.

REFERENCEBOOKS:

1. M. K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical Methods for Scientific and Engineering Computations, New Age International Publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. J. W. Brown and R.V. Churchill, Complex Variables and Applications, 7th Edition, MC-Graw Hill, 2004.

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(AUTONOMOUS)

2540406: ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES

II Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course provides a foundation in electromagnetic field theory, covering electrostatics, magnetostatics, and Maxwell's equations. Students will explore wave propagation in different media, analyze transmission line characteristics, and apply Smith charts for practical problem solving. Emphasis is placed on understanding field behavior, boundary conditions, and propagation parameters. The course bridges theoretical principles with engineering applications in communication systems.

Pre-requisites: Knowledge on Mathematics.

Course Objectives:
The students will try to learn

- Fundamental laws, concepts, and proofs of electrostatic and magneto static fields and apply them to physics and engineering problems
- Differences between static and time-varying fields and interpret the role of Maxwell's equations in electromagnetic theory
- Boundary conditions and their applications in solving practical communication engineering problems
- Characteristics and propagation parameters of Uniform Plane Waves (UPW) in dielectric and dissipative media
- Wave propagation in transmission lines and solve transmission line problems using analytical methods and the Smith Chart

Course Outcomes:
After successful completion of the course, students shall be able to

- Acquire knowledge of basic laws and concepts of electrostatics and magnetostatics, and apply them to solve related engineering problems
- Differentiate between static and time-varying electromagnetic fields, and interpret the role of Maxwell's equations across different boundaries
- Classify conductors, dielectrics, and other media, and analyze electromagnetic wave propagation in these materials
- Evaluate propagation characteristics such as impedance, attenuation, and phase velocity in dielectric and dissipative media
- Apply analytical methods and Smith charts to model, analyze, and solve transmission line problems

Module – I: Electrostatics **7L**
Review of Coordinate Systems & Vector Calculus, Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and its applications, Electric Potential, Relation between E and V, Maxwell's Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitors–Parallel Plate, Coaxial, Spherical.

Module – II: Magnetostatics **6L**
Biot-Savart's Law, Ampere's Circuit Law and its applications, Magnetic Flux Density, Maxwell's equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields,

Ampere's Force Law.

Module – III: Maxwell's Equations (Time Varying Fields) 7L

Faraday's Law, Transformer and Motional EMF, Inconsistency in Ampere's Law and Displacement Current Density, Maxwell's Equations in Differential and Integral form. Boundary Conditions (Dielectric – Dielectric, Conductor– Dielectric, Conductor–Free Space interfaces).

Module – IV: EM Wave Characteristics 7L

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves–Definitions, Relation between E&H, Wave Propagation in Lossless and Conducting Media, Wave Propagation in Good Conductors and Good Dielectrics, Skin Depth, Surface Impedance, Poynting Theorem. Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection.

Module – V: Transmission Lines 6L

Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless Lines, Types of Distortions, condition for Distortion less transmission lines, Minimum Attenuation, Loading – Types of Loading, Input Impedance, SC and OC Lines, Reflection Coefficient, VSWR, Impedance Transformations - λ/4, λ/2, λ/8 Lines, Smith Chart and Applications.

TEXT BOOKS:

1. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck,8thEd., McGrawHill,2014
2. Principles of Electromagnetics –Matthew N.O. Sadiku and S.V. Kulkarni, 6thEd., Oxford University Press, Asian Edition, 2015.

REFERENCES:

1. Electromagnetic Waves and Radiating Systems–E.C. Jordan and K.G. Balmain,2ndEd., PHI,2000.
2. Engineering Electromagnetics – NathanIda, 2ndEd., Springer (India) Pvt. Ltd., New Delhi,2005.
3. Electromagnetic Field Theory Fundamentals –Bhag Singh Guru and Husey in R. Hiziroglu, Cambridge University Press, 2nd Ed., 2006.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2540407: ANALOG AND DIGITAL COMMUNICATIONS

II Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Course Overview:
This course introduces the fundamental concepts and techniques of Analog and Digital Communication systems. It covers amplitude and angle modulation, transmitters and receivers, detection and estimation of signals, digital modulation schemes, and information theory with coding techniques. The course emphasizes both theoretical analysis and practical applications, preparing students to design, analyze, and optimize modern communication systems.

Pre-requisites: Knowledge on Signals and Fourier Transforms.

Course Objectives:
The students will try to learn

- About principles of analog communication including AM, FM, and PM, along with their generation and detection techniques.
- Design and operation of transmitters and receivers, and evaluate their performance under noise conditions
- Detection and estimation of signals in noise, including matched filter and correlation receiver concepts
- Digital modulation techniques such as PCM, DM, BPSK, QPSK, QAM, and M-ary modulation methods
- Information theory and coding to measure channel capacity, optimize bandwidth efficiency, and minimize errors

Course Outcomes:
After successful completion of the course, students shall be able to

- Design and analyze various Analog and digital Modulation and Demodulation techniques
- Understand the effect of noise present in continuous wave Modulation techniques
- Understand the concept of Super heterodyne Receiver and Pulse Modulation Techniques
- Analyze and design the various coding techniques and Base band Transmission
- Analyze linear block codes and cyclic codes for error detection and correction in communication channels

Module – I: Amplitude Modulation and Angle Modulation **9L**
Amplitude Modulation Need for modulation, Amplitude Modulation: Time and frequency domain description, Generation – Square Law modulator, Detection - Envelope detector, DSB-SC Modulation: Generation – Balanced Modulator, Detection- Synchronous detector, SSB Modulation: Time and frequency domain description, Generation – Phase discrimination Method and Demodulation - coherent detection, Introduction to Vestigial side band modulation.
Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis, Carson's Rule, Generation of FM Waves- Armstrong Method, Detection of FM Waves - Phase locked loop, Comparison of FM and AM.

Module – II: Transmitters & Receivers **6L**
Classification of Transmitters, AM Transmitters, FM Transmitters, AM Receiver - Super heterodyne receiver, FM Receivers, Comparison of AM and FM Receiver. Noise analysis in AM, DSB, SSB and FM Modulation System, Pre- emphasis, and de-emphasis Pulse Modulation: Types of Pulse modulation-PAM, PWM and PPM, Comparison of FDM and TDM.

Module – III: Detection and Estimation **9L**

Model of Digital Communication Systems, Detection of Known Signals in Noise, Probability of error, Optimum Receivers Using Coherent Detection: Matched filter Receiver and its Properties, Correlation receiver, Requirements of a line encoding format, various line encoding formats- Unipolar, Polar, Bipolar, Inter symbol interference, Nyquist's criterion, Correlation coding: Duobinary signaling, Eye pattern.

Module – IV: Digital Modulation Techniques **9L**

PCM Generation and Reconstruction, Quantization Noise, Uniform Quantization, DPCM, DM and Adaptive DM, Noise in PCM and DM. Digital Modulation formats- binary modulation techniques: BASK, BPSK, BFSK, and DPSK, M-ary modulation techniques: QPSK and QAM, Comparison of modulation techniques: power spectra, bandwidth and efficiency, constellation diagrams.

Module – V: Information Theory and Coding Techniques **7L**

Information theory: Entropy, Information rate, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law; Trade-off between bandwidth and SNR. Source coding - Huffman coding, Shannon Fano coding, Channel coding - Linear block codes and cyclic codes.

TEXT BOOKS:

1. Electronics Communication Systems-Fundamentals through Advanced-Wayne Tomasi, 5th Edition, PHI, 2009.
2. Digital and Analog Communication System – K. Sam Shanmugam, Wiley, 2019.

REFERENCES:

1. Electronic Communications – Dennis Roddy and John Coolean, 4th Edition, PEA, 2004.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH, 2004.
3. Communication System - Simon Haykin and Michael Moher, Wiley, 5th edition, 2022.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2540408: ELECTRONIC CIRCUIT ANALYSIS

II Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course provides an in-depth study of analog electronic circuits, focusing on multistage amplifiers, feedback systems, oscillators, power amplifiers, and waveform generators. Students will analyze, design, and evaluate transistor-based circuits for signal amplification and waveform generation. Practical applications, frequency response, distortion control, and stability techniques are emphasized throughout.

Pre-requisites: Basic knowledge of electronic devices and circuits.

Course Objectives:
The students will try to learn

- Design and analysis of multistage transistor amplifiers and their frequency response
- Various feedback amplifier topologies and their impact on amplifier performance
- Design sinusoidal and non-sinusoidal oscillators using both LC and RC feedback principles
- Different classes of power amplifiers in terms of efficiency, distortion, and configuration
- Design and implement multivibrators and time base generators using transistor circuits

Course Outcomes:
After successful completion of the course, students shall be able to

- Analyze and classify multistage amplifier configurations and determine the impact of coupling
  schemes on amplifier performance and frequency response
- Apply the hybrid-π transistor model to evaluate high-frequency behavior of common-emitter amplifiers and calculate gain-bandwidth product
- Examine feedback amplifier types and assess the influence of negative feedback on gain stability, bandwidth, and distortion
- Design and analyze LC, RC, and crystal oscillators based on the Barkhausen criterion to generate sinusoidal waveforms
- Design power amplifiers and multivibrator circuits, and evaluate their performance in terms of efficiency, distortion, and waveform generation

Module – I: Multistage Amplifiers: 9L
Classification of Amplifiers, Distortion in Amplifiers, Coupling schemes: RC, Transformer, Direct coupling, Frequency response of multistage amplifiers, Transistor configuration choice in cascade amplifiers, Cascade and Cascode amplifiers, Darlington pair amplifier. High-Frequency Transistor Model: Hybrid-π model, Hybrid-π parameters: Conductances and capacitances, CE short-circuit current gain, Gain with resistive load and gain-bandwidth product.

Module – II: Feedback Amplifiers: 7L
Concept and need for feedback in amplifiers, Types and classification of feedback amplifiers, Characteristics of negative feedback: Gain stability, bandwidth, noise, distortion, Voltage series, Voltage shunt, Current series, Current shunt configurations.

Module – III: Oscillators: 7L
Principle of positive feedback, Barkhausen Criterion for oscillations, LC Oscillators: Generalized analysis, Hartley, Colpitts, RC Oscillators: RC phase shift, Wien bridge, Crystal oscillator: Working and advantages

Module – IV: Power Amplifiers: 7L

Classification: Class A, B, AB, C, Series-fed Class A amplifier, Transformer coupled Class A amplifier, Class B amplifier: Push-pull, Complementary symmetry, Efficienc calculations and Crossover distortion.

Module – V: Multivibrators, Time Base Generators 6L

Analysis and design of Bistable, Monostable and Astable multivibrators and Schmitt Trigger using transistors.

Time Base Generators**:** General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators, Linearity improvement techniques

TEXT BOOKS:

1. Millman, Jacob, and Christos C. Halkias. Electronic Devices and Circuits. McGraw-Hill Education, 2008.
2. Bell, David A. Electronic Devices and Circuits. Oxford University Press, 2008.

REFERENCES:

1. Boylestad, Robert L., and Louis Nashelsky. Electronic Devices and Circuit Theory. 11th ed., Pearson Education, 2013.
2. Millman, Jacob, and Arvin Grabel. Microelectronics. 2nd ed., McGraw-Hill, 1987.
3. Malvino, Albert Paul. Electronic Principles. 7th ed., McGraw-Hill Education, 2007.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2540409: LINEAR AND DIGITAL IC APPLICATIONS

II Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Couse Overview: The course covers operational amplifiers, waveform generators, active filters, data converters, and digital ICs. It introduces both theoretical principles and practical applications, including voltage regulation, logic circuits, memory devices, and programmable IC systems. Students gain skills in designing, testing, and applying both analog and digital circuits in real-world scenarios.

Pre-requisites: Switching theory and logic design.

Course Objectives:
The students will try to learn

- Fundamental characteristics, configurations, and applications of operational amplifiers and voltage regulators.
- Working principles of IC 555 timers, IC 565 phase-locked loops, and their use in waveform generation and signal processing.
- Architecture, techniques, and performance parameters of digital-to-analog and analog-to-digital converters.
- Design and application of combinational logic integrated circuits using TTL and CMOS families.
- Concepts of sequential logic circuits and semiconductor memories, including ROM and RAM architectures.

Course Outcomes:
After successful completion of the course, students shall be able to

- A thorough understanding of operational amplifiers with linear integrated circuits
- Attain the knowledge of functional diagrams and design applications of IC555 and IC565
- Acquire the knowledge and design the Data converters
- Understanding of the different families of digital integrated circuits and their characteristics
- Combinational and Sequential logic ICs for practical engineering applications

Module – I: Operational Amplifiers **7L**
Ideal and Practical Op-Amp Characteristics, Features of 741 Op- Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

Module – II: Op-Amp, IC-555 & IC565 Applications **6L**
Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, principle, and Applications.

Module – III: Data Converters **7L**
Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2Rladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

Module – IV: Combinational Logic ICs **7L**

Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

Module – V: Sequential Logic IC's and Memories **6L**

Familiarity with commonly available 74XX & CMOS40XX Series ICs– All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers. Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

TEXT BOOKS

1. Op-Amps & Linear ICs– Ramakanth A. Gayakwad, PHI, 2003.
2. Digital Fundamentals –Floydand Jain, Pearson Education,8th Ed., 2005.

REFERENCE BOOKS

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.
2. Digital Design Principles and Practices–John. F. Wakerly, Pearson 3rd Ed., 2009.
3. Linear Integrated Circuits and Applications – Salivahana, TMH, 2008.

MA406PC: COMPUTATIONAL MATHEMATICS LAB
(Using Python/MATLAB software)

B.Tech. II Year II Sem. **L T P C**
0 0 2 1

Pre-requisites: Matrices, Iterative methods and ordinary differential equations

Course Objectives: To learn

1. Solve problems of Eigen values and Eigen Vectors using Python/MATLAB.
2. Solution of Algebraic and Transcendental Equations using Python/MATLAB
3. Solve problems of Linear system of equations
4. Solve problems of First-Order ODEs Higher order linear differential equations with constant coefficients

Course outcomes: After learning the contents of this paper, the student must be able to

1. Develop the code to find the Eigen values and Eigen Vectors using Python/MATLAB.
2. Develop the code find solution of Algebraic and Transcendental Equations and Linear system of equations using Python/MATLAB
3. Write the code to solve problems of First-Order ODEs Higher order linear differential equations with constant coefficients

*** Visualize all solutions Graphically through programmes**

UNIT - I: Eigen values and Eigenvectors: **6P**

Programs:

- Finding real and complex Eigen values.
- Finding Eigen vectors.

UNIT-II: Solution of Algebraic and Transcendental Equations **6P**

Bisection method, Newton Raphson Method

Programs:

- Root of a given equation using Bisection method.
- Root of a given equation Newton Raphson Method.

UNIT-III: Linear system of equations: **6P**

Jacobi's iteration method and Gauss-Seidal iteration method

Programs:

- Solution of given system of linear equations using Jacobi's method
- Solution of given system of linear equations using Gauss-Seidal method

UNIT-IV: First-Order ODEs
8P

Exact and non-exact equations, Applications: exponential growth/decay, Newton's law of cooling.

Programs:

- Solving exact and non-exact equations
- Solving exponential growth/decay and Newton's law of cooling problems

UNIT-V: Higher order linear differential equations with constant coefficients **6P**

Programs:

- Solving homogeneous ODEs
- Solving non-homogeneous ODEs

TEXT BOOKS:

1. MATLAB and its Applications in Engineering, Rajkumar Basal, Ashok Kumar Geo, Manoj Kumar Sharma, Pearson publication.
2. Kenneth A. Lambert, The fundamentals of Python: First Programs, 2011, Cengage Learnings.
3. Think Python First Edition, by Allen B. Downey, Orielly publishing.
4. Introduction to Python Programming, William Mitchell, Povel Solin, Martin Novak et al., NCLab Public Computing, 2012.
5. Introduction to Python Programming, ©Jacob Fredslund, 2007.

REFERENCE BOOKS:

1. An Introduction to Python, John C. Lusth, The University of Alabama, 2011.
2. Introduction to Python, ©Dave Kuhlman, 2008.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2540474: ANALOG AND DIGITAL COMMUNICATIONS LAB

II Year B.Tech. ECE II – Sem.

L	T	P	C
0	0	2	1

Course Overview:
This laboratory course provides hands-on experience in implementing and analyzing analog and digital communication systems. Students will design, generate, and demodulate various modulation techniques such as AM, FM, DSB-SC, SSB-SC, PCM, DM, FSK, PSK, DPSK, and QPSK. The course also includes experiments on sampling theorem, FDM, and pulse modulation techniques. Emphasis is placed on bridging the gap between theory and practice by verifying modulation indices, spectra, and performance under different signal conditions.

Course Objectives:
The students will try to learn

- Practical generation and demodulation of analog modulation schemes such as AM, FM, DSB-SC, and SSB-SC
- Implementation of multiplexing and sampling techniques, and verification of the sampling theorem
- Design of pulse modulation circuits such as PAM, PWM, and PPM using standard ICs
- Generation and demodulation of digital modulation techniques including PCM, DM, FSK, BPSK, DPSK, and QPSK
- Analyze and compare theoretical and practical performance of modulation systems using waveform observation and spectrum analysis

Course Outcomes:
After successful completion of the course, students shall be able to

- Design various Analog modulation and demodulation Techniques and observe the time and frequency domain characteristics of these modulated Signals
- Implement various Pulse modulation and demodulation Techniques and observe the time and frequency domain characteristics of these modulated Signals
- Understand the concept of aliasing and different types of Sampling with various Sampling rates and duty Cycles by implementing practically
- Design and implement various Digital modulation and demodulation Techniques and observe the waveforms of these modulated Signals practically
- Compare theoretical and experimental results through spectrum analysis and waveform observation, drawing conclusions on efficiency and performance

List of Experiments:

1. Generate Amplitude modulated Signal and perform demodulation for different modulation indices. Plot the corresponding waveforms and their spectrum. Compare the modulation index theoretically and practically. Plot the effect of modulating Signal frequency and Amplitude on the modulation index.
2. Generate Frequency modulated Signal and perform demodulation for different modulation indices. Plot the corresponding waveforms and their spectrum. Compare the modulation index theoretically and practically. Plot the effect of modulating Signal frequency and Amplitude on the modulation index.
3. Generate modulated and demodulate DSB-SC Signal for different modulation indices and plot the corresponding waveforms and their spectrum.

4. Generate and demodulate SSB-SC modulated Signal (Phase Shift Method) for different modulation indices and plot the corresponding waveforms and their spectrum.
5. Demonstrate the Frequency Division Multiplexing & De multiplexing practically by transmitting at least 3 different signals simultaneously.
6. Verify Sampling theorem for different sampling rates, Sampling types and Duty Cycles and Plot the sampled and reconstructed Signals. Write the conclusions, based on practical observations.
7. Generate a Pulse Amplitude Modulated & Demodulated signals and plot the corresponding waveforms from the practical observations
8. Generate a Pulse Width Modulated & Demodulated signals and plot the corresponding waveforms from the practical observations
9. Generate PCM Modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations
10. Differential pulse code modulation: Generation and detection. Plot the corresponding waveforms from practical observations.
11. Generate Delta Modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
12. Generate FSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
13. Generate practically Binary PSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
14. Design & Implementation of pre-emphasis & de-emphasis filters. Plot the corresponding waveforms from practical observations.

Open Ended Experiments

1. Spectrum Analyzer
2. Super heterodyne receiver

NOTE: Minimum of 12 experiments to be conducted.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2540475: ELECTRONIC CIRCUIT ANALYSIS LABORATORY

II Year B.Tech. ECE I – Sem.

L	T	P	C
0	0	2	1

Couse Overview:
The Electronic Circuit Analysis Laboratory is designed to provide hands-on experience in designing, building, and analyzing analog electronic circuits. It focuses on the practical implementation of amplifiers, oscillators, power amplifiers, multivibrators, and waveform generators using discrete components and simulation tools. The lab strengthens understanding of frequency response, gain, feedback, waveform shaping, and time base generation.

Pre-requisites: Basic knowledge of electronic devices and circuits

Course Objectives:
The students will try to learn

- Design and test basic analog circuits like amplifiers, oscillators, and multivibrators using hardware components
- Analyze waveforms using instruments like CRO/DSO to understand real-time circuit behavior
- Simulation of analog circuits using tools like LTspice or Multisim and compare results with practical experiments
- Calculation of key performance parameters such as gain, efficiency, frequency response, and distortion
- Working of time base generators and multivibrators through both hardware and software experiments

Course Outcomes:
After successful completion of the course, students shall be able to

- Design and analyze multistage and power amplifiers and evaluate their frequency response and efficiency
- Implement and examine feedback and oscillator circuits and validate theoretical conditions for sustained oscillations
- Develop and interpret waveform generation circuits such as multivibrators and time base generators
- Perform simulations to validate analog circuit performance using industry-standard software tools
- Correlate practical results with theoretical predictions and identify deviations due to real-world constraints

List of Experiments:

A. Hardware Experiments (7):
Perform practical design, implementation, and waveform analysis of amplifiers, oscillators, power stages, and multivibrators to validate theoretical concepts and observe real-world circuit behavior.

1. Design and analyze a two-stage RC coupled amplifier to demonstrate gain enhancement and study coupling capacitance effects.
2. Design Hartley and Colpitts oscillators for a specified frequency and observe their output waveforms.
3. Design an RC phase shift oscillator and derive the practical gain condition for oscillations at a given frequency.

4. Design a transformer-coupled class A power amplifier, observe input/output waveforms, and calculate efficiency.
5. Design a class B power amplifier, analyze input/output waveforms, and evaluate harmonic distortion.
6. Design a bistable multivibrator, analyze commutating capacitor effects, and record transistor waveforms.
7. Design an astable multivibrator and observe transistor base and collector waveforms.

B. Software Simulations (7):

Use circuit simulation software to design, analyze, and verify the performance of feedback amplifiers, waveform generators, and power amplifier circuits through virtual experimentation and frequency response evaluation.

1. Simulate four feedback amplifier topologies and compare their frequency responses with and without feedback.
2. Simulate a monostable multivibrator and analyze its input/output waveforms.
3. Simulate a Schmitt trigger for gain values greater than and less than one and analyze response behavior.
4. Simulate a bootstrap time base generator using BJT and observe the output sweep waveform.
5. Simulate a Miller sweep circuit using BJT and observe the time base output waveform.
6. Simulate a complementary symmetry push-pull amplifier and verify elimination of crossover distortion.
7. Simulate a single tuned amplifier and determine the quality factor (Q) of its tuned circuit.

Open ended Experiments

1. Two Stage RC Coupled Amplifier
2. Cascade Amplifier circuit
3. RC Phase Shift Oscillator using Transistor

Software Requirements:

Simulation Tools: LTspice / Multisim / PSpice / Proteus / NI Multisim Live or equivalent

Operating System: Windows or Linux (Ubuntu preferred)

Hardware Requirements:

1. Dual Power Supply (±15V, 0–30V)
2. Function Generator (up to 1 MHz)
3. CRO / DSO (Dual Channel, 20 MHz or more)
4. Digital Multimeters
5. Breadboards and Connecting Wires
6. BJTs: BC107, BC547, BC557, 2N2222, etc.
7. Resistors, Capacitors (Wide range of values)
8. Transformers (for power amplifiers)
9. Inductors, Crystals (1 MHz, 4 MHz, etc.)
10. Heat sinks, transistors for power stages (e.g., TIP41, TIP42 etc.)

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2540476: LINEAR AND DIGITAL IC APPLICATIONS LAB

B.Tech. II Year II Sem. **L T P C**
0 0 2 1

Course Overview:
This laboratory course provides hands-on experience in designing, implementing, and testing analog and digital circuits using operational amplifiers, timers, data converters, and logic ICs. Students learn to verify theoretical concepts through practical experiments and analyze circuit performance. The lab builds essential skills for applying IC-based circuit design in real-world applications of electronics and communication engineering.

Course Objectives:
The students will try to learn
- Fundamental principles, characteristics, and applications of operational amplifiers, timers, and regulators.
- Design and implementation of waveform generators, active filters, and signal processing circuits using ICs.
- Architecture, working principles, and performance parameters of data converters such as DACs and ADCs.
- Realization of combinational logic circuits using TTL and CMOS families for various digital applications.
- Design and analysis of sequential logic circuits and memory devices for practical digital system development.

Course Outcomes:
After successful completion of the course, students shall be able to
- Assemble and test op-amp based amplifiers (inverting/non-inverting), adders/subtractors, integrators/differentiators and measure their gains, bandwidth and linearity.
- Construct and verify waveform generators, mono-stable/astable timers, PLL blocks, and characterize their frequency, duty cycle and stability.
- Implement DACs and ADCs (R-2R, counter, SAR, dual slope, parallel comparator) and compute resolution, conversion time and efficiency.
- Design and experimentally verify combinational and sequential logic circuits (multiplexers, encoders, decoders, adders, counters, shift registers) and memory read/write operations.
- Analyze discrepancies between theoretical and measured results, compute error percentages, and propose methods to improve circuit performance (e.g., offset compensation, filtering, proper decoupling).

List of Experiments:
1. Design an Inverting and Non-inverting Amplifier using Op Amp and calculate gain.
2. Design Adder and Subtractor using Op Amp and verify addition and subtraction process.
3. Design a Comparator using Op-Amp and draw the comparison results of A=B, A<B, A>B.
4. Design a Integrator and Differentiator Circuits using IC741 and derive the required condition practically.
5. Design a Active LPF, HPF cutoff frequency of 2 KHz and find the roll off of it.
6. Design a Circuit using IC741 to generate sine / square / triangular wave with period of 1 KHz and draw the output waveform.
7. Construct Mono-stable Multivibrator using IC555 and draw its output waveform.

8. Construct Astable Multivibrator using IC 555 and draw its output waveform and also find its duty cycle.
9. Design a Schmitt Trigger Circuit and find its LTP and UTP.
10. Design Voltage Regulator using IC723, IC 7805 / 7809 / 7912 and find its load regulation factor.
11. Design a 8x1 multiplexer using digital ICs.
12. Design a 4-bit Adder / Subtractor using digital ICs and Add / Sub the following bits. (i) 1010 (ii) 0101 (iii) 1011 (iv) 0100 (v) 0010 (vi) 1001.
13. Design a Decade counter and verify its truth table and draw respective waveforms.
14. Design a Up/downcounterusingIC74163 and draw read/write waveforms.
15. Design a Universal shift register using IC74194 / 195and verify its shifting operation.
16. Design a 16x4 RAM using 74189 and draw its read /write operation.

Open Ended Experiments

1. Schmitt Trigger using Op-Amp – Noise elimination in digital circuits
2. Multiplexer (MUX) & Demultiplexer (DEMUX) Circuits – Data selection applications
3. Asynchronous & Synchronous Counters – Binary & Decade Counters

NOTE: Minimum 12 experiments to be conducted

Web and Shell Scripting

L	T	P	C
0	0	2	1

Course Outcomes : By the end of the course, students will be able to:

- **CO1**: Understand Linux system structure, OS architecture, and command-line environment.
- **CO2**: Perform Linux installation and basic administration including file, user, and permission management.
- **CO3**: Develop shell scripts to automate tasks such as backups, monitoring, and data processing.
- **CO4**: Use Linux tools for software management, networking, and service configuration.
- **CO5**: Implement backup, recovery, and basic troubleshooting techniques through practical labs.

1.Introduction to OS Concepts and Web

Lab Activity: Linux History, Opensource software basics & Licenses, Why Linux vs windows Identify system and application software on your PC. Differentiate their roles and explain basic OS functions.

Understand web architecture, clients, servers, and workflows. Explore an existing website's structure and elements using browser Dev Tools.

2.Linux Architecture & Kernel Types

Lab Activity: Compare Monolithic and Microkernel architectures using diagrams. Discuss how Linux's structure supports device-level control.

Installing Linux (Ubuntu/CentOS)

Lab Activity: Install Linux using VirtualBox or WSL. Document each installation step and troubleshoot any permission or hardware issues.

3.Linux Filesystem & Navigation

Lab Activity: Navigate key directories like /home, /etc, and /var. Create folder structures for a team project.

4.File Permissions & Ownership

Lab Activity: Set permissions on project folders so only group members can access/edit them. Verify permissions using multiple users.

User and Group Management

Lab Activity: Create users and groups for a coding team. Set up shared access using group permissions and configure hidden config files.

5.Process Management

Lab Activity: Identify and terminate frozen or unresponsive processes during compilation using commands like ps and top.

6. Shell Scripting Basics

Use Case: *System Info Script for Lab Login*

Lab Activity:

Create a shell script that automatically displays system uptime, current date/time, available disk space, and active users each time a lab user logs in. Use variables and echo statements to present the information in a readable format.

7.HTML Basics

Learn about different markup languages and their significance. Create a homepage for a static site using paragraphs, headings, lists, links, and images.

8.CSS – Layout & Design Foundations

Apply colors, spacing, and layouts using CSS. Practice Flexbox and Grid techniques by cloning a simple website layout.

9.Basic Server Concepts & Node.js

Set up a basic Node.js server to serve web content. Understand server-side fundamentals and simple routing.

10.Introduction to Databases

Learn to store and retrieve data using JSON or SQLite. Save contact form submissions from your portfolio into a database, confirmation messages , management application integrating both web and mobile interfaces.

11. Introduction to Flutter

Understand Flutter's widget structure and framework basics. Design a simple login and landing page for a mobile app.

Create a Flutter app that displays a list of events. Add RSVP functionality with confirmation messages.