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-R24)

Applicable From 2024-25 Admitted Batch

Structure Breakup

S. No	Category	Breakup of credits (Total 160 credits)
1	Humanities and Social Sciences (HSMC), including Management.	7
2	Basic Science Courses (BSC) including Mathematics, Physics and Chemistry	20
3	Engineering Science Courses (ESC), including Workshop, Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering.	23
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.	9
7	Experiential Learning/ Skill Development Courses (SDC) / Field Based Project/ Internship/ Project work (PROJ) / Seminar	23
8	Mandatory Courses (MC) / Value Added Courses (VAC)	Non-Credit
TOTAL		**160**

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	2410001	Matrices and Calculus	BS	3	1	0	4	40	60	100
2	2410008	Applied Physics	BS	3	0	0	3	40	60	100
3	2410501	Problem Solvig using C and C++	ES	3	0	0	3	40	60	100
4	2410010	English for Skill Enhancement	HSMC	3	0	0	3	40	60	100
		Laboratory Courses								
1	2410372	Engineering Workshop	ES	0	1	4	3	40	60	100
2	2410071	Applied Physics Laboratory	BS	0	0	2	1	40	60	100
3	2410571	Problem Solvig using C and C++ Laboratory	ES	0	0	2	1	40	60	100
4	2410073	English Language and Communications Skills Laboratory	HSMC	0	0	2	1	40	60	100
		Skill Development Course								
1	2410596	Web Application development	SDC	0	0	2	1	40	60	100
		Mandatory Course								
1		Foreign Language*	MC	0	0	0	0	-	-	-
		Induction Program	-	-	-	-	-	-	-	-
Total Credits				**12**	**2**	**12**	**20**	**360**	**540**	**900**

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

1. **24X0FL1**: French
2. **24X0FL2:** German
3. **24X0FL3:** Spanish
4. **24X0FL4:** 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	2420002	Differential Equations and Vector Calculus	BS	3	1	0	4	40	60	100
2	2420009	Engineering Chemistry	BS	3	0	0	3	40	60	100
3	2420221	Electrical Engineering	PC	3	0	0	3	40	60	100
4	2420502	Essentials of Problem Solving using Python	ES	3	0	0	3	40	60	100
		Laboratory Course								
1	2420371	Computer Aided Engineering Graphics	ES	1	0	4	3	40	60	100
2	2420072	Engineering Chemistry Laboratory	BS	0	0	2	1	40	60	100
3	2420276	Electrical Engineering Laboratory	PC	0	0	2	1	40	60	100
4	2420572	Essentials of Problem Solving using Python Laboratory	ES	0	0	2	1	40	60	100
		Skill Development Course								
1	2420027	Public Speaking Skills	SDC	0	0	2	1	40	60	100
		Mandatory Course								
1	2420026	Yoga & Inner Engineering	MC	0	0	0	0	-	-	-
Total Credits				**13**	**1**	**12**	**20**	**360**	**540**	**900**

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	2430003	Numerical Methods and Complex Variables	BS	3	1	0	4	40	60	100
2	2430421	Electronic Devices and Circuits	PC	2	0	0	2	40	60	100
3	2430422	Digital System Design	PC	2	0	0	2	40	60	100
4	2430423	Signals and Systems	PC	2	1	0	3	40	60	100
5	2430507	Data Structures	ES	3	0	0	3	40	60	100
6	243ExL1	Design and Innovation	EL	0	0	2	1	40	60	100
		Laboratory Course								
1	2430471	Electronic Devices and Circuits Laboratory	PC	0	0	2	1	40	60	100
2	2430472	Basic Simulation and Digital System Design Laboratory	PC	0	0	2	1	40	60	100
3	2430575	Data Structures Laboratory using Python	ES	0	0	2	1	40	60	100
		Skill Development Course								
1	2430455	PCB Fabrication	SDC	0	0	2	1	40	60	100
		Project								
1	2430491	Internship-1*	PS	0	0	2	1	100	-	100
		Mandatory Courses								
1		Indian Knowledge Systems**	MC	0	0	0	0	-	-	-
Total Credits				**12**	**2**	**12**	**20**	**500**	**600**	**1100**

*Students must complete internship-1 during 1-2 semester break (minimum 2 weeks)

**The students can choose any one of the following IKS Courses:

1. 24XIKS1: Indian Science, Engineering and Technology
2. 24XIKS2: Fundamentals and Applications of Vedic Mathematics
3. 24XIKS3: Indian Health, wellness, and Psychology-including Ayurveda
4. 24XIKS4: Indian Town Planning and Architecture

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	2440424	Electronic Circuits	PC	3	0	0	3	40	60	100
2	2440425	Probability Theory and Stochastic Processes	PC	3	0	0	3	40	60	100
3	2440426	Analog and Digital Communications	PC	2	1	0	3	40	60	100
4	2440226	Control Systems	PC	2	1	0	3	40	60	100
5	2440511	OOPS through JAVA	ES	3	0	0	3	40	60	100
6	244ExL2	Prototype/ Model development and Entrepreneurship	EL	0	0	2	1	40	60	100
		Laboratory Course								
1	2440473	Electronic Circuits Laboratory	PC	0	0	2	1	40	60	100
2	2440474	Analog and Digital Communications Laboratory	PC	0	0	2	1	40	60	100
3	2440592	OOPS through JAVA Laboratory	ES	0	0	2	1	40	60	100
		Skill Development Course								
1	2440574	Data visualization-Power Bi	SDC	0	0	2	1	40	60	100
		Mandatory Course								
1	2440021	Environmental Science	MC	0	0	0	0	-	-	-
Total Credits				**13**	**2**	**10**	**20**	**400**	**600**	**1000**

ExL: Experiential Learning

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	2450427	Electromagnetic Theory and Transmission Lines	PC	3	1	0	4	40	60	100
2	2450428	Microprocessors and Microcontrollers	PC	3	0	0	3	40	60	100
3	2450429	Integrated Circuits Applications	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	3	0	0	3	40	60	100
		Laboratory Course								
1	2450475	Microprocessors and Microcontrollers Laboratory	PC	0	0	2	1	40	60	100
2	2450476	Integrated Circuits Applications Laboratory	PC	0	0	2	1	40	60	100
3	2450477	Smart Sensors and Systems Lab	ES	0	0	2	1	40	60	100
		Project								
1	2450492	Field Based Project*	PS	0	0	2	1	100	-	100
		Mandatory Course								
1	2450022	Gender Sensitization	MC	0	0	0	0	-	-	-
Total Credits				**15**	**1**	**8**	**20**	**420**	**480**	**900**

***Students must complete Field Based 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	2460430	Antennas and Wave Propagation	PC	3	1	0	4	40	60	100
2	2460431	Digital Signal Processing	PC	3	1	0	4	40	60	100
3	2460432	Digital CMOS IC Design	PC	3	0	0	3	40	60	100
4		Professional Elective - II	PE	3	0	0	3	40	60	100
5		Open Elective – II	OE	3	0	0	3	40	60	100
		Laboratory Course								
1	2460478	Digital Signal Processing Laboratory	PC	0	0	2	1	40	60	100
2	2460479	Digital CMOS IC Design Laboratory	PC	0	0	2	1	40	60	100
3	2460480	Computational Electromagnetics and Antenna Laboratory	PC	0	0	2	1	40	60	100
		Mandatory Course								
1	2460025	Human Values and Professional Ethics	MC	0	0	0	0	-	-	-
Total Credits				**15**	**2**	**6**	**20**	**320**	**480**	**800**

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	2470433	Microwave and Optical Communications	PC	3	0	0	3	40	60	100
2	2470434	Analog CMOS IC Design	PC	2	0	0	2	40	60	100
3	2480010	Business Economics and Financial Analysis	HSMC	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	3	0	0	3	40	60	100
		Laboratory Course								
1	2470481	Analog CMOS IC Design Laboratory	PC	0	0	2	1	40	60	100
2	2470482	Microwave and Optical Communications Laboratory	PC	0	0	2	1	40	60	100
		Project								
1	2470493	Project Stage - I	PS	0	0	6	3	100	-	100
2	2470494	Internship-2*	PS	0	0	2	1	100	-	100
		Mandatory Course								
1	2470023	Constitution of India	MC	0	0	0	0	-	-	-
Total Credits				**17**	**0**	**12**	**23**	**520**	**480**	**1000**

*Students must complete internship-2 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								
1		Professional Elective - V	PE	3	0	0	3	40	60	100
2		Professional Elective - VI	PE	3	0	0	3	40	60	100
		Project								
1	2480495	Technical Seminar	PS	0	0	4	2	100	-	100
2	2480496	Project Stage - II	PS	0	0	18	9	40	60	100
Total Credits				**6**	**0**	**22**	**17**	**220**	**180**	**400**

List of Open Electives Applicable For 2024-25 Admitted Batch

Branch	Open Elective-I (OE – I)	Open Elective-II (OE – II)	Open Elective-III (OE – III)
Electronics and Communication Engineering	2450407: IOT and its Applications 2450408: Principles of Signals and Systems	2460409: Fundamentals of Embedded Systems 2460410: Introduction to Nano Technology	2470411: Principles of Communication Systems 2480412: Basic VLSI Design

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

I-I

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2410001: MATRICES AND CALCULUS

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

Course Overview:

Matrix algebra and calculus are essential for understanding and solving complex problems in many scientific and engineering fields. This course provides the mathematical foundation for advanced topics and applications. This course covers matrix theory, linear algebra and calculus. Linear algebra is a branch of mathematics that studies system of linear equations and the properties of matrices. The calculus part of the course typically covers differential and its applications, and integration techniques. Matrix algebra allows us to think of a matrix holistically, generalize and compute derivatives important matrix factorizations, understand how differentiation formulas must be reimagined in large scale computing. Calculus is used to model and solve real- world problems.

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.

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UNIT-I: Matrices **10 L**

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 **10 L**

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 **8 L**

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) **10 L**

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) **10 L**

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. H. K. Dassand Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi

B.Tech. I Year **MLRS-R24**

Course-code	Course Name	L	T	P	C
2410008	APPLIED PHYSICS	3	1	0	4

Course Overview

Applied Physics is the application of the Physics to solve Scientific or Engineering Problems. It is considered as bridge between Physics and Engineering.

Applied Physics under graduate program stress the basic Physics that underlies most developments in engineering and mathematical tools that are important to engineers.

Prerequisites:10 + 2 Physics

Course Objectives: The student will try to learn :

1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Study the fundamental concepts related to the dielectric, magnetic materials.
4. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
5. Study the characteristics of lasers and optical fibers.

Course Outcomes: After successful completion of the Course the students should be able to

1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator byclassification of solids.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric, magnetic materials and their applications.
4. Appreciate the features and applications of Nanomaterials.
5. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

UNIT - I: QUANTUM PHYSICS AND SOLIDS

Quantum Mechanics: Introduction to quantum physics, Blackbody radiation, Photoelectric effect, de-Broglie Hypothesis and matter waves, Davisson and Germer experiment, Heisenberg uncertainty principle, Born interpretation of the wave function, Timeindependent Schrodinger wave equation, Particle in one dimensional potential box.

Solids: Free electron theory (Drude& Lorentz, Sommerfeld), Bloch's theorem -Kronig-Penney model, Effective mass of electron, Origin of energy bands, Classification of solids.

UNIT - II: SEMICONDUCTORS AND DEVICES

Intrinsic and extrinsic semiconductors, Hall effect, Direct and Indirect band gap semiconductors, Construction, principle of operation and characteristics of P-N Junction diode, Zener diode and Bipolar junction transistor (BJT)

Opto-devices- Light emitting diode (LED), PIN diode, and Solar cell, their structure, materials, working principle and characteristics, Solar cell application- Space craft.

UNIT - III: DIELECTRIC AND MAGNETIC MATERIALS

Dielectric Materials: Introduction to dielectrics, Polarization, Permittivity, Dielectric constant, Types of polarizations (Qualitative), Internal field in Solids, Clausius-Mossotti equation, Ferroelectric, Piezoelectric and Pyroelectric materials, Applications.

Magnetic Materials: Introduction to Magnetism, Magnetization, Permeability, Susceptibility, Classification of Magnetic Materials, Hysteresis curve, Soft and Hard magnetic materials, Magnetostriction, Magneto resistance, Magnetic field sensors and bubble memory devices.

UNIT - IV: NANOTECHNOLOGY

Nanoscale, Quantum confinement, Surface to volume ratio, Bottom-up fabrication: Sol-gel, Precipitation methods, Top-down fabrication: Ball milling, Physical Vapor Deposition (PVD), Characterization techniques - XRD, SEM and TEM, Applications of nanomaterials.

UNIT - V: LASER AND FIBER OPTICS

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations, Lasing action, Population inversion, Pumping methods, Ruby laser, He-Ne laser, CO_2 laser, Applications of laser- Medical and Military.

Fiber Optics: Introduction to optical fiber, Total internal reflection, Construction of optical fiber, Acceptance angle, Numerical aperture, Classification of optical fibers, Losses in optical fiber, Optical fiber for communication system, Applications of optical fiber-Endoscopy.

TEXT BOOKS:

1. M. N. Avadhanulu, P.G. Kshirsagar& TVS Arun Murthy" A Text book of Engineering Physics", S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, McGraw Hill, 4thEdition,2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2ndEdition,2022.
5. Essentials of Nanoscience& Nanotechnology by Narasimha Reddy Katta, Typical CreativesNANO DIGEST, 1stEdition, 2021.

REFERENCE BOOKS:

1. Quantum Physics, H.C. Verma, TBS Publication, 2ndEdition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons,11thEdition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, PragathiPrakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1stEdition, 2007.

24X0501:Problem Solving Using C and C++

I B.Tech. I – Sem.

L	T	P	C
3	0	0	3

Course Overview:

The Course Provides good foundation in procedural oriented and object-oriented programming concepts. It provides overview on basic building blocks of procedural oriented concepts like arrays, pointers, structures, strings**.** It comprises object-oriented concepts such as information hiding, encapsulation, inheritance and polymorphism. C programming is used in operating systems, embedded devices, OS kernels, drivers, IoT applications. C++ is widely used for creating graphics-heavy software, game engines, VR applications, and web browsers.

Prerequisites: Nil

Course Objectives: The students will try to learn

- Using of structured programming approach in solving problems
- How to use arrays, pointers, strings and structures in solving problems
- Defining of structures in C and classes in C++
- Importance of inheritance in object-oriented programming
- Handling of exceptions in programs

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

- Develop programs using Control statements and Repetitive statements
- Modularize the code with functions so that they can be reused
- Learn about Object oriented concepts
- Design programs by using Inheritance concepts
- Implement polymorphism and Exception Handling

Module-I: Introduction to programming [10]

Introduction Procedure Oriented and Object-Oriented Programming. Algorithm, Flowchart, Pseudo code. Creating and Running of C Program. Structure of C program – C character set, C Tokens: Constants, Variables, Keywords, Identifiers, C data types, C operators. Standard I/O in C (scanf, printf), Conditional Control statements (if and Switch) Statements. Repetitive statements: While, Do While and For Loops - Use of Break and Continue Statements.

Module-II : Functions, Arrays, Strings and Pointers [12]

Arrays: Introduction, Declaration, Creating and Accessing of One-Dimensional Arrays, Two- Dimensional Arrays.
Strings and Pointers: Introduction to strings, string handling functions, Arrays of strings, Introduction to pointers, Dynamic Memory allocation.
Functions: Defining Functions – User Defined Functions, Storage Classes, passing parameters: Call By Value, Call By Reference, Recursion, Command-line Arguments.

Module-III : Structures and Classes **[8]**

Structures: Defining structures, initializing structures, unions, Array of structures
OOPS Concepts: Class, Object, Abstraction, Encapsulation, Inheritance and Polymorphism.
C++ Classes and Data Abstraction: Class definition, Class structure, Class objects, Class scope, this pointer, Friends to a class, Static class members, Constant member functions, Constructors and Destructors, Dynamic creation and destruction of objects, Data abstraction.

Module – IV: Inheritance **[7]**

Inheritance: Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class members, Base and Derived class construction, Destructors, Virtual base class.

Module –V : Polymorphism and Exception Handling **[8]**

Virtual Functions and Polymorphism: Static and Dynamic binding, virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtual destructors.
Exception handling: Try, throw and catch.

TEXTBOOKS:

1. Forouzan B.A & Richard F. Gilberg, A Structured Programming Approach using C,3rd Edition(2013), Cengage Learning.
2. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition,Pearson
3. ANSI and Turbo C++ by Ashoke N. Kamthane, Pearson Education
4. Robert Lafore C++

REFERENCES:

5. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall ofIndia
6. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
7. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
8. E. Balagurusamy, Object Oriented Programming using C++, 2nd Edition, McGraw-Hill

B.Tech. I Year Syllabus MLRS R-24

ENGLISH FOR SKILL ENHANCEMENT

Subject Code: 24X0010

B.Tech. I Year I/II Sem.

L	T	P	C
3	0	0	3

Course Overview:

1. The English language plays a vital role in engineering education. Acquiring LSRW skills has become a prerequisite to learning about different technologies and their intricacies.
2. All these extracts are fascinating, thought-provoking, and contextual to engineering students. The authors have sincerely tried connecting every lesson with the modules of vocabulary, grammar, reading comprehension and writing tasks stipulated under each module. The textbook includes several exercises and activities involving the student's language skills practice. They are extremely encouraging and motivational and cater to a group of students with mixed abilities.
3. Each module starts with the preparatory task which can stimulate an interesting discussion among the students in the classroom. Adequate explanations and more examples are provided in vocabulary and grammar sections to enable students to work independently in and outside the classroom. The reading part suggests improving students' reading skills and provides reading comprehension exercises. The writing module aims at developing the learner's writing skills by providing conceptual discussions and exercises in different forms of written communication such as formal letters, CV/ résumé and job application letters, e-mails, reports, etc.

Prerequisites: Language Comprehension

Course Objectives: The students will try to learn:

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.

3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

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

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.

MODULE – I (No of Hours = 7)

Chapter entitled '***Toasted English***' **by R.K. Narayan** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to Form Derivatives - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing concerning Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading.

Writing: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence- Organizing Principles of Paragraphs in Documents.

MODULE – II (No of Hours = 6)

Chapter entitled **'Appro JRD' by Sudha Murthy** from ***"English: Language, Context and Culture" published*** by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing concerning Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

MODULE – III (No of Hours = 7)

The chapter entitled **'Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et al** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English. **Grammar:** Identifying Common Errors in Writing Concerning Misplaced Modifiers and Tenses.

Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice **Writing:** Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

MODULE – IV (No of Hours = 6)

Chapter entitled **'Art and Literature' by Abdul Kalam** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

MODULE – V (No of Hours = 6)

Chapter entitled **'Go, Kiss the World' by Subroto Bagchi** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Technical Vocabulary and their Usage

Grammar: Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous modules*)

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of

Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Note: ***Listening and Speaking Skills which are given under Module 6 in the AICTE Model Curriculum are covered in the syllabus of the ELCS Lab Course.***

- **Note: 1**. 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 **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.

- **Note**: **2**. Based on the recommendations of NEP2020, teachers are requested to be flexible in adopting Blended Learning in dealing with the course contents. They are advised to teach 40 per cent of each topic from the syllabus in blended mode.

TEXTBOOK:

1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS:

1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar, and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition

MARRI LAXMAN REDDY
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Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

ENGINEERING WORK SHOP

(Common to all branches)

I Year I/II Semester **L T P C**

0 1 4 3

Course Overview: After successful completion of the course, students should able to learn.

Engineering Workshops: A foundational course aimed at introducing first-year students to a variety of tools, equipment, and techniques essential for creating physical objects and mechanisms using different materials. This course provides an opportunity for students to build confidence and gain practical experience in carpentry, fitting, house wiring, tin-smithy, black smithy, welding, and principles of modern manufacturing processes.

Prerequisite: NIL

Course Objective: The student will able to

1. To gain good basic working knowledge required for the production of various engineering products.
2. To study different tools uses and their demonstration.
3. To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in 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 different working tools and equipments.

Course outcomes: At the end of the course students should able to

1. Explain the design and model different prototype in the trade of carpentry such as Cross lap joint, Dove tail joint.
2. Demonstrate the design and model various basic prototypes in the trade of fitting such as straight fit and V-fit.
3. Understand to make various basic prototypes in the trade of tin smithy such as rectangular tray and open cylinder.
4. Demonstrate the design and model various basic prototype in welding and black smithy.
5. Understand to perform various basic house wiring techniques such as connecting one lamp with one switch, connecting two lamps with one switch.

Course content:

Module -I: CARPENTRY AND 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)

Module -II: TIN SMITHY AND BLACKSMITHY

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

Module -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).

Text Book:

1. Workshop practice/B.L. Juneja/ Cengage
2. Workshop manual/K.Venugopal/ Anuradha

Reference:

1. Work shop manual /P.Kannaiah/K.L. Narayana
2. Work shop Manual /Venkat Reddy /BSP

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B.Tech. I Year **MLRS-R24**

Course-code	Course Name	L	T	P	C
24X00071	APPLIED PHYSICS LAB	0	0	3	1.5

Course Objectives: The objectives of this course for the student to

1. Capable of handling instruments related to the Hall effect and photoelectric effect Experiment understands their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap.
3. Apply the analytical techniques & graphical analysis for Stewart Gees , LCR & RC .
4. Understanding the method of least squares fitting.
5. To develop intellectual communication skills through discussion on basic principles of scientific concepts in a group.

Course Outcomes: The students will be able to:

1. Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
2. Appreciate quantum physics in semiconductor devices and optoelectronics.
3. Gain the knowledge in calculating the quality factor and time constant of LCR and RC circuits.
4. Understand the variation of magnetic field at various points.
5. Carried out data analysis.

LIST OF EXPERIMENTS:

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode.
5. Input and output characteristics of BJT (CE, CB & CC configurations).
6. V-I and L-I characteristics of light emitting diode (LED) and LASER.
7. V-I Characteristics of solar cell.
8. Determination of Energy gap of a semiconductor.
9. To determine the time constant of R-C circuit.
10. Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
11. Understanding the method of least squares – Torsional pendulum as an example.
12. Determination of magnetic field induction along the axis of a current carrying coil.

REFERENCE BOOK:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers,2017.

24X0571:Problem Solving Using C and C++ Laboratory

I B.Tech. I – Sem.	L	TP	C
	0	0 2	1

Course Overview:

The Course Provides good foundation in procedural oriented and object-oriented programming concepts. It provides overview on basic building blocks of procedural oriented concepts like arrays, pointers, structures, strings**.** It comprises object-oriented concepts such as information hiding, encapsulation, inheritance and polymorphism. C programming is used in operating systems, embedded devices, OS kernels, drivers, IoT applications. C++ is widely used for creating graphics-heavy software, game engines, VR applications, and web browsers.

Prerequisites: Nil

Course Objectives: The students will try to learn

- Using of structured programming approach in solving problems
- How to use arrays, pointers, strings and structures in solving problems
- Defining of structures in C and classes in C++
- Importance of inheritance in object-oriented programming
- Handling of exceptions in programs

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

- Develop programs using Control statements and Repetitive statements
- Modularize the code with functions so that they can be reused
- Learn about Object oriented concepts
- Design programs by using Inheritance concepts
- Implement polymorphism and Exception Handling

Week 1: Algorithm and Flowchart

1. You are designing a flowchart and algorithm for a distance and speed calculator. The flowchart should prompt the user to input the distance traveled and the time taken and calculate the speed using the formula: **Speed = Distance / Time**.

2. You are developing an algorithm and flowchart for a circle area calculator. The flowchart should prompt the user to input the radius of a circle and calculate the area using the formula: **Area = πr^2**

3. You are designing an algorithm and flowchart for a fuel efficiency calculator in a car rental app. The flowchart should prompt the user to input the distance traveled and the amount of fuel consumed and calculate the fuel efficiency in miles per gallon (MPG) using the formula MPG = Distance / Fuel Consumption.

4. You are developing an algorithm and flowchart for a discount calculator in an online shopping app. The flowchart should prompt the user to input the original price and the discount percentage and calculate the discounted price using the formula: **Discounted Price = Original Price - (Original Price * Discount Percentage /100).**

5. You are developing a flowchart and algorithm for a monthly budget tracker. The flowchart should prompt the user to input their income and expenses and calculate the total savings using the formula **Total Savings = Income - Total Expenses**.

6. You are designing a flowchart for a loan amortization calculator. The flowchart should prompt the user to input the loan amount, interest rate, and duration, and calculate the monthly payment using the formula Monthly Payment = (Loan Amount * Interest Rate * (1+ Interest Rate)^{Duration}) / ((1 + Interest Rate)$^{Duration - 1}$).

7. You are developing a flowchart and algorithm for a construction materials calculator. The Flow chart should guide the user through the process of inputting the dimensions of a room, including the length, width, and height. The goal is to calculate the surface area of the room using the provided formula:
   Surface Area = 2 * (Length * Width + Length * Height +Width * Height).

8. Develop a flowchart and an algorithm to convert a given time in hours and minutes to minutes only. Prompt the user to input the time in hours and minutes and display the converted time in minutes.

Skill Oriented Exercise

9. Farmer Thimmayya bought some mules at Rs. 50 each, sheep at Rs. 40 each, goats at Rs. 25 each, and pigs at Rs. 10 each. The average price of the animals per head worked to Rs. 30.What is the minimum number of animals of each kind did he buy?

10. **A Matter of Rupees and Paisa:** I have money pouch containing Rs.700. There are equal number of 25 paise coins, 50 paise coins and 1 rupee coins. How many of each are there.

11. Develop an algorithm and flowchart that prompts the user to input the initial velocity, acceleration, and time. Calculate and display the final velocity using the formula Final Velocity = Initial Velocity + (Acceleration * Time).

12. Develop an algorithm and flowchart that prompts the user to input the lengths of the three sides of a triangle. Calculate and display the area of the triangle using Heron's formula: Area = √(s * (s - Side1) * (s - Side2) * (s - Side3)), where s = (Side1 + Side2 + Side3) / 2.

Week 2: Algorithm and Flowchart

1. ABC Company wants to calculate the monthly salary for its employees based on various components such as basic pay, DA, HRA, and deductions for taxes and provident fund. The company follows the following rules for salary calculation:
   - The basic pay is a fixed amount each employee receives.
   - DA is calculated as 20 percentage of the basic pay.
   - HRA is calculated as 10percentage of the basic pay.
   - The gross salary is the sum of the basic pay, DA, and HRA.
   - The net salary is the gross salary minus deductions for taxes and provident fund.

   Develop an algorithm and flowchart to calculate the gross and net salary of the employee. Include the necessary steps to calculate the net salary.

2. Sarah, a dedicated student, wants to calculate her average grade for a semester. She has received marks in four different subjects and seeks assistance in creating an algorithm to determine her average grade based on these marks. Develop an algorithm and flowchart to help Sarah calculate her average grade for the semester using the marks obtained in these four subjects. Ensure that the algorithm includes the necessary steps to compute the average grade accurately.

3. John is a programmer who wants to convert a given temperature in Celsius to Fahrenheit. Help John in developing an algorithm and flowchart to perform this conversion. Design an algorithm for John to convert a given temperature in Celsius to Fahrenheit. Provide step-by-step instructions for performing the conversion.

4.**The Tall Men Next Door:** Next door to me live four brothers of different heights. Their average height is 74 inches, and the difference in height among the first three men is two inches. The difference between the third and the fourth man is six inches. Can you tell how tall each brother is?

5.**Driving Through the Country:** I decided to travel through the country leisurely and on the first day I did only 7 miles. On the last day I did 51 miles, increasing my journey by 4 miles per day. How many days did I travel and how far?

6. There is a beautiful pond in a park, filled with clear water. The park management wants to monitor the water level in the pond regularly to ensure it remains at an optimal level. They have asked you to create an algorithm to help them with this task. Develop an algorithm and flowchart to monitor the water level in the pond and notify the park management if it falls below a certain threshold. (Note: You can assume that the input for the current water level and threshold level is obtained from a monitoring device or sensor).

7. If a participant can make one submission every 45 seconds, and a contest lasts for Y minutes, create an algorithm and flowchart to find the maximum number of submissions that the participant can make during the contest? Assume the participant is allowed to make submissions until the last second of the contest.

Skill Oriented Exercise

8. Michael wants to find the largest number among a set of given numbers. Help Michael write an algorithm to determine the largest number from the given inputs. Create an algorithm and flowchart for Michael to find the largest number among a set of given inputs. Provide step-by-step instructions to identify the largest number.

9. A construction worker needs to paint the exterior walls of a rectangular building. The dimensions of the walls are L meters in length, H meters in height, and W meters in width. If the cost of painting is Rs. 20 per square meter, what will be the total cost of painting the walls? Prepare an algorithm and flowchart to calculate the total cost of painting.

10. An ice cream vendor brings 'i' litre of ice cream to a fair. Each cone requires 0.25 liters

of ice cream. If the vendor sells 80 cones, Develop an algorithm and flowchart to find the number of liters of ice cream left with the vendor.

11. Amanda is planning a party and wants to determine the total number of guests attending. Assist Amanda by writing an algorithm to calculate the total number of guests based on the number of adults and children invited. Create an algorithm and flowchart for Amanda to calculate the total number of guests attending her party, considering the number of adults and children invited. Include the necessary steps to calculate the total number of guests.

Week: 3 Data Types, Console I/O, Operators Storage Classes

1. You are working as a financial analyst at a bank. As part of your job, you need to calculate the maturity amount for fixed deposits (FD) based on the principal amount, interest rate, and duration. For that help me to write a C program that takes the principal amount, interest rate, and duration (in years) as input from the user. Calculate and display the maturity amount using the simple interest formula: Maturity Amount = Principal + (Principal * Interest Rate * Duration).

2. Jenny, a budding mathematician, was studying the concept of area and perimeter. She was given a rectangular garden with a known length and width. Jenny wondered if she could find the area without knowing the width. Can you help Jenny derive a formula to calculate the area of a rectangle using only the length and perimeter?

3. Develop a C program that computes the hypotenuse of a right-angled triangle given the lengths of its two perpendicular sides. Prompt the user to enter the lengths and display the result. (Pythagorean theorem: $Hypotenuse^2 = Side1^2 + Side2^2$)

4. Once upon a time, there was a mathematician named Alex. Alex loved solving mathematical problems and puzzles. One day, Alex came across an ancient scroll that contained a secret formula to calculate the sum of the first n natural numbers. The scroll mentioned that by using the formula, one could find the sum of any given number of natural numbers without having to manually add them up. Alex was intrigued and decided to test the formula. Can you help Alex implement a C program that uses the formula to calculate the sum of the first n natural numbers?

Instructions:

Write a C program that takes an input integer n from the user and calculates the sum of the first n natural numbers using the formula: **sum = (n * (n + 1)) / 2**

5. Once upon a time in a small town, there were two friends, Kavi and Jei, who were fascinated by the concept of slopes in mathematics. They loved exploring the hills and valleys around their town and wondered how they could calculate the slope of any given landscape. One sunny day, while hiking up a hill, Kavi and Jei discovered an ancient map that had the secret to finding the slope of a line between two points. The map indicated that by using the coordinates of two points, they could determine the slope of the line connecting them. Excited about their discovery, Kavi and Jei decided to create a C program that could calculate the slope for any two points. They wanted to share their program with others so that everyone could explore the slopes of various landscapes. Can you help Kavi and Jei bring their idea to life by implementing a C program that calculates the slope of a line?

Instructions:

Write a C program that prompts the user to enter the coordinates of two points: (x1, y1) and (x2, y2). The program should then

Calculate, the slope of the line connecting these points using the formula: slope = (y2 - y1) / (x2 - x1)

Finally, the program should display the calculated slope to the user.

6. Ravi and Kavi are on an exciting treasure hunt adventure, following a map with hidden treasures located at different coordinates. They want to calculate the distance between two treasures to determine how far apart they are. Can you help them by writing a C program that performs this calculation?

   Instructions:

   Write a C program that prompts the user to enter the coordinates of two treasures: Treasure A and Treasure B. The coordinates should be in the form (x, y). Calculate the distance between the treasures using the distance formula:

   distance = sqrt((x2 - x1)^2 + (y2 - y1)^2)

   Finally, output a message indicating how far apart the treasures are.

7. Imagine a scenario where there is a coconut tree with multiple coconuts hanging from it. There is a person standing at a distance of "D" meters away from the tree. The coconuts are positioned at a height of "H" meters from the ground. Could you please help write a C program that calculates the angle at which the person should aim in order to hit the coconuts? (Hint: you can use the inverse tangent function (atan() in C) to determine the angle based on the ratio of the height of the coconuts to the distance from the tree.)

Skill Oriented Exercise

8. In a faraway kingdom, two treasure hunters named Alex and Bella embarked on a daring quest to find valuable treasures. While exploring a mysterious cave, they stumbled upon two treasure chests, each containing a unique gemstone. Curiosity took over, and they decided to swap the gemstones inside the chests. However, a magical enchantment prevented them from directly swapping the gemstones. To fulfill their quest and restore the treasures to their rightful chests, Alex and Bella realized they could use a third variable and arithmetic operations. Can you help them by writing a C program that takes the values of the gemstones as input, and swap their values.

9. Emily, a young architect, was working on designing a cylindrical water tank for a new building. As she was finalizing the plans, she needed to calculate the surface area of the cylinder to determine the amount of material required for its construction. However, she was unsure of the exact formula and the steps involved in the calculation. Can you help Emily by writing a C program that assists her in calculating the surface area of a cylinder?(Surface Area = $2\pi r^2 + 2\pi rh$)

10. Hemanth is an architect who wants to design a garden with a beautiful polygon-shaped fountain at its center. He needs to calculate the area of the polygon so that he can determine the appropriate size for the fountain. Help Hemanth by writing a C program that calculates the area of a regular polygon when given the number of sides and the length of each side.

Area = (numSides * sideLength * sideLength) / (4 * tan(π / numSides))

11. Prathima loves ice cream cones and wants to decorate the surface of her favorite ice cream cone with colorful stickers. To know how many stickers she needs, she wants to calculate the surface area of the cone. Help Prathima by writing a C program that calculates the surface area of a cone when given the radius of the base and the slant height, (Surface Area = π * r * (r + l))

12. **RIGHT FOOT FORWARD:** A short man takes three steps to a tall man's two steps. They both start out on the left foot. How many steps do they have to take before they are both stepping out on the right foot together?

Week: 4 Data Types, Console I/O, Operators Storage Classes

PREDICT THE OUTPUT:

1.
```
#include <stdio.h>
int main() {
    int a = 5; float b = 3.5;
    int result = a + b; printf("%d\n", result); return 0;
}
```
Output:

2.
```
#include <stdio.h>
int main() { int a = 10; int b = 20;
int result = a * b / 4 % 3; printf("%d\n", result); return 0;
}
```
Output:

3.
```
#include <stdio.h>
int main() { int a = 15; int b = 10;
int result = (a > b) && (b != 0); printf("%d\n", result);
return 0;
}
```
Output:

4.
```
#include <stdio.h>
int main() { int a = 10; int b = 5;
int result = (a > b) || (a == 10); printf("%d\n", result);
return 0;
}
```
Output:

5.
```
#include <stdio.h>
int main() {
int x = 3, y = 2;
int result = x * y - y / x % y; printf("%d\n", result);  return 0;
}
```
Output:

6.
```
#include <stdio.h>
int main() { int x = 5;
int *ptr1 = &x;
int **ptr2 = &ptr1; printf("%d\n", **ptr2); return 0;
}
```
Output:

7. #include <stdio.h> **Output:**

```
int main() { int x = 5;
int *ptr1, *ptr2; ptr1 = &x;
ptr2 = ptr1; printf("%d\n", *ptr2); return 0;
}
```

8. #include <stdio.h> **Output:**

```
int main() { int x = 51;
int *ptr = &x; printf("%d\n", *ptr); x = 15;
printf("%d\n", *ptr); return 0;
}
```

9. #include <stdio.h> **Output:**

```
int main() { float *ptr;
printf("Size of ptr: %lu bytes\n", sizeof(ptr)); return 0;
}
```

10. #include <stdio.h> **Output:**

```
int main() { double arr[5];
printf("Size of arr: %lu bytes\n", sizeof(arr)); return 0;
}
```

11. #include <stdio.h> **Output:**

```
int main() {
int x = 10; if (x > 5) {
printf("Hello\n");
}
printf("Goodbye\n"); return 0;
}
```

Skill Oriented Exercise

Find the syntax error, logical errors if any in the following code snippet:

1. #include <stdio.h> **Errors:**

```
int main() {
printf("Hello, KLU Family!\n") return 0;
}
```

2. #Include <stdio.h> **Errors:**

```
int main() {
int x = 5, y = 0; int result = x / y;
printf("The result is: %d\n", result); return 0;
}
```

3.#include <stdio.h> **Errors:**

```
int main() { int x = 5; int *ptr;
*ptr = &x; printf("%d\n", *ptr); return 0;
```

}

4.#include <stdio.h>

```
int main() { int x = -5; if (x) {
printf("x is not zero\n");
} else
{
printf("x is zero\n";)
}
return 0;
}
```

Errors:

Week 5: If else and Ternary Operator

1. Chef and Chefina are playing with dice. In one turn, both of them roll their dice at once. They consider a turn to be good if the sum of the numbers on their dice is greater than 6. Given that in a particular turn Chef and Chefina got X and Y on their respective dice, find whether the turn was good.

2. Chef has been working hard to compete in MasterChef. He is ranked *X* out of all contestants. However, only 10 contestants would be selected for the finals. Check whether Chef made it to the top 10 or not?

3. Apple considers any iPhone with a battery health of 80% or above, to be in *optimal* condition. Given that your iPhone has *X*% battery health, find whether it is in *optimal* condition.

4. In a classic chase, Tom is running after Jerry as Jerry has eaten Tom's favorite food. Jerry is running at a speed of *X* metres per second while Tom is chasing him at a speed of *Y* metres per second. Determine whether Tom will be able to catch Jerry.
   Note that initially Jerry is not at the same position as Tom.

5. Chef has started studying for the upcoming test. The textbook has *N* pages in total. Chef wants to read at most *X* pages a day for *Y* days. Find out whether it is possible for Chef to complete the whole book.

6. Chef has finally got the chance of his lifetime to drive in the *F*1 tournament. But, there is one problem. Chef did not know about the 107% rule and now he is worried whether he will be allowed to race in the main event or not.
   Given the fastest finish time as *X* seconds and Chef's finish time as *Y* seconds, determine whether Chef will be allowed to race in the main event or not.
   Note that, Chef will only be allowed to race if his finish time is within **107%** of the fastest finish time.

Skill Oriented Exercise

7. Chef wants to host a party with a total of *N* people. However, the party hall has a capacity of *X* people. Find whether Chef can host the party.

8. Chef has to attend an exam that starts in *X* minutes, but of course, watching shows takes

priority. Every episode of the show that Chef is watching, is 24 minutes long. If he starts watching a new episode now, will he finish watching it **strictly before** the exam starts?

9. Chef has to travel to another place. For this, he can avail any one of two cab services.
   - The first cab service charges *X* rupees.
   - The second cab service charges *Y* rupees.

   Chef wants to spend the **minimum** amount of money. Which cab service should Chef take?

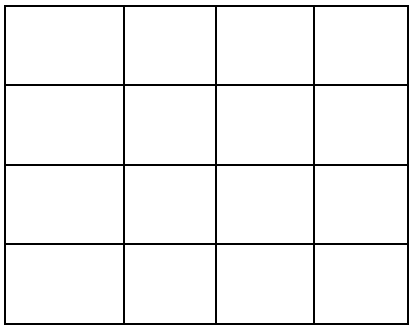
10. Chef categorizes an Instagram account as *spam*, if, the *following* count of the account is more than 10 times the count of *followers*.
    Given the *following* and *follower* count of an account as *X* and *Y* respectively, find whether it is a *spam* account.

11. Chef is watching TV. The current volume of the TV is *X*. Pressing the volume up button of the TV remote increases the volume by 11 while pressing the volume down button decreases the volume by 11. Chef wants to change the volume from *X* to *Y*. Find the minimum number of button presses required to do so.

12. Cities on a map are connected by a number of roads. The number of roads between each city is in an array and city 0 is the starting location. The number of roads from city 0 to city 1 is the first value in the array, from city 1 to city 2 in the second, and so on. How many paths are there from city 0 to the last city in the list, modulo 1234567?

13. Square within Square

Write a C program to determine the number of squares in the given illustration below



Week 6: Loops, Increment and Decrement operator

1. Sum of digits of five digit number.
   Given the five digit number, print the sum of its digits.
   Input
   10564
   Output
   16
2. Write a program that takes two integers as input, start and end. The program should use for loop to iterate from start to end (both inclusive).

3. Write a C program that takes the input for multiple test cases. For each test case, the program should receive two integers, E and K, representing the energy at the lowest trophic level and the energy reduction factor, respectively. The program should calculate and output the maximum length of the food chain for each test case.

4. Write a program in C that takes an integer, n, as input, representing the number of multiplication tables to be generated. The program should output the multiplication table for each number from 1 to n, up to a multiple of 10.

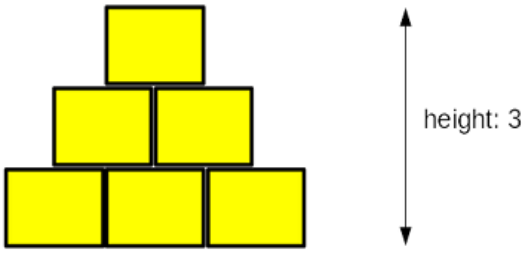
5. Alice, Bob, and Charlie have different preferences for numbers. Alice likes numbers that are even and multiples of 7, while Bob prefers numbers that are odd and multiples of 9. They have found a number, A, and the task is to determine who takes it home.
   Write a program that takes an integer, A, as input and outputs the person who takes the number home based on their preferences. If A is an even multiple of 7, Alice takes it home. If A is an odd multiple of 9, Bob takes it home. If neither Alice nor Bob likes the number, Charlie takes it home.
6. Chef owns a car that can run 15 kilometers using 1 litre of petrol. He wants to attend a programming camp at DAIICT, which is a distance of Y kilometers from his house. Chef currently has X litres of petrol in his car. The task is to determine whether Chef can attend the event at DAIICT and return to his home with the given amount of petrol. Write a program that takes two integers, X and Y, as input and outputs whether Chef can complete the round trip with the available petrol.

Skill Oriented Exercise

7. Listen to this story: a boy and his father, a computer programmer, are playing with wooden blocks. They are building a pyramid. Their pyramid is a bit weird, as it is actually a pyramid- shaped wall - it's flat. The pyramid is stacked according to one simple principle: each lower layer contains one block more than the layer above. The figure illustrates the rule used by the builders:

Note: the height is measured by the number of fully completed layers - if the builders don't have a sufficient number of blocks and cannot complete the next layer, they finish their work immediately.

Sample input: 6
Expected output: The height of the pyramid: 3 Sample input: 1000



Expected output: The height of the pyramid: 44

8. **The Special Number**
   There is a number whose double is greater than its half by 45. Can you find this number?

9. Chef is a student at a university, and the university has a requirement that students must be present for at least 75% of the working days in a semester to pass. The semester has a total of 120 working days. Chef has been taking a lot of holidays and is worried about meeting the attendance requirement. The information about the days Chef has attended or been absent is given as a sequence of N bits: B1, B2, ..., BN. If Bi = 0, it means Chef was absent on the ith day, and if Bi = 1, it means Chef was present on that day. The task is to determine if Chef can pass the attendance requirement by the end of the semester. Write a program that takes an integer N as input, followed by a sequence of N bits, and outputs whether Chef can hope to pass the attendance requirement or not.

10. There are N piles where the i^{th} pile consists of A_i stones. Chef and Chefina are playing a game taking alternate turns with Chef starting first. In his/her turn, a player can choose any non-empty pile and remove exactly 1 stone from it. The game ends when exactly 1 pile becomes empty. The player who made the last move wins. Determine the winner if both players play optimally.

11. Write the c program for following pattern

```
1 2 3 4 5
1 2 3 4
1 2 3
1 2
1
```

12. Write a program to obtain a number N and increment its value by 1 if the number is divisible by 4 otherwise decrement its value by 1.

Week 7: Arrays

1. Given a large integer represented as an integer array digits, where each digits[i] is the i-th digit of the integer, ordered from most significant to least significant in left-to-right order (without any leading zeros), implement a program to increment the large integer by one and return the resulting array of digits.

2. Chef has set a target to solve at least 10 problems every week for a duration of 4 weeks. The input consists of four integers representing the number of problems Chef solved in each week (P1, P2, P3, and P4). The task is to determine the number of weeks in which Chef met his target. The output should be a single integer indicating the count of weeks where Chef solved at least 10 problems.
3. Code Chef recently revamped its practice page to make it easier for users to identify the next problems they should solve by introducing some new features: Recent Contest Problems - contains only problems from the last 2 contests Separate Un-Attempted, Attempted, and All tabs.
   Problem Difficulty Rating - the recommended dropdown menu has various difficulty ranges so

that you can attempt the problems most suited to your experience Popular Topics and Tags. Like most users, Chef didn't know that he could add problems to a personal to-do list by clicking on the magic '+' symbol on the top-right of each problem page. But once he found out about it, he went crazy and added loads of problems to his to-do list without looking at their difficulty rating.
Chef is a beginner and should ideally try and solve only problems with difficulty rating strictly less than 1000. Given a list of difficulty ratings for problems in the Chef's to-do list, please help him identify how many of those problems Chef should remove from his to-do list, so that he is only left with problems of difficulty rating less than 1000.

4. You are given an array price where prices[i] is the price of a given stock on the ith day. You want to maximize your profit by choosing a single day to buy one stock and choosing a different day in the future to sell that stock. Return the maximum profit you can achieve from this transaction. If you cannot achieve any profit, return 0.

5. Given a non-empty array of integer's nums, every element appears twice except for one. Find that single one. You must implement a solution with a linear runtime complexity and use only constant extra space.

6. Given an array nums of size n, return the majority element. The majority element is the element that appears more than ⌊n / 2⌋ times. You may assume that the majority element always exists in the array.

7. Write a C program to calculate the factorial of small positive integers. The input consists of an integer 't' representing the number of test cases, followed by 't' lines containing a single integer 'n' (1 <= n <= 100) for each test case. The output should display the factorial of 'n' on a separate line for each input value of 'n'.

8. (Puzzle)On the Way to Market One morning.
I was on my way to the market and met a man who had 4 wives. Each of the wives had 4 bags, containing 4 dogs and each dog had 4 puppies. Taking all things into consideration how many were going to the market?

9. Vasya likes the number 239. Therefore, he considers a number pretty if its last digit 2,3 or 9. Vasya wants to watch the numbers between L and R (both inclusive), so he asked you to determine how many pretty numbers are in this range. Can you help him?

10. You are participating in a contest which has 11 problems (numbered 1 through 11). The first eight problems (i.e. problems 1,2,…,8) are scorable, while the last three problems (9,10 and 11) are non-scorable — this means that any submissions you make on any of these problems do not affect your total score.
Your total score is the sum of your best scores for all scorable problems. That is, for each scorable problem, you look at the scores of all submissions you made on that problem and take the maximum of these scores (or 0 if you didn't make any submissions on that problem); the total score is the sum of the maximum scores you took. You know the results of all submissions you made. Calculate your total score.

Skill Oriented Exercise

11. Write a C program to help Joe and Lilly multiply two matrices, A and B. The program

should take input for multiple test cases. For each test case, the program should read the dimensions and values of matrices A and B. If the multiplication is possible, the program should print the output matrix values. If the multiplication is not possible, the program should print "IMPOSSIBLE".

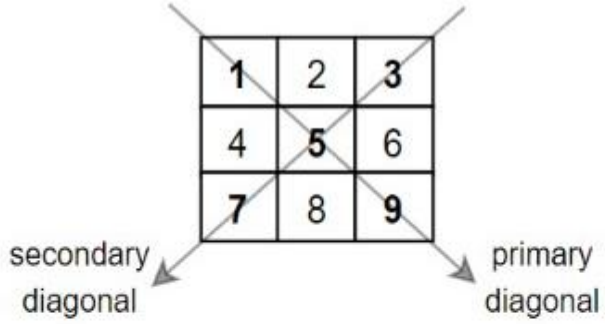
12. You are given an m x n integer matrix with the following two properties:
Each row is sorted in non-decreasing order. The first integer of each row is greater than the last integer of the previous row. Given an integer target, return true if target is in matrix or false otherwise.

1	3	5	7
10	11	16	20
23	30	34	60

Input: matrix = [[1,3,5,7],[10,11,16,20],[23,30,34,60]], target = 3
Output: true

13. You are given an m x n integer grid accounts where accounts[i][j] is the amount of money the ith customer has in the jth bank. Return the wealth that the richest customer has A customer's wealth is the amount of money they have in all their bank accounts. The richest customer is the customer that has the maximum wealth.

14. Given a square matrix mat, return the sum of the matrix diagonals. Only include the sum of all the elements on the primary diagonal and all the elements on the secondary diagonal that are not part of the primary diagonal.




```
Input: mat = [[1,2,3],
              [4,5,6],
              [7,8,9]]
Output: 25
Explanation: Diagonals sum: 1 + 5 + 9 + 3 + 7 = 25
Notice that element mat[1][1] = 5 is counted only once.
```

15. Write a program to perform matrix multiplication. If Multiplication cannot be done for a given matrices then print "NOT POSSIBLE"

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \quad B = \begin{pmatrix} 5 & 6 & 7 \\ 8 & 9 & 10 \end{pmatrix}$$

Multiplication of two matrixes:

$$A * B = \begin{pmatrix} 1*5 + 2*8 & 1*6 + 2*9 & 1*7 + 2*10 \\ 3*5 + 4*8 & 3*6 + 4*9 & 3*7 + 4*10 \end{pmatrix}$$

$$A * B = \begin{pmatrix} 21 & 24 & 27 \\ 47 & 54 & 61 \end{pmatrix}$$

Input:

1) Read the row & column size of matrix 1
2) Read the matrix 1
3) Read the row & column size of matrix 2
4) Read the matrix 2

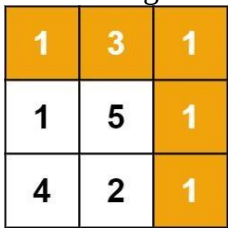
Output:

Resultant Matrix.

Sample Input	Sample Output
2 2	7 10
1 2	15 22
3 4	
2 2	
1 2	
3 4	

16. Given two sorted arrays nums1 and nums2 of size m and n respectively, return the median of the two sorted arrays.
Input: nums1 = [1,3], nums2 = [2] Output: 2.00000
Explanation: merged array = [1,2,3] and median is 2.

17. Given a m x n grid filled with non-negative numbers, find a path from top left to bottom right, which minimizes the sum of all numbers along its path.
Note: You can only move either down or right at any point in time.



Input: grid = [[1,3,1],[1,5,1],[4,2,1]]
Output: 7
Explanation: Because the path 1 → 3 → 1 → 1 → 1 minimizes the sum.

18. Given an array nums of size n, return the majority element. The majority

element is the element that appears more than ⌊n / 2⌋ times. You may assume that the majority element always exists in the array.
Input: nums = [3,2,3] Output: 3

19. Given a sorted array of distinct integers and a target value, return the index if the target is found. If not, return the index where it would be if it were inserted in order.

Input: nums = [1,3,5,6], target = 5 Output: 2

20. Given a m x n matrix grid which is sorted in non-increasing order both row-wise and column-wise, return the number of negative numbers in grid.

```
Input: grid = [[4,3,2,-1],[3,2,1,-1],[1,1,-1,-2],[-1,-1,-2,-3]]
Output: 8
Explanation: There are 8 negatives number in the matrix.
```

Example 2:

```
Input: grid = [[3,2],[1,0]]
Output: 0
```

Week 8: String Handling

1. Louise joined a social networking site to stay in touch with her friends. The signup page required her to input a *name* and a *password*. However, the password must be *strong*. The website considers a password to be *strong* if it satisfies the following criteria:

- Its length is at least 6.
- It contains at least one digit.
- It contains at least one lowercase English character.
- It contains at least one uppercase English character.
- It contains at least one special character. The special characters are: @#$%^&*()-+!

2. A space explorer's ship crashed on Mars! They send a series of SOSmessages to Earth for help.

Letters in some of the SOS messages are altered by cosmic radiation during transmission. Given the signal received by Earth as a string, determine how many letters of the SOS message have been changed by radiation.

s = 'SOSTOT'

Example

The original message was SOSSOS. Two of the message's characters were changed in transit.

Function Description

Complete the marsExploration function in the editor below. marsExploration has the following parameter(s):

string s: the string as received on Earth

Returns

int: the number of letters changed during transmission

3. Chef has a string S with him. Chef is happy if the string contains a contiguous substring of length strictly greater than 2 in which all its characters are vowels.
   Determine whether Chef is happy or not.
   Note that, in english alphabet, vowels are a, e, i, o, and u.

4. Given two strings needle and haystack, return the index of the first occurrence of needle in haystack, or -1 if needle is not part of haystack.

5. Given a string s consisting of words and spaces, return the length of the last word in the string. A word is a maximal substring consisting of non-space characters only.

6. Given a string S, reverse only all the vowels in the string and return it. The vowels are 'a', 'e', 'i', 'o', and 'u', and they can appear in both lower and upper cases, more than once.

7. You have been given a String S. You need to find and print whether this string is a palindrome or not. If yes, print "YES" (without quotes), else print "NO" (without quotes).

Skill Oriented Exercise

8. Jeff, Chef's younger brother, is learning to read and knows a subset of the Latin alphabet. Chef gave Jeff a book with N words to practice. Jeff can only read words that consist of the letters he knows. The task is to determine which words Jeff can read based on the given letters and output "Yes" or "No" accordingly.

9. Timur loves code forces. That's why he has a string S having length 10 made containing only lowercase Latin letters. Timur wants to know how many indices string s differs from the string "codeforces".

For example string s= "coolforsez" differs from "codeforces" in 4 indices, shown in bold.

Up the Ladder

A man wants to reach window which is 40ft above from the ground. And the distance between the foot of the ladder and wall is 9 feet. How long should the ladder be?

10. Given two strings s and t, return true if t is an anagram of s, and false otherwise. An Anagram is a word or phrase formed by rearranging the letters of a different word or phrase, typically using all the original letters exactly once. Given a string s, find the first non-repeating character in it and return its index. If it does not exist, return -1.

11. A robot starts at the origin (0, 0) on a 2D plane. It is given a sequence of moves represented by the string "moves". Each move is represented by 'R' (right), 'L' (left), 'U' (up), or 'D' (down). The task is to determine if the robot returns to the origin after completing all the moves. The robot's direction is irrelevant, and all moves have the same magnitude. Return true if the robot ends up at the origin, and false otherwise.

12. Chandu is a bad student. Once his teacher asked him to print the reverse of a given string. He took three hours to solve it. The teacher got agitated at Chandu and asked you the same question. Can you solve it?

13. There is a string s of lowercase English letters that is repeated infinitely many times. Given an integer n find and print the number of letter a's in the first n letters of the infinite string.

Week 9: Recursion

1. Given an integer n, return true if it is a power of three. Otherwise, return false. An integer n is a power of three, if there exists an integer x such that n == 3^x.
2. You are climbing a staircase. It takes n steps to reach the top. Each time you can either

climb 1 or 2 steps. In how many distinct ways can you climb to the top?

3. Given an integer n, return true if it is a power of four. Otherwise, return false. An integer n is a power of four, if there exists an integer x such that n == 4^x.

4. You are given an integer N. You need to print N! - the factorial of N.

Input The first line of the input contains a single integer *T* denoting the number of test cases. The description of *T* test cases follows. The first and only line of each test case contains a single integer *N*.

Output For each test case print a single line containing a single integer *N*!

5. The Fibonacci numbers, commonly denoted F(n) form a sequence, called the Fibonacci sequence, such that each number is the sum of the two preceding ones, starting from 0 and 1

6. Kristen loves playing with and comparing numbers. She thinks that if she takes two different positive numbers, the one whose digits sum to a larger number is *better* than the other. If the sum of digits is equal for both numbers, then she thinks the smaller number is *better*. For example, Kristen thinks that 13 is better than 31 and that12 is better than 11 .Given an integer,n ,can you find the divisor of n that Kristin will consider to be the best?

7. A perfect number is a positive integer that is equal to the sum of its positive divisors, excluding the number itself. A divisor of an integer x is an integer that can divide x evenly. Given an integer n, return true if n is a perfect number, otherwise return false.

8. Given an integer num, repeatedly add all its digits until the result has only one digit, and return it.

9. **Something for Profit:** A friend of mine bought a used pressure cooker for Rs. 60. She somehow did not find it useful and so when a friend of hers offered her Rs. 70 she sold it to her. However, she felt bad after selling it and decided to buy it back from her friend' by offering her Rs. 80. After having bought it once again she felt that she did not really need the cooker. So, she sold it at the auction for Rs. 90. How much profit did she make? Did she at all make any profit?

10. Given a signed 32-bit integer x, return x with its digits reversed. If reversing x causes the value to go outside the signed 32-bit integer range [-2^{31}, 2^{31} - 1], then return 0.

11. Given an integer array nums, move all 0's to the end of it while maintaining the relative order of the non-zero elements.

12. Write a function that takes the binary representation of an unsigned integer and returns the number of '1' bits it has (also known as the Hamming weight).

13. Martha is interviewing at Subway. One of the rounds of the interview requires her to cut a bread of size l X b into smaller identical pieces such that each piece is a square having maximum possible side length with no leftover piece of bread.

14. Given N two-dimensional points in space, determine whether they lie on some vertical or horizontal line.

If yes, print YES; otherwise, print NO.

Skill Oriented Exercise

PREDICT THE OUTPUT

```
#include <stdio.h> void foo(int n) {
        if (n > 0) { printf("%d ", n); foo(n - 1); printf("%d ", n);
           }
        }
int main() {
        foo(3); return 0;
}
```

1. What is the output of the above program?

- 3 2 1 1 2 3
- 3 2 1
- 1 2 3
- 1 2 3 3 2 1

```
#include <stdio.h> int bar(int n) {
        if (n <= 0) { return 0;
        } else {
        return n + bar(n - 2);
        }
}
int main() {
        int result = bar(7); printf("%d", result); return 0;
}
```

2. What is the output of the above program?

- 20
- 16
- 14
- 12

```
#include <stdio.h> void baz(int n) {
        if (n > 0) {
        baz(n / 2); printf("%d ", n % 2);
   }
}
int main() {
        baz(10); return 0;
}
```

3. What is the output of the above program?

- 1 0 1 0
- 0 1 0 1
- 0 0 1 0 1
- 1 1 0 1

```
#include <stdio.h> int factorial(int n) {
        if (n == 0) { return 1;
        } else {
        return n * factorial(n - 1);
}
int main() {
        int result = factorial(5); printf("%d", result); return 0;
}
```

4. What is the output of the above program?

- 120
- 24
- 25
- 20

```
#include <stdio.h>
int power(int base, int exponent) { if (exponent == 0) { return 1;
        } else {
        return base * power(base, exponent - 1);
        }
}

int main() {
        int result = power(2, 4); printf("%d", result); return 0;
}
```

5. What is the output of the above program?

- 16
- 8
- 32
- 64

Week 10: Structures

1. You are building a payroll system for a company with multiple departments. Design a program using structures that stores employee details such as name, employee ID, and salary. Implement an array of structures to store employee records for each department. Calculate the total salary expenditure for each department and display it. Additionally, identify the department with the highest salary expenditure and acknowledge it as the top-performing department

2. VGP logistics is a premium Cargo service for Sending/receiving parcels from Vijayawada to Singapore. You are appointed as Manager in delivery department and need to maintain the arrival and delivery of the consignments sent/received. Create a structure consignment with the following Members Consignment_id, name, from, to, DOS (Date of Shipment), net weight, Address.

   For Example:
   Consignment_id: 1008 Name: Haier Steamer From: Vijayawada
   To: Singapore
   DOS (Date of Shipment): 30-may-2023 net_weight: 28.8 kg
   Address: Mint Street Chennai

3. You have been assigned the task of developing a student grading system for a prestigious college. Design a program using structures that stores student details, such as name, roll number, and marks in various subjects. Implement an array of structures to store multiple student records and calculate the overall percentage for each student. Additionally, provide a functionality to generate a grade for each student based on their percentage and display it alongside their record.

4. You are developing a soldier management system for an army unit. Each soldier's record consists of the following information: name, rank, and years of service. Implement an array of structures to store the records of multiple soldiers. Write a C program to calculate and display the average years of service for all soldiers in the unit.

5. You are working on a ship management system for a naval fleet. Each ship's record contains the following details: name, type (e.g., aircraft carrier, destroyer), and year of commissioning. Implement an array of structures to store the ship records. Write a C program to search for a specific type of ship within the fleet and display the names of all ships belonging to that type.

6. You have been assigned the task of developing a pilot roster system for an air force squadron. Each pilot's record inclu des the following information: name, rank, and flight hours. Implement an array of structures to store the pilot records. Write a C program to find and display the pilot with the highest number of flight hours in the squadron.

7. You are working on a reservation system for a luxurious hotel. Create a program using structures that stores guest details, including name, room number, and check-in date. Implement an array of structures to store multiple guest records and allow the hotel staff to search for guests by either their room number or name. Provide an additional feature that calculates the duration of each guest's stay and generates the total revenue earned by

the hotel.

Skill Oriented Exercise

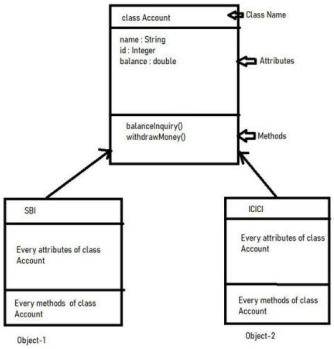
8. You have been tasked with developing a library management system for a renowned library. Create a program using structures that stores book information, including title, author, and publication year. Implement an array of structures to store multiple book records and allow the librarian to search for books by either title or author's name. Enhance the system by enabling the librarian to borrow and return books, updating the book status accordingly.

9. You have been assigned the task of creating a customer billing system using an array of structures. Each structure should store the customer's name, account number, and total amount due. Implement functions to add customer records, display all records, and find the customer with the highest amount due.

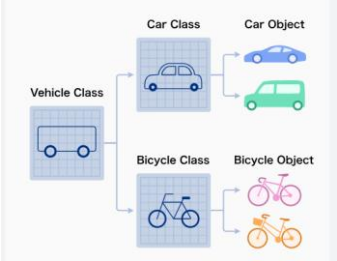
10. You are working on a car inventory management system using an array of structures. Each structure should hold the details of a car, including the make, model, and year of manufacture. Implement functions to add car records, display all records, and find the newest car in the inventory.

11. You are developing a product inventory management system for a retail store. Each product has a unique identifier, name, price, and quantity in stock. Implement an array of structures to store the product records. Create functions to add new products, update product details, display all products, and search for products based on their identifier or name.

Week 11: Class and Objects:



1. Create a class and the object code for the above scenario.



2. Develop code for Class and Object.

Week 12: Data Abstraction

Developing a banking application that handles various types of accounts such as savings, checking, and loans.

- **Abstraction Use:** Create abstract classes or interfaces like Account with common methods (e.g., deposit(), withdraw(), getBalance()). Concrete classes (e.g., SavingsAccount, CheckingAccount) implement these methods. The user interacts with Account objects without needing to know the specific type of account or its internal workings.

Inheritance

Developing a graphical user interface (GUI) library with various types of buttons.

- **Inheritance Use:** Create a base class Button with common properties like label, size, and methods like click(). Derive subclasses like ImageButton, ToggleButton, and RadioButton that inherit from Button and add specific properties or methods unique to each type of button.

Building an e-commerce platform with different types of products.

- **Inheritance Use:** Define a base class Product with common attributes like name, price, and methods like applyDiscount(). Create subclasses like Electronics, Clothing, and Books, each adding specific attributes (e.g., Electronics might have warrantyPeriod, Clothing might have size and color).

Skill Oriented Exercise

Building educational software that manages different types of learning resources.

- **Inheritance Use:** Establish a base class LearningResource with common properties like title, subject, and methods like display(). Derive subclasses such as Book, VideoLecture, and Quiz, each adding specific attributes and methods (e.g., Quiz might have questions and a method evaluate()).

Designing a system to classify and manage information about different animals.

- **Inheritance Use:** Define a base class Animal with common attributes like name, habitat, and methods like eat(), sleep(). Create subclasses such as Mammal, Bird, and Reptile, each with specific characteristics and methods (e.g., Bird might have methods fly()).

Week 13: Polymorphism

An application that can draw various shapes such as circles, rectangles, and triangles.

- **Polymorphism Use:** Define an abstract class Shape with a method draw(). Implement subclasses Circle, Rectangle, and Triangle, each providing its specific draw() implementation. The application can then handle any shape object through the Shape interface

A program that simulates sounds of different animals.

- **Polymorphism Use:** Create a base class Animal with an abstract method makeSound(). Implement subclasses Dog, Cat, and Cow that override makeSound(). The simulator can then invoke makeSound() on any animal object

Managing different types of transportation such as cars, buses, and bicycles.

Skill Oriented Exercise

- **Polymorphism Use:** Define a base class Vehicle with an abstract method move(). Implement subclasses Car, Bus, and Bicycle, each with its own implementation of move(). The system can then manage different vehicles uniformly

A system sending notifications via email, SMS, and push notifications.

- **Polymorphism Use:** Define an abstract class Notification with a method send(). Implement subclasses EmailNotification, SMSNotification, and PushNotification, each with its own send() method. The system can send notifications through any medium using the same interface

Week 14: Virtual functions

A document editor that supports different types of documents such as text documents, spreadsheets, and presentations.

- **Virtual Function Use:** Define a base class Document with a virtual function save(). Subclasses TextDocument, Spreadsheet, and Presentation override save() to handle specific saving mechanisms.

An audio processing library that handles various audio effects such as reverb, echo, and distortion.

Skill Oriented Exercise

- **Virtual Function Use:** Define a base class AudioEffect with a virtual function apply(). Subclasses ReverbEffect, EchoEffect, and DistortionEffect override apply() to implement specific effects.

An AI strategy game that involves different types of game characters such as warriors, mages, and archers.

- **Virtual Function Use:** Define a base class Character with a virtual function attack(). Subclasses Warrior, Mage, and Archer override attack() to provide specific attack behaviors.

Week 15: Exception handling

1) File Operations Scenario: An application needs to read data from a file.

Exception Handling Use: Implement code to handle scenarios where the file might not exist, the application lacks permissions, or the file is corrupted. Use try-catch blocks to manage these exceptions:

2) E-Commerce Checkout Process

Scenario: An e-commerce application processes user orders during checkout.

- Exception Handling Use: Handle errors such as invalid payment details, out-of-stock items, or delivery address issues.

Skill Oriented Exercise

3) An application processes images for various operations like resizing, filtering, and saving.

- Exception Handling Use: Handle errors such as unsupported file formats, corrupted files, or out-of-memory issues.

TEXTBOOKS:

1. Forouzan B.A & Richard F. Gilberg, A Structured Programming Approach using C,3rd Edition(2013), Cengage Learning.
2. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition,Pearson
3. ANSI and Turbo C++ by Ashoke N. Kamthane, Pearson Education

REFERENCES:

4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall ofIndia
5. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
6. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
7. E. Balagurusamy, Object Oriented Programming using C++, 2nd Edition, McGraw-Hill

B.Tech. I Year Syllabus MLRS R-24

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

Subject Code: 24X0073

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

0 0 2 1

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

Course Objective

- ✓ To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- ✓ To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
- ✓ To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- ✓ To improve the fluency of students in spoken English and neutralize the impact of dialects.
- ✓ To train students to use language appropriately for public speaking, group discussions and interviews

Course Outcomes: Students will be able to:

- ✓ Understand the nuances of the English language through audio-visual experience and group activities
- ✓ Neutralize their accent for intelligibility
- ✓ Speak with clarity and confidence which in turn enhances their employability skills

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

a. **Computer Assisted Language Learning (CALL) Lab**

b. **Interactive Communication Skills (ICS) Lab**

Listening Skills:

Objectives

1. To enable students to develop their listening skills so that they may appreciate the role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and to recognize and use the right intonation in sentences.

- Listening to general content
- Listening to fill up information
- Intensive listening
- Listening to specific information

Speaking Skills:

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students to express themselves fluently and appropriately in social and professional contexts

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities
- Just A Minute (JAM) Sessions

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

Exercise – I

CALL Lab:

Understand Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. *Practice*: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*

ICS Lab:

Understand: Spoken vs. Written Language- Formal and Informal English.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II

CALL Lab:

Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - *Testing Exercises*

ICS Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication.

Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise - III

CALL Lab:

Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).

Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -*Testing Exercises*

ICS Lab:

Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing

Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise – IV

CALL Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests - *Testing Exercises*

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.

Practice: Making a Short Speech – Extempore- Making a Presentation.

Exercise – V

CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests -*Testing Exercises*

ICS Lab:

Understand: Group Discussion

Practice: Group Discussion

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

2. **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.

Source of Material (Master Copy):

- *Exercises in Spoken English. Part 1,2,3*. CIEFL and Oxford University Press

Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

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).

- Digital All
- Orell Digital Language Lab (Licensed Version)

REFERENCE BOOKS:

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* Oxford University Press
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* Cambridge University Press

2410596: WEB APPLICATION DEVELOPMENT

L	T	P	C
0	0	2	1

COURSE OBJECTIVES: The students will try to learn

- HTML tags
- CSS
- Development of static web site
- Concepts of Java script
- Development of dynamic web site

COURSE OUTCOMES: After successful completion of the course, students should be able to

- Learn HTML tags and CSS
- Develop static web pages using HTML
- Use CSS in web pages
- Understand basic concepts of Javascript
- Develop dynamic web pages

PART-A

1. Write a HTML program to create a webpage about the different art forms of India, with appropriate title on the title bar. Use different heading tags for the headings, and list them using ordered list.
2. Write a HTML program to create sections in the document using appropriate tags and apply different color as background to them. Use internal hyperlinks to move to different points within the page.
3. Write a HTML program to insert a picture on the webpage, giving description for the picture in a paragraph. Use properties of height, width, hspace, vspace and align, with different values.
4. Write a HTML Program, to create a profile of 2 pages, the First page containing the applicant's picture with personal details using unordered lists, and the second containing Educational details using tables. Use hyperlinks to move to the next page.
5. Using Frames create an Indian Flag and insert the image of chakra in the center.
6. Create a frame like structure based on the given diagram, such that When the first link is clicked, the contents of the first frame is filled with the corresponding information and when the second link is clicked the second frame is filled.

• Networks • Simulation	Networks…….. Simulation

7. Write a program in HTML to demonstrate the concept of Image map, for India map. Map for areas rectangle, Circle and polygon.

PART-B

1. Write a program using Javascript to do the multiplication table for a number entered by the user in the textbox.
2. Create a sparse array using the values entered by the user in the five textboxes, and use Array methods such as sort(),pop(),push(), reverse() and join().
3. Create a Math object and use methods ceil(),floor(), round() for rounding off the number, also use methods such as cos(), sin(),sqrt().
4. Write a Program using Javascript to print a bill for 5 items purchased by the user.
5. Write a program Using Date object, to display appropriate greeting message "Good Morning" or "Good Afternoon" or "Good Night", in an alert box with the user's name, after receiving the same in the prompt box.
6. To demonstrate the concept of styles, Write a program applying internal style for paragraph tag, and override the same by applying inline style. Also create an external CSS file applying styles for the headings.
7. Create a registration form for creating an email account, having the input type elements like checkbox, radio button, select option, text area and submit button, and validate the textboxes for verifying the password.
8. Create a web page using two image files, which switch between one another as the mouse pointer moves over the image. Use onMouseOut and onMouseOver event handlers.
9. Using filters apply opacity feature to blur the image and using Transition apply hover feature, so the image will be transparent again when the mouse pointer is placed on the image.

I-II

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2420002: DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

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

Course Overview:

This course plays a crucial role in engineering, serving as the foundation upon which engineers build and apply their knowledge to solve real world applications. It presents a systematic and comprehensive introduction to ordinary differential equations and vector calculus for engineering students. Mathematical concepts and various techniques are presented in a clear logical and concise manner. A linear differential equation is used to regulate the flow of electricity in various electrical circuits like LR, LCR and CR circuits. Vector calculus is extensively used in the description of electromagnetic fields, gravitational fields and fluid flow.

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 transform 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 surface, volume and line of different geometrical models.

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UNIT-I: First Order ODE **10 L**

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 **10 L**

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: Legendre's equation, Cauchy-Euler equation.

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

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 **8 L**

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 **10 L**

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. H. K. Dassand Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

ENGINEERING CHEMISTRY

B.Tech. I Year. **MLRS-R24**

Course-code	Course Name	L	T	P	C
2410009	**ENGINEERING CHEMISTRY**	**3**	**1**	**0**	**4**

Course Objectives:

I	Understand the different parameters to remove causes of the hardness of water and their reactions towards the complexometric method.
II	Study the concepts of electrochemical principles and causes of corrosion in the newdevelopments and breakthroughs efficiently in engineering and technology.
III	Remember the applications of bio-degradable polymers.
IV	Describe the properties, and separation techniques of natural gas and crude oil along with potentialapplications in major chemical reactions.
V	Differentiate the types of materials concerning mechanisms and its significance inindustrial, and medical applications.

Course Outcomes:

CO1	**Understand** the basics on softness of water by ion exchange process.
CO2	**Remember** the types of factors affecting the corrosion.
CO3	**Knowledge** of polymer usage in day-to-day life.
CO4	**Compare** the various types of solid, liquid, and gaseous fuels.
CO5	**Recall** upon smart materials and their applications.

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

Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation- Determination of F^- ion by Nalgonda Technique.

Boiler troubles: Sludges, Scales 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 Battery Chemistry & Corrosion [8]

Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell. Solar cells - Introduction and applications of Solar cells.

Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods.

UNIT - III: Polymeric materials: [8]

Definition – Classification of polymers with examples – Types of polymerization – addition (Mechanism of free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene

Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP).

Rubbers: Natural rubber and its vulcanization.

Elastomers: Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol rubber.

Conducting polymers: Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

UNIT - IV: Energy Sources: [8]

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula-Numerical problems. Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Trans esterification, advantages.

UNIT - V: **Engineering Materials: [8]**

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

Introduction**,** classification, characteristics of Smart materials and their engineering applications Shape memory materials- Poly L- Lactic acid.

Lubricants: Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point 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, and Rath, Cengage learning, second edition 2022.
3. Textbook of Engineering Chemistry by Jaya Shree Anjireddy, Wiley Publications, 2022.
4. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.

REFERENCE BOOKS:

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011).

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2420221 ELECTRICAL ENGINEERING

(Common for EEE & ECE)

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

COURSE OVERVIEW:

The course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the electrical and electronics engineering. It includes the basic of network elements and laws with an emphasis on resistors, inductors and capacitors (RLC) circuits applied to alternating current (AC) or direct current (DC) of electrical networks. Further this course provides analysis of AC circuits, network theorems with different excitations, transient analysis, two port networks and graph theory to solve for real-time applications.

Prerequisite: Mathematics

COURSE OBJECTIVE: The students will try to learn

- The network reduction techniques such as source transformation, mesh analysis, nodal analysis to solve different networks.
- The basic concept of AC circuits for optimization of household and industrial circuitry.
- The basic concepts of theorems to solve complicated circuits
- The characteristics of two-port networks and network topologies suitable in power system.

COURSE OUTCOMES: After successful completion of the course, students should be able to

- Apply the techniques like nodal analysis and mesh analysis to solve the complicated circuits.
- Understand the behavior of sinusoidal AC supply compared to the DC supply.
- Summarize the procedure for several theorems to reduce complex network into simple equivalent network with DC and AC excitation.
- Understand the concept of initial conditions of RLC elements to determine the transient response of first and second order electrical circuits
- Recognize the two port parameters, correlate their interrelations and importance of graph theory and duality of various circuits

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MODULE-I: NETWORK ELEMENTS & LAWS

Basic Concepts of Circuits: Basic definitions, Ohm's Law, Kirchhoff's laws, dependent and Independent sources. Passive elements — R, L and C, Energy stored in inductance and capacitance.

Circuit Analysis: Source transformations, Star-delta transformations, Node voltage method, Mesh current method including super node and super mesh analysis.

MODULE-II: ANNLYSIS OF AC CIRCUITS

Single Phase AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power and power factor. Analysis of single-phase ac circuits consisting of R, L, C, and RL, RC, RLC combinations (series only).

MODULE-III: MAGNETOSTATICS

Network Theorems-I: Superposition theorem, Thevinin's theorem, Norton's theorems, and Maximum power transfer theorems for DC and AC excitations, numerical problems.

Network Theorems-II: Tellegen's theorem, Compensation theorem, Milliman's theorem and Reciprocity theorems for DC and AC excitations, numerical problems.

MODULE-IV: TRANSIENT ANALYSIS

Initial conditions, Transient Response of RL, RC and RLC series and parallel circuits with DC and AC excitations, differential equation and Laplace transform approach.

MODULE-V: TWO PORT NETWORK AND GRAPH THEORY

Two Port Network: Two port parameters, interrelations, Two port Interconnections.
Network topology: Definitions, incidence matrix, basic tie set and basic cut set matrices for planar networks duality and dual networks.

Text Books:

1. A Sudhakar, Shyammohan S Palli."Circuits and Networks: Analysis and Synthesis",McGraw Hill", 5th Edition,2017.
2. Van Valkenburg M.E,"Network Analysis"Prentice Hall of India,3rd edition, 2000.
3. M Nahvi, Joseph A. Edminister, Schaum's " Outline of Electric Circuits", 7th Edition, 2018.

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Reference Books:

1. B. Subramanyam," Electric Circuit Analysis", Dreamtech Press & Wiley, 2021.
2. James W.Nilsson, Susan A.Riedel" Electric Circuits", Pearson, 11th Edition, 2020.
3. Jagan N.C, Lakshrninarayana C," Network Analysis", B.S. Publications, 3 rd Edition, 2014.
4. Ravish R Singh," Network Analysis and Synthesis", McGrawHill, 2nd Edition, 2019.

24X0502: Essentials of Problem Solving Using Python

B.Tech. I Year II Sem.

L	T	P	C
3	0	0	3

Course Overview:

This course gives acquaintance to Python Programming and Graph Theory. The course deals with Python programming concepts and concepts in graph theory like properties of standard graphs, Eulerian graphs, Hamiltonian graphs, Chordal graphs, Distances in graphs, Planar graphs, graph connectivity and Colouring of graphs.

Graph theory is used in Network Topologies and Routing Algorithms, Algorithm Design, Social Network Design, Logistics.

Prerequisites:

- A course on “Problem solving using C and C++”.

Course Objectives: The students will try to learn

- Basic building blocks of python
- Using of Functions and Modules
- Importance of Multithreading in problem solving
- The fundamental concepts of graph theory
- Graph coloring and traversal algorithms for solving real-world problems

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

- Construct Python data structures programs using tuples sets and dictionaries
- Design Programs using Functions and Modules
- Implement Multithread concept in solving problems
- Understand graph terminology
- Build efficient graph routing algorithms for various optimization problems on graphs.

Module-I **[10]**

Python Basics: Python Objects, Operators, Python Numbers, Operators, Built-in Functions. Conditionals and Loops-if, else, elif, for, while, break, continue, pass**.**

Sequences: Strings, Lists, and Tuples- Built-in Functions, Special features. Mapping and Set Types: Dictionaries, Sets.

Module –II **[9]**

Functions and Functional Programming –Calling Functions , Creating Functions, Passing Functions , Formal Arguments, Variable-Length Arguments, Functional Programming.

Modules–Modules and Files, Namespaces, Importing Modules, Module Built-in Functions, Packages, Related modules.

Module –III **[8]**

Files and Input / Output: File Objects, File Built-in Functions, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments.

Multithreaded Programming: Introduction, Threads and Processes, Python Threads, the Global Interpreter Lock, Thread Module, Threading Module.

Module -IV **[8]**

Graph terminology, Digraphs, Weighted graphs, Complete graphs, Graph complements, Bipartite graphs, Graph combinations, Isomorphism's, Matrix representations of graphs, incidence and adjacency matrices, Degree Sequence, Eulerian circuit: Konigsberg bridge problem, Touring a graph; Eulerian graphs, Hamiltonian cycles

Module – V **[7]**

Shortest paths: Dijkstra's algorithm, Walks using matrices.

Graph Coloring And Graph Algorithms: Four color theorem, Vertex Coloring, Edge Coloring, Coloring Variations.

Graph traversal: Depth-First Search, Breadth-First Search and its applications; The traveling salesman problem, Minimum Spanning Trees: Kruskal's and Prim's algorithm

TEXTBOOKS:

1. Core Python Programming, Wesley J. Chun, Third Edition, Prentice Hall PTR
2. Karin R Saoub, Graph Theory: An Introduction to Proofs, Algorithms, and Applications, 1 st edition, Chapman and Hall, 2021.

REFERENCES:

1. Think Python, Allen Downey, Green Tea Press
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Python Programming: A Modern Approach, VamsiKurama, Pearson
4. Learning Python, Mark Lutz, O'Really
5. R Balakrishnan, K Ranganathan, A Textbook of Graph Theory, Springer Exclusive, 2 nd edition, 2019.

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

2410371: Computer Aided Engineering Graphics
(Common to All Branches)

I st Year I/II Semester

L	T	P	C
1	0	4	3

Course Overview:

Engineering Graphics is a foundational course designed to introduce first-year engineering students to the principles and practices of technical drawing and computer-aided design (CAD). This course covers essential topics such as geometric construction, orthographic projection, isometric drawing, lettering and dimensioning. Students will develop skills to create and interpret engineering drawings and gain proficiency in using CAD software for engineering applications.

Prerequisite: NIL

Course Objective: The students will be able

1. To understand the importance of engineering graphics in the engineering design process.
2. To apply principles of dimensioning and lettering in engineering drawings
3. To develop the ability to create and interpret technical drawings.
4. To master geometric constructions and projections.
5. To gain proficiency in computer-aided design (CAD) software.

Course Outcomes: Upon successful completion of this course, students will be able to:

1. Explain the role of engineering graphics in the engineering design and manufacturing process.
2. Understand the fundamental concepts of AutoCAD.
3. Perform basic geometric constructions and create accurate technical drawings.
4. Develop skills to create 2D and 3D drawings.
5. Use CAD software to create, modify, and manage engineering drawings.

Module-I: **Introduction to Engineering Graphics:** [12]

The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line, The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.

Module-II: Conic Sections and Engineering Curves [10]

Construction of Ellipse, Parabola, Hyperbola (General Method Only)
Engineering Curves: Cycloids, Epicycloid and Hypocycloid

Module -III: Orthographic Projections [12]

Introduction to Projections: Assumptions, Principles and Different angles of projections.
Projections of Points: Located in all Quadrants
Projections of Lines: Parallel, Perpendicular, Inclined to one plane.

Module -IV: Projections of Planes and Projection of Solids [12]

Projections of Planes: Introduction to planes, Regular lamina- Orientations- Surface parallel to HP, Surface parallel to VP, Inclined to HP, Inclined to VP.
Projections of Solids: Introduction to solids, Right Regular Solids- Orientations- Axis perpendicular to HP, Axis perpendicular to VP, Axis inclined to HP, Axis inclined to VP.

Module –V: Isometric Drawing and Conversions [14]

Principles of Isometric projections, Isometric View and Isometric Scale, Isometric view of: Planes and Solids, Conversion: Isometric to Orthographic and Vice Versa

Text Books:

1. **"Engineering Drawing",** N.D. Bhatt,Charotar Publishing House Pvt. Ltd, 53rd Edition, 2014, ISBN: 978-9380358173
2. **"Textbook of Engineering Drawing",** K. Venkata Reddy, BS Publications, Revised Edition, 2013, ISBN: 978-9381075994
3. **"Engineering Graphics"**, K.R. Gopalakrishna, Subhas Stores, 32nd Edition, 2014, ISBN: 978-9353460206
4. "**Engineering Drawing and Computer Graphics",** M B Shah & C. Rana, Pearson Edition 2010.

Reference Books:

1. "**A Textbook of Engineering Drawing**", R.K. Dhawan, S. Chand Publishing, Revised Edition, 2012, ISBN: 978-8121914311
2. "**AutoCAD 2024: A Problem-Solving Approach, Basic and Intermediate**", Sham Tickoo, CADCIM Technologies, 1st Edition, 2023, ISBN: 978-1640571577
3. "**Engineering Drawing and Graphics Using AutoCAD**", T. Jeyapoovan, Vikas Publishing House 2nd Edition, 2015, ISBN: 978-9325982417.

ENGINEERING CHEMISTRY LAB

B.Tech. I Year. **MLRITM R24**

Course-code	Course Name	L	T	P	C
24X0072	**ENGINEERING CHEMISTRY LAB**	**0**	**0**	**2**	**1**

Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry, potentiometry methods.
- Students will learn to prepare polymers such as Bakelite and Thiokol rubber in the laboratory.
- Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

Course Outcomes: The experiments will make the student gain skills on:

- Determination of parameters like the hardness of water
- Able to perform methods such as conductometry and potentiometry to find out the concentrations or equivalence points of acids and bases.
- Students are able to prepare polymers like bakelite and Thiokol rubber.
- Estimations of saponification value, surface tension and viscosity of lubricant oils.

List of Experiments:

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

II. Conductometry: Estimation of the concentration of an strong acid by Conductometry.

III. Potentiometry: Estimation of the amount of Fe^{+2} by Potentiomentry.

IV. Dichrometry: Determination of Ferrous ion by Dichrometry

V. Preparations:

1. Preparation of Thiokol rubber

VI. Lubricants:

1. Estimation of acid value of given lubricant oil.
2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

VII. Preparation of Hand sanitizer (Isopropyl alcohol)

VIII. Virtual lab experiments

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

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).

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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(2420276) ELECTRICAL ENGINEERING LABORATORY

B.TECH II Year I Sem

L	T	P	C
0	0	2	1

COURSE OVERVIEW:

The course is designed to provide students with hands-on experience and practical skills in the field of electrical engineering. The course serves as a complement to theoretical concepts learned in the concurrent electrical circuits course. Through a series of structured experiments, students gain an in-depth understanding of fundamental electrical circuits, components, measurement techniques, and troubleshooting procedures.

Prerequisite: There are no prerequisites to take this course

COURSE OBJECTIVE: The students will try to learn

- The gap between theoretical knowledge and practical applications by exposing students to a wide range of electrical components and circuit configurations.
- The essential skills in circuit design, measurement, testing, and analysis using laboratory equipment such as multimeters, and power supplies.
- The basic laws, network reduction techniques and theorems for different circuits.

COURSE OUTCOMES: After successful completion of the course, students should be able to

- Solve the source resistance, currents, voltage and power using various laws associated with electrical circuits.
- Perform the superposition principle, reciprocity and maximum power transfer condition
- for the Electrical network with DC excitation.
- Demonstrate Thevenin's and Norton's theorem to reduce complex networks into simple
- equivalent networks with DC excitation.
- Apply Faraday's laws of electromagnetic induction for calculating the various performance parameters in magnetic circuits.
- Understand the waveforms of different inputs and determine the form factor of electrical circuits.

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COURSE CONTENT:

EXERCISES FOR ELECTRICAL ENGINEERING LABORATORY

Perform Any Ten Experiments From Below

1. Verification of Ohm's Law
2. Verification of Kirchhoff's laws
3. Calculations and verification of Impedance and current of series RL & RC
4. Determination of Resonant frequency and band width of Series Resonance circuit
5. Calculations and verification of Impedance and current of series RLC
6. Verification of Thevenin's and Norton's Theorem
7. Verification of Superposition Theorem
8. Verification of Reciprocity Theorem
9. Verification of Maximum Power Transfer Theorem
10. Determination of self and mutual inductance of two inductive coils
11. Determination of form factor for non-sinusoidal waveform

Text Books:

1. A Chakrabarti, "Circuit Theory",Dhanpat Rai Publications, 8th Edition, 2021.
2. William Hayt, Jack E Kemmerly S.M. Durbin, "Engineering Circuit Analsysis", Tata McGraw Hill, 9th Edition, 2020.

Reference Books:

1. CL Wadhwa, Electrical Circuit Analysis including passive network synthesis, International, 2nd Edition, 2009.
2. David A Bell, Electrical Circuits, Oxford University Press, 7th Edition, 2009.

24X0572:Essentials Of Problem Solving Using Python Laboratory

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

Course Overview:

This course gives acquaintance to Python Programming and Graph Theory. It deals with Python programming concepts and concepts in graph theory like properties of standard graphs, Eulerian graphs, Hamiltonian graphs, Chordal graphs, Distances in graphs, Planar graphs, graph connectivity and Colouring of graphs. Python programming is used developing machine learning and data science applications. Graph theory is used in Network Topologies and Routing Algorithms, Algorithm Design, Social Network Design, Logistics.

Prerequisites:

- A course on “Problem solving using C and C++”.

Co-Requisites: Essentials of problem solving

Course Objectives: The students will try to learn

- Basic building blocks of python
- Using of Functions and Modules
- Importance of Multithreading in problem solving
- The fundamental concepts of graph theory
- Graph coloring and traversal algorithms for solving real-world problems

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

- Construct Python data structures programs using tuples sets and dictionaries
- Design Programs using Functions and Modules
- Implement Multithread concept in solving problems
- Understand graph terminology
- Build efficient graph routing algorithms for various optimization problems on graphs.

Week 1: Python Numbers

a) You are developing a program to determine whether a given year is a leap year, using the following formula: a leap year is one that is divisible by four, but not by one hundred, unless it is also divisible by four hundred. For example, 1992, 1996, and 2000 are leap years, but 1967 and 1900 are not. The next leap year falling on a century is 2400.

b) You are developing a program to determine the greatest common divisor and least common multiple of a pair of integers.

c) You are developing a program to create a calculator application. Write code that will take

two numbers and an operator in the format: N1 OP N2, where N1 and N2 are floating point or integer values, and OP is one of the following: +, -, *, /, %, **, representing addition, subtraction, multiplication, division, modulus/remainder, and exponentiation, respectively, and displays the result of carrying out that operation on the input operands.

Hint: You may use the string split() method, but you cannot use the exal () built-in function.

Skill Oriented Exercise

1. The cricket World Cup has started in Chefland. There are many teams participating in the group stage matches. Any team that scores 12 or more points in the group stage matches qualifies for the next stage.

2. The elections in Chefland have concluded, and the results are conducted. Chef received X votes, and his rival Chefu received Y. Chef thinks he dominated the election if and only if he received at least double the number of votes Chefu received. Did Chef dominate the election?

3. Bob has an account in the Bobby Bank. His current account balance is W rupees. Each month, the office in which Bob works deposits a fixed amount of X rupees to his account. Y rupees is deducted from Bob's account each month as bank charges. Find his final account balance after Z months. Note that the account balance can be negative as well.

4. You're a bit all over the place as a college student. You used to eat out at expensive restaurants almost every day until your parents gave you a talking-to about being irresponsible. Now, you've got to control your eating and spending habits. So, here's the plan: you'll stick to the college mess for your meals every day, except Sundays. On Sundays, you're treating yourself to those fancy restaurant meals. The cost is Rs.X for the mess food each day, and Rs. Y for the restaurant splurges. Now, what's the cost of food per week? Note that you don't have to pay for the mess on Sundays. (A week has seven days, as usual.)

Week 2: ***Control Flow***

a) Write a Program for checking whether the given number is a prime number or not.
b) Write a program to print Fibonacci series upto given n value.
c) Write a program to calculate factorial of given integer number.
d) Write a program to calculate value of the following series $1+x-x^2+x^3-x^4+\text{-----}\ x^n$.
e) Write a program to print Pascal triangle.

Skill Oriented Exercise

1. Charlie is 17 years old and is eager to vote. Write a Python program to check if he meets the legal voting age of 18.

2. Your friend given a list of numbers to you and asked to find out the largest number among them. Write a python program to find the largest number.

3. Daemon don't like the multiples of 7 so help him to write a Python program that prints numbers from 1 to 30 but skip the number if it encounters multiple of a 7.

4. Bob has an account in the Bobby Bank. His current account balance is W rupees. Each month, the office in which Bob works deposits a fixed amount of X rupees to his account. Y rupees is deducted from Bob's account each month as bank charges. Find his final account balance after Z months. Note that the account balance can be negative as well.

Week-3 Python Sequences

a) Write a program to sort the numbers in ascending order and strings in reverse alphabetical order.
b) Given an integer value, return a string with the equivalent English text of each digit. For example, an input of 89 results in "eight-nine" being returned. Write a program to implement it.

c) Write a program to create a function that will return another string similar to the input string, but with its case inverted. For example, input of "Mr. Ed" will result in "mR.eD" as the output string.
d) Write a program to take a string and append a backward copy of that string, making a palindrome.

Skill Oriented Exercise

1. Alice loves quotes. Write a Python program to count the number of characters in her favorite quote: "To be or not to be, that is the question.".
2. Emily wants to know if her friends name is a palindrome. Write a Python program to check for a name is a palindrome.
3. Charlie just read a new book and wants to add it to his set of favorite books {"The Hobbit", "Harry Potter"}. Write a Python program to add "The Great Gatsby" to Charlie's set and print the updated set.
4. You have a list of friends' ages: [25, 22, 29, 24]. Write a Python program to sort this list in ascending order.

Week-4 Python Dictionaries

a) Write a program to create a dictionary and display its keys alphabetically.
b) Write a program to take a dictionary as input and return one as output, but the values are now the keys and vice versa.
c) Given a List, extract all elements whose frequency is greater than K.
Ex: Input test_list = [4,6,4,3,3,4,3,4,3,8], k=3
Output =[4,3]

Skill Oriented Exercise

1. You have a dictionary of your friends' favorite fruits: {"Alice": "Apple", "Bob": "Banana", "Charlie": "Cherry"}. Write a Python program to print Bob's favorite fruit.

2. John manages a small store and needs a program to track his product inventory. Write a Python program that will help John Creating the dictionary which contains the name and

price of the product and print the maximum product name along with its price.

Week-5 Files

a) Write a program to compare two text files. If they are different, give the line and column numbers in the files where the first difference occurs.

b) Write a program to compute the number of characters, words and lines in a file.

Skill Oriented Exercise

1. Alice wants to list all files in her current directory. Write a Python program to import the os module and use it to print the names of all files in the current directory.
2. Charlie wants to read the contents of books.txt line by line and print each book name. Write a Python program to open the file and use the readline method to print each line.
3. Write a Python program greet.py that takes a name as a command-line argument and prints "Hello, [name]!". Demonstrate how to run it with the argument "Alice".

Week- 6&7 Functions

a) Write a function ball collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.
Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius
If (distance between two balls centers) <= (sum of their radii) then (they are colliding)
b) Find mean, median, mode for the given set of numbers in a list.
c) Write simple functions max2() and min2() that take two items and return the larger and smaller item, respectively. They should work on arbitrary Python objects. For example, max2(4, 8) and min2(4, 8) would each return 8 and 4, respectively.

d) Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.

e) Write a function dups to find all duplicates in the list.

f) Write a function unique to find all the unique elements of a list.

g) Write a function cumulative_ product to compute cumulative product of a list ofnumbers.
h) Write a function reverse to reverse a list. Without using the reverse function.
i) Write function to compute GCD, LCM of two numbers. Each function shouldn’texceed one line.

Skill Oriented Exercise

1. Alice wants to create a reusable function to greet her friends. Write a Python function greet that takes a friend's name as an argument and prints a greeting. Call the function with the name "Bob."

2. Charlie needs a function that can sum any number of arguments. Write a function sum_numbers that takes a variable number of arguments and returns their sum. Use this function to sum 1, 2, 3, and 4.
3. Alice wants a quick way to increment a number by 1. Write a lambda function that takes a number and adds 1 to it. Use this lambda to increment 7.
4. Bob has written a custom module called mymath.py with a function add(a, b) that returns the sum of a and b. Write a Python program to import this module and use the add function to add 3 and 5.

Week- 8 Multithreading

a) Write a program to create thread using thread module.
b) Write a program to create thread using threading module.
c) Write a Program to use Python's threading module to calculate the square and cube of a number concurrently.

Skill Oriented Exercise

1. Alice wants to perform two tasks simultaneously: counting numbers and printing messages. Write a Python program to create two threads, one for counting from 1 to 5 and another for printing "Hello" five times.
2. Charlie is learning about the Global Interpreter Lock (GIL). Write a Python program demonstrating how GIL affects multi-threaded CPU-bound tasks by incrementing a counter in two threads.
3. Diana wants to print numbers in a separate thread using the thread module. Write a Python program to print numbers from 1 to 5 in a new thread.
4. Emily needs a background thread to print a heartbeat message every second. Write a Python program to create a daemon thread that prints "Heartbeat" every second.
5. Alice is managing a shared resource. Write a Python program where two threads increment a shared counter using a threading.Lock to avoid race conditions.

Week 9:

a) Write a Python program to implement Euler Circuit.
b) Write a Python program to implement Dijkstra's algorithm.
c) Given a connected graph G with N nodes and M edges (edges are bi-directional). Every node is assigned a value $A[i]$. We define a value of a simple path as :

Value of path = Maximum of (absolute difference between values of adjacent nodes in a path). A path consists of a sequence of nodes starting with start node S and end node E.

$S-u1-u2-....-E$ is a simple path if all nodes on the path are distinct and $S,u1,u2,...,E$ are nodes in G.

Given a start node S and end node E, find the minimum possible ***"value of path"*** which starts with node S and ends with node E.

d) Yatin created an interesting problem for his college juniors. Can you solve it?

Given N rooms, where each room has a one-way door to a room denoted by $room[i]$, where $1 \leq i \leq N$. Find a positive integer K such that, if a person starts from room i, ($1 <= i <= N$) , and continuously moves to the room it is connected to (i.e. $room[i]$) , the person should end up in room i after K steps;

Note: The condition should hold for each room.If there are multiple possible values of K modulo (109+7), find the smallest one.If there is no valid value of K, output -1

Week 10: Implement the following using python

a) M-coloring
b) Vertex coloring
c) Edge coloring

Week 11: Implement the following graph traversal methods.

a) Depth-First Search
b) Breadth-First Search
c) You are presented with a network comprising N computers and M wired connections between them. Your objective is to optimize the network's connectivity using precisely K wires from your inventory. The aim is to **maximize** the number of computers that can be linked together within the given constraints. Your task is to determine and report the size of the largest network that can be formed by establishing these connections.

In the context of this problem, computers are considered connected if they share either a direct or indirect wired connection. It is worth noting that the value of K will always be less than the number of isolated (standalone) networks in the given configuration, and it may even be zero.

d) A country consists of N cities. These cities are connected with each other using $N-1$ bidirectional roads that are in the form of a tree. Each city is numbered from 1 to N. You want to safeguard all the roads in the country from any danger, and therefore, you decide to place cameras in certain cities. A camera in a city can safeguard all the roads directly connected to it. Your task is to determine the minimum number of cameras that are required to safeguard the entire country.

Week 12: Travelling Salesman problem**.**

a) You are working in a salesmen company as a programmer.

There are *n* towns in your country and *m* directed roads between them. Each road has a cost person should spend on fuel. The company wants to sell goods in all *n* towns. There are infinitely many salesmen in the company. We can choose some positive number of salesmen and give a non-empty list of towns to each of them. Towns from the list are the towns to sell goods in. Each salesman will visit all the towns in his list in this particular order in cycle (after the last town he will return to the first town and so on). Salesman can visit other towns on his way but he will not sell goods in these towns. Two salesmen cannot sell goods in one town because it will attract unnecessary attention to your company. But for every town there must be a salesman who sell goods in this town. If salesman's list of towns consists of exactly one town then he should pay fee to stay in this town each month (each town has its own fee) or he should go for a round trip and spend money on fuel.

Your task is to calculate the minimal amount of money company must spend monthly to achieve its goals. We will assume that every salesman will spend a month to make one cycle.

b) It is the final leg of the most famous amazing race. The top 'n' competitors have made it to the final. The final race has just begun. The race has 'm' checkpoints. Each team can reach any of the 'm' checkpoint but after a team reaches a particular checkpoint that checkpoint gets closed and is not open to any other team. The race ends when 'k' teams finish the race. Each team travel at a constant speed throughout the race which might be different for different teams. Given the coordinates of n teams and m checkpoints and speed of individual team return the value of minimum time needed to end the race.

c) Little Jhool is a very lenient teaching assistant in his college. He doesn't like cutting the marks of students, so obviously, every student in his tutorial loves him. But anyway, the teacher has got to know about the leniency of Jhool while giving marks, so this time in exam, he decides to give a different exam paper to every single student to check how well have the students been taught by Jhool. Now, Little Jhool knows the strong and weak topics of every single student, so he wants to maximize the total marks obtained by students in his tutorial.You are given the number of students in Jhool's tutorial, denoted by **n** - **n** also being the number of different exam papers - that is, one for every student. Every student will get only one exam paper to solve. You are further given a matrix, *(n x n)* denoting the marks every student will get if he attempts a particular exam paper. You've to help Jhool figure out a way by which he could maximize the total score obtained by his entire class.

Week 13: Construct minimal spanning tree using the following

a) Prim's Algorithm

b) Kruskal's Algorithm

c) There are total N Hacker-cities in a plane. Each city is located on coordinates ($X[i]$,$Y[i]$) and there can be any number of cities on the same coordinates.

You have to make these cities connected by constructing some roads in such a way that it is possible to travel between every pair of cities by traversing the roads. The

cost of constructing one road between any two cities is the minimum of the absolute difference between their X and Y coordinates.

As you want to earn more and more, you decided to do this in the most optimal way possible, such that the total cost of constructing these roads is minimal. You have to return the minimum money you need to spend on connecting all the cities.

d) Tom is visiting the country Hackerland. Hackerland has *n* cities and *m* bi-directional roads. There are *k* types of tokens. Token *i* costs ci. The costs of the tokens are such that for all $2 \leq i \leq k$, $ci \geq 2ci-1$. For each road, you need to have a particular set of tokens, if you want to travel it. Note that you don't have to give the tokens, you just need to show them. Thus, one token can be used at any number of roads, where it is required. Tom wants to select a set of tokens, such that using them, he can go from any city to any other city. You have to help him minimize the total cost of tokens he buys.

TEXT BOOKS:

1. Core Python Programming, Wesley J. Chun, Third Edition, Pearson.
2. Karin R Saoub, Graph Theory: An Introduction to Proofs, Algorithms, and Applications, 1 st edition, Chapman and Hall, 2021.

REFERENCE BOOKS:

1. Think Python, Allen Downey, Green Tea Press
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Python Programming: A Modern Approach, VamsiKurama, Pearson
4. Learning Python, Mark Lutz, O'Really.

B.Tech. I/II Year Syllabus **MLRSR-24**

PUBLIC SPEAKING SKILLS

Subject Code: 24X0027

L T P C

2 0 0 0

Course Description:

This course is designed to develop students' public speaking skills, focusing on speech preparation, delivery techniques, and the use of non-verbal communication. Students will learn to present effectively in various contexts, from formal presentations to informal meetings.

Prerequisites: Basic communication skills

Course Objectives: The students will learn:

- Understand the fundamentals and prerequisites of public speaking.
- Develop the ability to convert ideas into structured speeches.
- Enhance performance through verbal and non-verbal communication.
- Master different types of public speaking and professional presentations.
- Learn the etiquette and mannerisms required for effective public speaking.

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

1. **Prepare and deliver** speeches confidently by organizing content and overcoming stage fright.
2. **Utilize** verbal and non-verbal communication to engage the audience effectively.
3. **Adapt** to different contexts by tailoring speeches for diverse audiences and settings.
4. **Exhibit** professionalism and creativity using proper etiquette, rhetorical devices, and creative language

Module 1: Fundamentals of Public Speaking (No of hours: 6)

This unit introduces public speaking, covering its importance, course structure, assessment methods, and prerequisites like understanding the audience, research, organizing speech structure, overcoming

stage fright, and practising speech delivery.

Module2: Speech Development and Delivery (No of hours: 6)

This unit focuses on converting ideas into action through brainstorming, outlining, drafting speeches, using storytelling, and practising impromptu speaking. It also emphasizes public speaking as a performative act, covering voice modulation, eye contact, audience engagement, effective pacing, gestures, and techniques for handling questions and interruptions.

Module 3: Non-verbal Communication and Speech Types (No of hours: 5)

This unit explores non-verbal communication's role in public speaking, covering the importance and types of cues like facial expressions and gestures, aligning verbal with non-verbal messages, observing audience feedback, and adapting non-verbal communication to virtual settings. It also addresses various types of public speaking, including informative, persuasive, special occasion, motivational speeches, panel discussions, and debates.

Module 4: Professional and Formal Speaking (No of hours: 6)

This unit covers speeches, including analysis of famous examples, preparing and delivering various types, conducting peer and self-evaluation, and effectively utilizing visual aids and multimedia. Adapting speeches for diverse audiences, and addressing practical skills for interviews, professional communication, conducting meetings, conferences, presentations, and building professional networks.

Module 5: Advanced Techniques and Professionalism (No of hours: 5)

This unit focuses on structuring and delivering professional presentations effectively, using creative language techniques for impactful messaging, and embodying proper etiquette and professionalism in public speaking.

TEXTBOOK:

- "**The Art of Public Speaking**" by Dale Carnegie Prabhat Prakashan Pvt. Ltd.; First Edition (31 December 2020) **ISBN-10:** 8184302614

REFERENCEBOOKS:

- **"The Art of Public Speaking" by Stephen E. Lucas**, ISBN: 978-0073523910, Year of Publication: 2014, Publisher: McGraw-Hill Education
- **Confessions of a Public Speaker" by Scott Berkun**, ISBN: 978-0596801991, Year of Publication: 2010, Publisher: O'Reilly Media ISBN: 978-0596801991, Year of Publication: 2010
- **"Speak Like Churchill, Stand Like Lincoln: 21 Powerful Secrets of History's Greatest Speakers" by James C. Humes,** ISBN: 978-0761563518, Year of Publication: 2002, Publisher: Three Rivers Press
- **"The Quick and Easy Way to Effective Speaking" by Dale Carnegie,** ISBN: 978-0671724009, Year of Publication: 1990, Publisher: Pocket Books

II-I

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2430003: NUMERICAL METHODS AND COMPLEX VARIABLES

II Year B.Tech. I Sem (ECE, EEE) **L T P C**

3 1 0 4

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 $1/3^{rd}$ and $3/8^{th}$ 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, 36^{th} Edition, 2010.
2. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI, 4^{th} 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, 9^{th} Edition, John Wiley & Sons, 2006.
3. J. W. Brown and R.V. Churchill, Complex Variables and Applications, 7^{th} Edition, MC-Graw Hill, 2004.

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2430421: ELECTRONIC DEVICES AND CIRCUITS

II Year B.Tech. ECE I – Sem. **L T P C**

2 0 0 2

Couse Overview:
This course is intended to introduce students to the fascinating world of electronic devices and circuits. Also, the emphasis of the course is to build practical skills to contribute effectively to the ever-evolving filed of electronic and technology. This course can be applied in consumer electronics, communications, medical devices, aerospace and defense, robotics, and industrial control systems.

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

Course Objectives:
The students will try to learn
- Components such as Diodes, BJTs and FETs
- Applications of semiconductor devices
- Special purpose semiconductor devices
- Various types of amplifier circuits
- Design and analyze the different small-signal amplifier circuits

Course Outcomes:
After successful completion of the course, students shall be able to
- List the characteristics of various semiconductor components
- Understand the utilization of components
- Analyze the biasing techniques
- Design and analyze small signal amplifier circuits
- Demonstrate the BJT and FET amplifiers operation

Module – I: PN Junction Diode and Applications **7L**
Operation and characteristics of PN junction diode, Static and Dynamic resistances, Diffusion and Transition capacitances, Diode configurations, Rectifiers: HWR, FWR, Bridge rectifier, Rectifiers with Capacitive and Inductive filters, Clippers, and Clampers.

Module – II: Bipolar Junction Transistor (BJT) **6L**
Principle of Operation - Common Emitter, Common Base and Common Collector configurations; Transistor as a switch, Transistor biasing and stabilization - Load line analysis, Biasing – fixed-bias, Self-bias, Voltage-divider bias, Bias stability.

Module – III: Field Effect Transistor (FET) **7L**
JFET construction, Principle of operation, Pinch-off voltage, Volt- Ampere characteristic, Comparison of BJT and FET, Biasing of FET, FET as voltage variable resistor. MOSFET operation, MOSFET characteristics in Enhancement and Depletion mode, MOS as a capacitor, FET amplifier.

Module – IV: Analysis and Design of Small Signal Low Frequency BJT Amplifiers **7L**
Transistor hybrid model, Determination of h-parameters from transistor characteristics, Typical values of h- parameters in CE, CB and CC configurations, Transistor amplifying action, Analysis of CE, CC,

CB amplifiers, Low frequency response of BJT amplifiers, Effect of coupling and bypass capacitors on CE amplifier.

Module – V: Special Purpose Devices **6L**

Zener diode, Voltage Regulator, SCR, Photo diode, Varactor diode, Tunnel diode, LED, and Solar Cell: Characteristics, Operations and Applications.

TEXT BOOKS:

1. Jacob Millman, Christos C. Halkias, and Satyabrata Jit, "Electronic Devices and Circuits", 3rd Edition., Mc-Graw Hill Education, 2010.
2. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuits theory" 11th Edition, Pearson, 2013.

REFERENCES:

1. Donald Neamen, Dhrubes Biswas, "Semiconductor Physics and Devices" 4th Edition, McGraw Hill Education, 2017.
2. Steven T. Karris, "Electronic Devices and Amplifier Circuits with MATLAB Applications" Orchard Publications, 3rd Edition 2005.
3. Paul Horowitz, Winfield Hill, "The Art of Electronics" 3rd Edition Cambridge University Press, 1994.

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2430422: DIGITAL SYSTEM DESIGN

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

Couse Overview:
This course is intended to introduce students to the fascinating world of Digital Electronics. The emphasis of the course is to build intuition behind the operation of logic circuits. There are several applications of this course such as Combinational circuits, Sequential Circuits, Boolean Algebra, PLDs & PLAs and Computers Memory Architectures Design.

Pre-requisite: Nil

Course Objectives:
The students will try to learn
- Number systems in logic circuits
- Basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems
- Simple logical operations using combinational logic circuits and design of sequential logic circuits
- Sequential circuits systems in terms of state machines
- Concepts of programmable logic devices

Course Outcomes:
After successful completion of the course, students shall be able to
- Understand the numerical information in different forms and Boolean Algebra theorems
- Implement the Boolean algebra and to minimize combinational functions
- Design small combinational circuits and to use standard Combinational functions to build larger more complex circuits
- Implement small sequential circuits and devices and to use standard sequential Function blocks to build larger more complex circuits
- Illustrate the operation of PLD & PLA

Module – I Number Systems & Boolean Algebra **6L**
Number systems, Complements of numbers, Codes: weighted and non-weighted codes and its properties, Parity check code and Hamming code.
Boolean Algebra: Basic theorems and properties, Switching functions- Canonical and standard form, Algebraic simplification, Digital logic gates, EX-OR gates, Universal gates, Multilevel NAND/NOR realizations, and their applications.

Module – II: Minimization of Boolean Functions & Combinational Logic Circuits **7L**
Minimization of Boolean Functions: Karnaugh Map method - Up to five variables, Don't Care map entries, Quine Mc Cluskey, and Tabular method.
Combinational Logic Circuits: Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free relations.

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Module – III: Sequential Circuits Fundamentals, Registers and Counters **7L**

Sequential Circuits Fundamentals: Basic architectural distinctions between combinational and sequential circuits, SR latch, flip flops: SR, JK, JK master slave, D and T type flip flops, Excitation table of all flip flops, Timing and triggering consideration, Conversion from one type of flip-flop to another.

Registers and Counters: Shift registers – left, right and bidirectional Shift Registers, Applications of shift registers - Design and operation of ring and twisted ring counter, Operation of asynchronous and synchronous counters.

Module – IV: Sequential Machines **6L**

Finite state machines, Synthesis of synchronous sequential circuits- Serial binary adder, Sequence detector, Parity-bit generator, Synchronous modulo N –counters. Finite state machine-Capabilities and limitations, Mealy and Moore models.

Module – V: Programmable Logic Devices, **Threshold Logic** **6L**

Basic PLD's-ROM, PROM, PLA, and PLD, Realization of Switching functions using PLD's. Capabilities and limitations of threshold gate, Synthesis of threshold functions, Multigate Synthesis.

TEXT BOOKS:

1. Zvi Kohavi & Niraj K. Jha, "Switching and finite automata theory," 3rd edition, Cambridge, 2010.
2. M.Morris Mano, Michael D. Ciletti, "Digital design," Pearson, 4th edition, 2012.

REFERENCES:

1. R. P. Jain, "Modern digital electronics," Tata McGraw-Hill, 3rd edition, 2007.
2. Charles H. Roth, "Fundamentals of logic design," Cengage Learning, 5th edition, 2004.
3. A. Anand Kumar, "Switching theory and logic design," PHI, 2nd edition, 2013.

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2430423: SIGNALS AND SYSTEMS

II Year B.Tech. ECE I - Sem.

L	T	P	C
2	1	0	3

Couse Overview:
This course covers essential theories and practical applications for engineering learners, including digital signal processing, communications systems, and more, the basic concepts for continuous-time and discrete-time signals in the time and frequency domains are applied in speech recognition, video streaming, cellular networks and medical scans such as MRI.

Pre-requisites: Basics of Mathematics

Course Objectives:

The students will try to learn

- The knowledge of signals and systems
- The behavior of signals in time and frequency domain
- The characteristics of LTI systems
- Concepts of Signals and Systems and its analysis using different Transform techniques
- The relation between two same signals and two different signals

Course Outcomes:

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

- Differentiate various signal functions
- Inspect any arbitrary signal in time domain and frequency domain
- Understand the characteristics of linear time invariant systems
- Analyze the signals with different Transform techniques
- Design a system for sampling a signal

Module – I: Signal Analysis **9L**

Analogy between vectors and signals, Orthogonal signal space, Signal approximation using orthogonal functions, mean square error, Closed or complete set of orthogonal functions, elementary signals, singularity functions, Classification of signals, Operations on signals: time shifting, time scaling, time reversal, differentiation, and integration.

Module – II: Fourier Series and Fourier Transforms **10L**

Fourier Series: Representation of Fourier series, Dirichlet's conditions, Trigonometric Fourier series, exponential Fourier series and its properties.

Fourier Transforms: Fourier Transform of arbitrary signals, standard signals, and periodic signals, Properties of Fourier Transform, Introduction to Hilbert Transform and properties.

Module – III: Signal Transmission through Linear Systems **9L**

Classification of systems**,** Impulse response, Linear time invariant (LTI) system, Transfer function of a LTI system, Filter characteristics of linear system, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF, and BPF characteristics, Relationship between bandwidth and rise time, Convolution of signals, Concept of convolution in time domain and frequency domain, Graphical representation of convolution

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Module – IV: Laplace Transforms and Z–Transforms 10L

Laplace Transforms: Laplace Transforms (L.T), Concept of region of convergence (ROC) for Laplace Transforms, Inverse Laplace Transform, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.

Z–Transforms: Concept of Z-Transform of a discrete sequence, Distinction between Laplace, Fourier and Z Transforms, Region of convergence, Properties of ROC, Properties of Z-Transforms, Inverse Z-Transform.

Module – V: Sampling Theorem and Correlation 10L

Sampling Theorem: Graphical and analytical proof for band limited signals, Impulse sampling, Natural and flat top sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing.

Correlation: Cross correlation and auto correlation of functions, Properties of correlation functions, Energy density spectrum, Parsevals theorem, Power density spectrum, Relation between autocorrelation function and energy/power spectral density function, Relation between convolution and correlation.

TEXT BOOKS:

1. B.P. Lathi, “Signals, Systems & Communications,” BSP, 2nd Edition 2001.
2. A. Anand Kumar, “Signals and Systems,” PHI, 3rd Edition, 2013.

REFERENCES:

1. Simon Haykin and Van Veen, “Signals and Systems,” John Wiley 2nd Edition, 2007.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, “Signals and Systems,” Pearson India 2nd Edition, 1996
3. Michel J. Robert, “Fundamentals of Signals and Systems,” MGH International, 2nd Edition, 2008.

2430507: DATA STRUCTURES
(COMMON TO ALL BRANCHES)

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

3 0 0 3

Course Overview:

Data structures are the fundamental building blocks of computer programming. They define how data is organized, stored, and manipulated within a program. Understanding data structures is very important for developing efficient and effective algorithms. In this Course, student will explore the most commonly used data structures, including **linked lists, stacks, queues, trees, and Hashing.**

Prerequisites:

- A course on “Essentials of Problem Solving using python”.

Course Objectives: The students will try to learn

- Various linear and non-linear data structures.
- How to perform operations on data structures.
- Priority Queues and Heaps
- Various searching and sorting techniques.
- Different hashing techniques

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

- Develop solutions by using different types of linked lists
- Solve problems using stack and queue
- Learn different types of trees and their applications
- Implement and know the application of algorithms for searching and sorting.
- Design Programs using Hashing

Module -I: Linked Lists **[9]**

Introduction to Data Structures, Linear list – singly linked list, Doubly linked list, Circular linked list - operations and its applications.

Module-II: Stack and Queue **[8]**

Stacks- Introduction, Operations, array and linked representations of stacks, stack applications (Infix to postfix conversion and postfix evaluation),

Queues- Introduction, operations, array and linked representations of queues and its applications.

Module-III: Trees **[10]**

Trees: General Trees, Binary Trees, Implementing Trees, Tree traversals

Search Trees: Binary Search Trees,Balanced search trees- AVL trees, B- trees

Priority Queue and Heaps: Priority queue ADT, Priority queue, Applications, Heap Trees, implementing a priority queue with a Heap, Heap Sort.

Module–IV: Searching and Sorting **[9]**

Searching: Linear Search and Binary Search and its applications.

Sorting: Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort and its applications.

Module – V: Hashing **[8]**

Introduction, Hash Functions-Modulo, Middle of Square, Folding, Collision Resolution Techniques- Separate Chaining, Open addressing,- Linear Probing, Quadratic Probing, Double Hashing.

TEXTBOOKS:

1. Fundamentals of data structures in C, E.Horowitz, S.Sahni and Susan Anderson Freed, 2nd Edition, Universities Press.
2. Data structures using C, A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

REFERENCES:

1. Data structures: A Pseudocode Approach with C, R.F.Gilberg And B.A.Forouzan, 2nd Edition, Cengage Learning.
2. Introduction to data structures in C, Ashok Kamthane, 1st Edition, PEARSON.

243EXL1 Design and Innovation

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

Prerequisites :

Course Objectives:

:	Introduce the principles, stages, and tools of Design Thinking for organizational problem-solving.
:	Enable empathy-driven research and ideation to address stakeholder needs.
:	Develop skills to build and prototype user-centric solutions collaboratively.
:	Train students to test and refine solutions through iterative feedback.
:	Guide students in business modeling, effective presentation, and basics of IP filing.

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

CO 1	:	Understand the principles and process of Design Thinking and its relevance in organizational and educational contexts.
CO 2	:	Apply empathy-driven research methods to understand stakeholder needs and create user personas
CO 3	:	Define problem statements and ideate innovative solutions using appropriate tools and frameworks
CO 4	:	Develop and test prototypes iteratively, using feedback and testing tools to refine user-centric solutions
CO 5	:	Design, present, and document a viable business model with potential for publication or IP filing

Week 1: Course Introduction and Project Kickoff

- Course Overview: Objectives, structure, and expectations
- Capstone Project Introduction: SDG Goals, Themes or challenges
- Team Formation: Assign roles and responsibilities
- Initial Brainstorming: Discuss project ideas and start preliminary research
- Task : Team Formation

Week 2: What Is Design Thinking, Really?

- Define the term “design thinking.”
- Design thinking in problem-solving.
- Importance of design thinking for organizations.
- Perspectives of design thinking.
- Case Study: DT at Asian Paints Ltd.
- Case Study: Waste for Warmth
- Task : SDG/Theme Proforma

Week 3: Setting the Stage for Design Thinking in Management Education

- Establishing the Context for Design Thinking Project
- Traditional Problem-Solving and Design Thinking
- Research and Planning for a DT Project
- Principles of Design Thinking Relevant for Business Management
- Case Study: DT at Flipkart
- Case Study: Uber
- Task : Literature Survey

Week 4: Establishing the Design Thinking Essentials

- Ensuring the DT Mindset
- Role of Teams in Design Thinking
- Effects of Design Thinking on Teams
- DT Warm-up (Ice-breaking) Exercises
- Case Study: DT at Apple
- Case Study: Solar energy Supply in Rural Africa
- Task : Abstract Submission and 9 Whys’s

Week 5: The DT Process—Understanding the Environment

- DT Process
- First step of the design thinking process—exploration.
- why exploration is an important step to begin with.
- "tools" for conducting exploration.
- Frameworks for analyzing the information collected through exploration.
- Case Study: DT at HCL Technologies
- Case Study: Siemens CT, China
- Task : STEEP Analysis

Week 6: Understanding the Stakeholders' Perspective—Empathy

- Need for "understanding the stakeholders" in design thinking process.
- Role of empathy in design thinking.
- Approaches to "empathizing" with stakeholders.
- How to create customer profiles based on empathy mapping.
- Case Study: DT at Hero MotoCorp Ltd.
- Case Study: PillPack
- Task : Empathy map, Persona of a user, Finalize the Stakeholders/ Customer Segments

Week 7: Defining the Point of View—Problem Articulation

- "How Might we" statements
- Art of Storytelling
- Context Mapping
- Creating a critical item diagram
- Case Study: DT at Infosys
- Case Study: OPT Bank Romania
- Task: Template for Context Mapping

Week 8: Ideation

- Ideation Techniques
- Importance of the ideation phase in the design thinking project.
- Build a buyer utility map.
- Create the lean canvas for the proposed-solution.
- Case Study: DT at Mahindra and Mahindra Group
- Case Study: In-Flight Meal Experience at L Airlines
- Task : Evaluating the Idea: SWOT Analysis, 2*2 Matrix, Dot Voting, NABC Method

Week 9: Creating the Prototype

- Importance of prototyping stage.
- Types of prototypes.
- Stages of prototyping and the uniqueness of each stage.
- Case Study: DT at Godrej
- Case Study: Making Sydney's King Cross Crime Free
- Task : Any Prototyping Method, POC, 3D Model

Week 10: Testing

- Testing Phases
- Need of testing phases
- Tools for testing phase
- Techniques used in testing the prototypes.
- Case Study: DT at Paytm

- Case Study: Employment Pass Service at Singapore
- Task : Tools for Testing Phase- Create a Template for Testing (Testing sheet, Feedback Capture Grid, A/B Testing)

Week 11: Execution

- Creating a Pitch
- Business Model Canvas and Lean Canvas
- Task : Business Model Canvas (BMC)

Week 12: Assessment, Showcase and Publication/Patenting

- Presentation: Teams present their projects to faculty, industry professionals, and peers
- Demonstration: Showcase prototypes and explain the design process
- Publication/Patenting: selecting appropriate journals for publication
- patent application process, including patent searches, drafting patent claims, and filing procedures

Text Books:

1. **Design Thinking: A Comprehensive Textbook** by Shalini Rahul Tiwari, Rohit Rajendra Swarup, Wiley, 2024
2. **Design Thinking: A Beginners perspective**, E Balagurusamy, Bindu Vijaykumar, Mc Graw Hill, 2024

References:

1. **Design Thinking in the Classroom**, David Lee**,** Ulysses Press, Korea, 2018

Course Outcomes Mapping with Weekly Experiments

CO No.	Mapped Weeks	Course Outcome Statement
CO1	Weeks 1–3	**Understand the principles and process of Design Thinking and its relevance in organizational and educational contexts.** *(Covers DT definition, perspectives, traditional vs DT, and initial team/project setup.)*
CO2	Weeks 4–6	**Apply empathy-driven research methods to understand stakeholder needs and create user personas.** *(Covers DT mindset, empathy, STEEP analysis, stakeholder/customer profiling.)*
CO3	Weeks 7–8	**Define problem statements and ideate innovative solutions using appropriate tools and frameworks.** *(Covers HMW statements, context mapping, ideation techniques, Lean Canvas, evaluation methods.)*
CO4	Weeks 9–10	**Develop and test prototypes iteratively, using feedback and testing tools to refine user-centric solutions.** *(Covers prototyping types and stages, testing methods, tools like A/B testing, feedback capture.)*
CO5	Weeks 11–12	**Design, present, and document a viable business model with potential for publication or IP filing.** *(Covers BMC, pitch preparation, patent process, and project demonstration.)*

Course Name: Employability Skills – JobReady

Link to Register:

https://skilling.wadhwanifoundation.org/en/guest

Course Platform: Wadwani Foundation

Week	Course Name	Key Skills
1	Effective Speaking and Listening Skills	• Give and Seek Opinions Effectively • Workplace Conversations • Active Listening
2	Impactful Writing Skills	• Constructing Meaningful Sentences • Describe Experiences • Effective Purposeful Writing
3	Self-Presentation	• Making a Great First Impression • Non-verbal Communication • Group Discussions
4	Self-Management	• Emotional Intelligence • Self-awareness & Growth Mindset • Time and Stress Management
5	Interpersonal Skills	• Teamwork and Networking • Conflict Management • Gaining Acceptance and Negotiating
6	Problem Solving & Innovation	• Critical Thinking • Decision Making • Creative Thinking
7	Professionalism	• Adaptivity • Quality and Result Orientation • Workplace Awareness
8	Customer Centricity	• Customer-focused Mindset • Customer Lifecycle • Customer Relationship Management
9	Work Productivity Tools	• Computer Fundamentals • Microsoft Suite Essentials • Effective Information Search Online
10	Online Communication & Data Security	• Online Meetings & Communication • Internet Safety • Organizational Data Security
11	Financial Literacy	• Banking Basics • Money Management • Financial Concepts
12	Start-up Mindset	• Who is an Entrepreneur? • Establish Startup Mission and Vision • Leadership and Ownership
13	Introduction to Entrepreneurship	• Types of Enterprises • Business Planning and Marketing • Business Accounting

Types of Activities

- **Team-Based Activities** – Brainstorming, role assignments, prototyping
- **Individual Work** – Empathy maps, literature review, persona building
- **Case Study Analysis** – Weekly discussions to reflect real-world DT applications
- **Hands-on Tools** – STEEP, SWOT, Lean Canvas, 2x2 Matrix, Empathy Map
- **Presentation & Pitching** – Mid and final presentations of projects
- **Documentation** – Abstracts, canv

Title: *Capstone Design Thinking Project*

Objective:
To identify a real-world problem, apply the Design Thinking process, and collaboratively develop an innovative, user-centric solution that can be pitched with a viable business model and prototyped outcome.

Project Guidelines

Component	Details
Team Size	4 students
Theme Selection	Based on real-world challenges in domains such as education, health, environment, urban problems, rural innovation, digital inclusion, etc.
Deliverables	Weekly submissions aligned to DT stages (Empathy Map, Persona, Lean Canvas, Prototype, etc.), and a final demo + report
Tools Suggested	Empathy Map, STEEP Analysis, BMC, Lean Canvas, Storyboard, 2x2 Matrix, Dot Voting, NABC, Testing Templates

Week 1: Course Introduction and Project Kickoff
Week 2: What Is Design Thinking, Really?
Week 3: Setting the Stage for Design Thinking in Management Education

Week 4: Establishing the Design Thinking Essentials
Week 5: The DT Process—Understanding the Environment
Week 6: Understanding the Stakeholders' Perspective—Empathy

Week 7: Defining the Point of View—Problem Articulation
Week 8: Ideation

Week 9: Creating the Prototype
Week 10: Testing

Week 11: Execution
Week 12: Assessment, Showcase and Publication/Patenting

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2430471: ELECTRONIC DEVICES AND CIRCUITS LABORATORY

II Year B.Tech. ECE I – Sem.

L	T	P	C
0	0	2	1

Couse Overview:
This course is intended to Illustrates the working of Basic elements of EDC, different Transistors and their applications, the experiments in this course provide essential hands-on experience and theoretical knowledge that are critical for a deep understanding of both Electronic Devices and Electronic Circuits. This course can be applied in Consumer Electronics, Medical Devices, Aerospace and Defense, and Robotics, Industrial Control Systems.

Pre-requisites: Knowledge about electronic devices and circuits is required

Course Objectives:
The students will try to learn
- V-I Characteristics of diode and its applications
- Characteristics of non-linear wave shaping circuits.
- Input and output Characteristics of BJET and FET
- Implementation of BJT applications
- Frequency response of BJT and FET amplifiers

Course Outcomes:
After successful completion of the course, students shall be able to
- Demonstrate the PN-diode and its applications
- Analyze the non-linear wave shaping circuits
- Determine I/O characteristics of BJET and FET configurations
- Build applications of BJT
- Compare the frequency response of BJT and FET amplifiers.

List of Experiments:

1. PN Junction diode characteristics: (a) Forward bias (b) Reverse bias
2. Half Wave Rectifier with & without filters
3. Full Wave Rectifier with & without filters
4. Clippers at different reference voltages
5. Clampers at different reference voltages
6. Input and output characteristics of BJT in CE Configuration
7. Frequency Response of CE amplifier
8. Logic gates using BJT
9. Voltage level indicator
10. Input and output characteristics of FET in CS Configuration
11. Frequency Response of Common Source FET amplifier

12. Transistor as a switch to control the on–off states of a bulb
13. Zener diode as a voltage regulator
14. Verify the SCR Characteristics

NOTE: Minimum of 12 experiments to be conducted.

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2430472: BASIC SIMULATION & DIGITAL SYSTEM DESIGN LABORATORY

II Year B.Tech. ECE I – Sem.

L	T	P	C
0	0	2	1

Couse Overview:

MATLAB plays a crucial role in Digital System Design Labs by providing essential tools and capabilities for simulation, algorithm development, testing, and education. Its versatility, ease of use, and integration with hardware platforms make it an indispensable tool for engineers and students alike in the field of digital system design. This Laboratory also serves as hardware implementation in various domains of digital system design, Signal and Image Processing, Data Visualization and Analysis, Control Systems Design, Machine Learning and Deep Learning, etc.

Course Outcomes:

The students will try to learn

- Various signals and various operations on signals
- Laplace and Fourier transform of a signal and its frequency response
- Random process characteristics
- Algebraic expressions using logic gates
- Adder and subtractor circuits, flip flop operation & sequential circuits using flip flops
- Combinational circuits like mux, decoder, encoder

Course Outcomes:

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

- Examine the applications of signal analysis and system design
- Acquire the basic knowledge of digital logic levels and to design and verify basic digital electronics circuits
- Understand combinational and sequential circuit analysis and design
- Apply Laplace and Fourier transforms of a signal and also analyze its frequency response
- Design optimization methods using random logic gates, multiplexers, decoders, registers, counters.

List of Experiments:

- **Basic Simulation Lab:**
  1. Generation of Various Signals and Sequences (Periodic and Aperiodic).
  2. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
  3. Convolution and for Correlation (ACF and CCF) Signals and sequences.
  4. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
  5. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system.
  6. Gibbs Phenomenon Simulation.
  7. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.

8. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function.
9. Verification of Sampling Theorem.
10. Checking a Random Process for Stationary in Wide sense.

- **Digital System Design Lab:**
  1. Realization of Boolean expressions using gates.
  2. Generation of clock using NAND / NOR gates.
  3. Design a 4 – bit adder/subtractor.
  4. Design and realization of a 4-bit gray to binary and binary to gray Converter.
  5. Design and realization of an 8-bit parallel load and serial out shift register using flip-flops.
  6. Design and realization of a synchronous and asynchronous counter using flip-flops.
  7. Design and realization of 8x1 MUX using 2x1 MUX.
  8. Design and realization of 4-bit comparator.
  9. Design a Ring counter and Twisted ring counter using a 4-bit shift register
  10. Design and Realization of a sequence detector-a finite state machine.

Note:

- All the Basic Simulation Lab experiments are to be simulated using MATLAB/SCI LAB or equivalent software.

Minimum of 14 experiments (7 from Basic Simulation and 7 from Digital System Design Lab) are to be completed.

24X0575: DATA STRUCTURES LAB USING PYTHON

L	T	P	C
0	0	2	1

Course Overview:

Data structures are the fundamental building blocks of computer programming. They define how data is organized, stored, and manipulated within a program. Understanding data structures is very important for developing efficient and effective algorithms. In this Course, student will explore the most commonly used data structures, including linked **lists, stacks, queues, trees, and Hashing.**

Prerequisites:

- A course on “Essentials of Problem Solving”.

Course Objectives: The students will try to learn

- Various linear and non-linear data structures.
- How to perform operations on data structures.
- Priority Queues and Heaps
- Various searching and sorting techniques.
- Different hashing techniques

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

- Develop solutions by using different types of linked lists
- Solve problems using stack and queue
- Learn different types of trees and their applications
- Implement and know the application of algorithms for searching and sorting.
- Design Programs using Hashing

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
3. Write a program that uses functions to perform the following operations on circular linked list: i) Creation ii) Insertion iii) Deletion
4. Write a program that implement stack operations using i) Arrays ii) Pointers

5. Write a c program to implement infix to postfix conversion using stack.
6. Write a c program to implement postfix evaluation.
7. Write a program that implement Queue operations using i) Arrays ii) Pointers
8. Write a program to implement the tree traversal methods using both recursive and non-recursive.
9. Write a program to implement tree operations on i) AVL Trees ii) B Trees iii) Heap
10. Write a program that implements the following sorting methods to sort a given list of integers in ascending order i) Bubble sort ii) Selection sort iii) Insertion sort
11. Write a program that implements the following sorting methods to sort a given list of integers in ascending order i) Merge sort ii) Quick sort iii) Heap Sort
12. Write a program that use both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers: i) Linear search ii) Binary search
13. Write a program to implement hashing.

CASE STUDY-1 Balanced Brackets

A bracket is considered to be any one of the following characters: (,), {, }, [, or].

Two brackets are considered to be a *matched pair* if the an opening bracket (i.e., (, [, or {) occurs to the left of a closing bracket (i.e.,),], or }) *of the exact same type*. There are three types of matched pairs of brackets: [], {}, and ().

A matching pair of brackets is *not balanced* if the set of brackets it encloses are not matched. For example, {[(])} is not balanced because the contents in between { and } are not balanced. The pair of square brackets encloses a single, unbalanced opening bracket, (, and the pair of parentheses encloses a single, unbalanced closing square bracket,].

By this logic, we say a sequence of brackets is *balanced* if the following conditions are met:

- It contains no unmatched brackets.
- The subset of brackets enclosed within the confines of a matched pair of brackets is also a matched pair of brackets.

Given strings of brackets, determine whether each sequence of brackets is balanced. If a string is balanced, return YES. Otherwise, return NO.

CASE STUDY-2 Minimum Average Waiting Time

Mr. Raju owns a pizza restaurant and he manages it in his own way. While in a normal restaurant, a customer is served by following the first-come, first-served rule, Raju simply minimizes the average waiting time of his customers. So he gets to decide who is served first, regardless of how sooner or later a person comes.

Different kinds of pizzas take different amounts of time to cook. Also, once he starts cooking a pizza, he cannot cook another pizza until the first pizza is completely cooked. Let's say we have three customers who come at time t=0, t=1, & t=2 respectively, and the time needed to cook their pizzas is 3, 9, & 6 respectively. If Raju applies first-come, first-served rule, then the waiting time of three customers is 3, 11, & 16 respectively. The

average waiting time in this case is (3 + 11 + 16) / 3 = 10. This is not an optimized solution. After serving the first customer at time t=3, Raju can choose to serve the third customer. In that case, the waiting time will be 3, 7, & 17 respectively. Hence the average waiting time is (3 + 7 + 17) / 3 = 9.
Help Raju achieve the minimum average waiting time. For the sake of simplicity, just find the integer part of the minimum average waiting time.

Note:

- The waiting time is calculated as the difference between the time a customer orders pizza (the time at which they enter the shop) and the time she is served.
- Cook does not know about the future orders.

TEXTBOOKS:

1. Fundamentals of data structures in C, E.Horowitz, S.Sahni and Susan Anderson Freed, 2nd Edition, Universities Press.
2. Data structures using C, A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

REFERENCES:

1. Data structures: A Pseudocode Approach with C, R.F.Gilberg And B.A.Forouzan, 2nd Edition, Cengage Learning.
2. Introduction to data structures in C, Ashok Kamthane, 1st Edition, PEARSON

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2430455: PCB FABRICATION

II Year B.Tech. ECE I – Sem.

L	T	P	C
0	0	2	1

Couse Overview:
This is a skill development course for designing and fabrication of PCB (Printed Circuit Board) for prototyping using software and hardware. PCB designing is an integral part of each electronics product and this course is designed to make students capable to design their own projects PCB.

Pre-requisite: Basic electronics concepts

Course Objectives:
The students will try to
- Understand components and materials simulation tools
- Understand PCB simulation tools
- Develop PCB Designing Flow Chart and description
- Single layer and multilayer PCB
- Design of different circuits on PCB

Course Outcomes:
After successful completion of the course, students shall be able to
- Understand components and their categories
- Understand PCB simulation tools
- Develop PCB Designing Flow Chart and description
- Single layer and multilayer PCB
- Design of different circuits on PCB

List of Experiments:
1. Introduction to circuit creation and simulation using EasyEDA.
2. Introduction to Layout Tool, and creating Layout board using Proteus
3. Design a RLC circuit & verify it for different values of R, L &C.
4. Design a half wave rectifier using Proteus.
5. Design a full wave center tapped rectifier using Proteus.
6. Design a clipper circuit using Proteus.
7. Design a clamper circuit using Proteus.
8. Convert the power supply circuit into PCB.
9. Introduction of the following materials required for the fabrication of simple PCB's
    - PCB copper clad boards
    - Ferrous chloride' for PCB etching
    - Hand drills with needles
    - Glossy photo paper (130gsm) hands on schematic implantation on board
    - Hand grouses, Soldering iron, Soldering paste flux, Soldering lead
    - Iron boxes as a heat sink
10. Development of different mini projects on PCB.

B.Tech. II Year.

MLRS-R24

Course-code	Course Name	L	T	P	C
24XIKS2	Fundamental and Applications of Vedic Mathematics	2	0	0	0

Course Objectives:

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

- Understand the origin, structure and purpose of the Sutras and Upsutras in the context of Vedic Mathematics.
- Compare Urdhva Tiryak multiplication with conventional methods to evaluate and simplicity.
- Solve square root problems using the Dwandwa Yoga method.
- Formulate linear equations in two variables.
- Recognize the contributions of modern Indian mathematicians, such as Srinivasa Ramanujan, in extending mathematical understanding that includes trigonometric functions.

Course Outcome:

CO1: Interpret the Sutras and Upsutras of Vedic Mathematics

CO2: Apply the Urdhva Tiryak Sutra for Vertical and Crosswise Multiplication

CO3: Illustrate square roots using the Dwandwa Yoga method.

CO4: Develop Logical Thinking and Algebraic Reasoning.

CO5: Understand the Contributions of Ancient and Modern Indian Mathematicians on trigonometry.

Unit -I: High Speed Addition and Subtraction: **(5 Hours)**

History of Vedic Maths and its Features, Vedic Maths formulae: Sutras and Upsutras, Addition in Vedic Maths – Without carrying, Dot Method, Subtraction in Vedic Maths – Nikhilam Navatashcaramam Dashatah.

Unit -II: Miracle Multiplication and Excellent Division: **(5 Hours)**

Multiplication in Vedic Maths: Base Method (any two numbers upto three digits), Multiplication by Urdhva Tiryak Sutr, Miracle multiplication: Any three-digit number by series of 1's and 9's, Division by Urdhva Tiryak Sutra (Vinculum method).

Unit- III: Vedic Maths-Lightening Squares and Rapid Cubes: **(6 Hours)**

Squares of any two-digit numbers: Base method, Square of numbers ending in 5: Ekadhikena Purvena Sutra, Easy square roots: Dwandwa Yoga (duplex) Sutra, Square root of 2: Baudhayana Shulbasutra, Cubing: Yavadunam Sutra

Unit- IV: Easy Solution of linear equations: **(4 Hours)**

Introduction of simple equation, Solutions of simple equations, Solutions of linear equations in two variables, Practical application of linear equations in two variables.

Unit V: Contribution of Indian Mathematicians- Trigonometry and its applications: **(8 Hours)**

Varahmihir, Brahmagupta, Srinivasa Ramanujan, Neelkanth Somayya, Bharti Krishna, Tirtha, Baudhayana, Apastamba, Aryabhata, Bhaskara and Lilavati.

Introduction of Trigonometric ratios,Application Trigonometry-Height and Distance, Inverse Trigonometric Function.

References:

1. Vedic Mathematics, Motilal Banarsi Das, New Delhi.
2. Vedic Ganita: Vihangama Drishti-1, Siksha Sanskriti Uthana Nyasa, New Delhi.
3. Vedic Ganita Praneta, Siksha Sanskriti Uthana Nyasa, New Delhi.
4. Vedic Mathematics: Past, Present and Future, Siksha Sanskriti Uthana Nyasa, New Delhi.

Useful Video links:

1. https://www.youtube.com/results?search_query=vedic+mathematics+multiplication.
2. https://www.youtube.com/watch?v=yic5xmqPonMhttps://www.youtube.com/watch?v=yic5xmqPonM.
3. https://www.youtube.com/watch?v=yic5xmqPonM&list=PLrpYUF9DFVUNOwBtrT5QfnJKk3pqCL_7i&index=2
4. https://www.youtube.com/watch?v=LiLGBMX6dBA
5. https://www.youtube.com/watch?v=hkmAkhCLfEQ

II-II

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

240424: ELECTRONIC CIRCUITS

II Year B.Tech. ECE II – Sem. **L T P C**

3 0 0 3

Couse Overview:
This course is intended to introduce students to the fascinating world of analog electronics and pulse circuits. The emphasis of the course is to build intuition behind the operation of circuits. This course can be applied in speedometers, position sensors (laser, radar), Microphones, Thermometers, Amplifiers. RF devices, Heart rate monitors, Pressure gauges.

Pre-requisite: Knowledge on Electronic Devices and Circuits is required.

Course Objectives:
The students will try to learn
- Design concepts of multistage amplifiers
- Design concepts of transistor amplifiers at high frequency
- The concepts of feedback in amplifier circuits
- Various multi-vibrators using transistors and sweep circuits
- Different types of Oscillators and Large Signal Amplifiers

Course Outcomes:
After successful completion of the course, students shall be able to
- Analyze the different types of amplifiers, operation and its characteristics
- Understand the concepts of feedback in amplifier circuits
- Categorize different classes of power amplifiers and tuned amplifiers
- Design the concepts of transistor amplifiers at high frequency
- Illustrate multivibrators for various applications using transistors and sweep circuits

Module – I: Multistage Amplifiers **10L**

Classification of Amplifiers, Distortion in amplifiers, Different coupling schemes used in amplifiers, Frequency response and Analysis of multistage amplifiers, Cascade amplifier, Darlington pair. Transistor at High Frequency: Hybrid – π model of Common Emitter transistor model, f_α, f_β and Unity gain bandwidth, and Gain bandwidth product.

Module – II: Feedback Amplifiers **8L**

Concepts of feedback – Classification of feedback amplifiers – General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations.

Module – III: Oscillators **9L**

Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators, Frequency and amplitude stability of oscillators, Crystal oscillator – Operation and applications.

Module – IV: Large Signal Amplifiers and Tuned Amplifiers **10L**

Large Signal Amplifiers: Class A Power Amplifier- Series fed and Transformer coupled, Conversion

efficiency, Class B Power Amplifier-Push Pull and Complimentary symmetry configurations, Conversion Efficiency, Principle of operation of Class AB and Class C Amplifiers.

Tuned Amplifiers: Single Tuned Amplifiers – Q-factor, Frequency response of tuned amplifiers, Concept of stagger tuning and synchronous tuning.

Module – V: Multivibrators **10L**

Introduction, Types of Triggering, Analysis and Design of Bistable, Monostable, Astable multivibrators, Schmitt trigger using transistors. Time Base Generators: General features of a Time base Signal, Methods of generating time base waveform, concepts of Transistor Miller and Bootstrap time base generator, and Methods of linearity improvement.

TEXT BOOKS:

1. Millman J., Halkias C.C. and Satyabrata Jit, Electronic Devices and Circuits, 3rd edition, Tata McGraw-Hill, 2011.
2. Jacob Millmann and Herbert Taub, “Pulse, Digital and Switching waveforms”, 2nd Edition, Edition, Tata McGraw- Hill publishing company Limited, New Delhi, 2007

REFERENCES:

1. Salivahanan, Suresh Kumar and Vallavaraj, “Electronic Devices and Circuits,” 2nd edition, Tata McGraw-Hill, 2010.
2. Ramakanth A. Gayakwad, “Op-amps and Linear Integrated Circuits”, 3rd Edition, Prentice-Hall of India private Limited, New Delhi, 1995.
3. David A.Bell, “Solid State pulse circuits”, 4th Edition, Prentice-Hall of India Private Limited, New Delhi, 2000.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2440425: PROBABILITY THEORY AND STOCHASTIC PROCESSES

II Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
As a mathematical foundation for statistics, probability theory is essential to many human activities that involve quantitative analysis of data. Explanations and expositions of probability and stochastic processes concepts which they need for their experiments and research. Stochastic processes have applications in many disciplines such as biology, chemistry, ecology, neuroscience, physics, image processing, signal processing, control theory, information theory, computer science, and telecommunications.

Pre-requisite: Knowledge on probability and integration

Course Objectives:
The students will try to learn
- Basic concepts of probability and its various concepts
- Different types of random variables, their density distribution functions and its operations
- The functions of two random variables probability density distribution of the joint random variables
- Concepts of the random processes or distribution functions
- Concepts of temporal and spectral characteristics of random process

Course Outcomes:
After successful completion of the course, students shall be able to
- Apply the basic concepts of probability to solve problems on sample space
- Utilize the density function concepts in communication systems
- Extend knowledge on multiple random variables; relate the same through examples to practical problems
- Understand the usage of stochastic processes
- Analyze the response of LTI systems driven by a stationary random process

Module – I: Probability and Random Variable **10L**

Probability: Probability introduced through sets and relative frequency, Experiments and sample spaces, Discrete and continuous sample spaces, Events, Probability definitions and axioms, Mathematical model of experiments, Probability as a relative frequency, Joint probability, Conditional probability, Total probability, Bayes' theorem, and independent events.

Random Variable: Definition of a random variable, Conditions for a function to be a random variable, Discrete, Continuous, and mixed random variables

Module – II: Distribution & Density Functions and Operations on One Random Variable **9L**

Distribution & Density Functions: Distribution and density functions and their properties - Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and conditional distribution.

Operations on One Random Variable: Expected value of a random variable, Moments about the origin, Central moments, Variance and Skew, Chebyshev's inequality, Characteristic function, Moment generating function, Transformations of a random variable.

Module – III: Multiple Random Variables **9L**

Vector random variables, Joint distribution function and density function, Properties, Marginal

distribution and density functions, Conditional distribution and density, properties, Statistical independence, Sum of two random variables, Central limit theorem (without proof). Expected value of a function of random variables: Joint moments about the origin, Joint central moments,

Module – IV: Stochastic Processes – Temporal Characteristics 10L

The stochastic 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. Time averages and ergodicity, Autocorrelation function and its properties, Cross-correlation function and its properties.

Module – V: The power spectrum and Noise 10L

The power spectrum: Properties, Relationship between power spectrum and autocorrelation function, Transmission of a random process through a linear filter, Power density spectrum of linear system response, Relationship between the PSD at the input and output of LTI system.

Noise: Types of noise, Gaussian and white noise characteristics, resistive/thermal noise, narrow band noise- In-phase and quadrature representation and its properties. Properties of white noise, filtering of white noise through LTI system.

TEXT BOOKS:

1. Peyton Z. Peebles, “Probability, Random Variables & Random Signal Principles,” TMH, 4th Edition, 2005.
2. Herbert Taub & Donald L Schilling, “Principles of Communication Systems,” Tata McGraw-Hill, 4th Edition, 2013.

REFERENCE BOOKS:

1. Athanasios Papoulis and S. Unnikrishnan Pillai, “Probability, Random Variables and Stochastic Processes,” PHI, 4th Edition, 2002.
2. K. Murugesan, P. Guruswamy, “Probability, Statistics & Random Processes”, Anuradha Agencies, 3rd Edition, 2003.
3. B.P. Lathi, “Signals, Systems & Communications,” B.S. Publications, 3rd Edition, 2003.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2440426: ANALOG AND DIGITAL COMMUNICATIONS

II Year B.Tech. ECE II – Sem. **L T P C**

2 1 0 3

Couse Overview:

This course illustrates the working of generation and detection of different analog and digital modulation techniques. This course provides theoretical knowledge that are critical for a deep understanding of both analog and digital communications. Communication is used extensively in radio broadcasting, where analog signals carry music, news, and other audio content over the airwaves to be received by radios.

Pre-requisite: Knowledge on Signals and Fourier Transforms.

Course Objective:

The students will try to learn

- System requirements of analog and digital communication systems
- The generation and detection of various analog and digital modulation techniques
- Theoretical knowledge of each block in AM/FM transmitters and receivers
- The concepts of baseband transmissions and various source & channel coding techniques
- Various noise sources and SNR/Figure of Merit calculations

Course Outcome:

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

- Understand the basic knowledge of AM Transmission & Reception
- Extend the knowledge of FM Transmission & Reception
- Analyze the error performance of digital modulation techniques
- Examine the baseband signal & system transmission model
- Design of conventional telecommunication system

Module – I: Amplitude Modulation **10L**

Significance of modulation, Amplitude Modulation - Time and frequency domain description, power relations in AM waves, Generation of AM waves -square law modulator, Detection of AM signal - Envelope detector, Generation of DSBSC signal - Balanced Modulators, Detection of DSB-SC Modulated signal, SSB modulation, Frequency discrimination and Phase discrimination methods, Demodulation of SSB signal, Introduction to VSB modulation.

Module – II: Angle Modulation **10L**

Introduction to Angle Modulation, Frequency Modulation - Narrow band FM and Wide band FM, bandwidth calculations, constant average power, FM signal generation- Armstrong method, Detection of FM Signal- balanced slope detector, Phase locked loop, Concepts of phase modulation, Comparison of AM, FM and PM, Pre-emphasis, and de-emphasis. Frequency division multiplexing.

Module – III: Introduction to Digital Communications **8L**

Block diagram of digital communication system, advantages, Generation, and demodulation of PAM, PWM, and PPM, Pulse code modulation, differential pulse code modulation, Delta modulation, ADM, noise considerations in PCM and DM, Optimum receiver, Matched filter receiver.

Module– IV: Passband Data Transmission **8L**

ASK generation and detection, FSK generation and detection, PSK generation and detection, DPSK generation and detection, M-ary schemes- QAM and QPSK. Probability of error of ASK, FSK, and PSK.

Module– V: Receivers, Noise Analysis, Information Theory and Coding **10L**

Receivers and Noise Analysis: AM receivers- tuned radio frequency and super heterodyne receivers, FM receiver, SNR and figure of merit calculations of AM, DSBSC, and FM.

Information Theory and Coding: Entropy, mutual information, channel capacity theorem, trade of between bandwidth and SNR, Source coding: Shannon Fano coding and Huffman coding, channel coding – introduction to linear block codes.

TEXT BOOKS:

1. Simon Haykin, “Analog and digital communications,” John Wiley, 4th edition 2005.
2. Herbert Taub, Donald L Schiling, Goutam Saha, “Principles of communication systems,” Mcgraw- Hill, 3rd edition, 2008..

REFERENCES:

1. Dennis Roddy and John Coolean, “Electronic communications,” PEA, 4th Edition, 2004.
2. Wayne Tomasi, “Electronics communication systems,” PHI, 5th edition, 2009.
3. Sudakshina Kundu, “Analog and digital communications,” Pearson India, 1st edition 2010

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2440226: CONTROL SYSTEMS

II Year B.Tech. EEE II – Sem.

L	T	P	C
2	1	0	3

Couse Overview:

(i) Importance of Course: Control system engineering ensures that there is a strategic method to improving productivity and enhancing the best practices of your company. You want to eliminate the redundant manual controls and reduce human errors that could cost you a significant amount of money.

(ii) Brief about the course: the course is designed for the beginners. It includes the basics of control system, the types and elements of the control system. The mathematical modelling of electrical and mechanical systems is discussed.

(iii) Applications of Course: Control systems are used in a wide range of applications, including manufacturing, transportation, and energy production.

Pre-requisites: 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

- Introduce various control systems (Open and closed loop) and their equivalent mathematical models using block diagrams, signal flow graphs and state space techniques
- To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
- To assess the system performance using time and frequency domain analysis and methods for improving it
- Study different types of stability concepts in control systems
- To design various controllers and compensators to improve system performance

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Distinguish the closed-loop control systems from open-loop control systems and develop mathematical models in time domain (differential equations, state equations) and S-domain (Transfer function using Laplace transform).
- Evaluation of transfer function from block diagram and signal flow graph by using block diagram reduction techniques and Mason gain formula, respectively.
- Investigate the stability of control system via Routh-Hurwitz criteria, Root-locus method and Nyquist Plot.
- Utilize standard test signals to analyze the time response of first and second-order control systems and frequency response analysis of the control system.
- Design and develop various controllers and compensators to control the steady state error, stability and transient response.

UNIT - I

Introduction to Control Systems:

Classification of control systems, Effects of feedback: Mathematical modeling of Electrical systems, Transfer function: Potentiometer, synchro, AC servo motor, DC servo motor, Block diagram reduction techniques, signal flow graph, Mason's gain formula.

UNIT - II

Time Domain Analysis:
Standard test signals, Time response: Transient response of first order and second order systems for unit step input, Time domain specifications: rise time, peak time, peak over shot and settling time, Steady state response: Steady state errors and error constants - Effects of P, PD, PI and PID controllers.

UNIT – III

Stability Analysis in S-Domain:
The concept of stability - Routh's stability Criterion, Absolute stability, and relative stability.
Root Locus Technique: The root locus concept, construction of root locus using rules, Effects of adding poles and zeros on the root loci.

UNIT – IV

Frequency Response Analysis: Frequency domain specifications: Bode plot, Stability analysis from Bode plots, Polar Plots, Nyquist Plots, Stability Analysis, Gain margin and phase margin.
Control System Design: Introduction - Lag, Lead and Lag-Lead Compensator.

UNIT - V

State Space Analysis: Concepts of state, State variables and state model, Derivation of state models of linear time invariant systems: transfer function from state model, State transition matrix, Solution of state equation, Concepts of Controllability and Observability.

TEXT BOOKS:

1. I. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009
2. B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.

REFERENCE BOOKS:

1. K. Ogata, “Modern Control Engineering”, Prentice Hall, 1991.
2. M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education, 1997.

24X0511: OOPS Through JAVA

B.Tech. II Year II – Sem.

L	T	P	C
3	0	0	3

Course Overview:

OOPs Through java makes it possible to create full reusable applications with less code and sorted development time. This course is about the fundamentals of Object-Oriented Programming (OOP) Concept and OOP-based software development methodology. It encourages modular objects for reusable code, ensure well organize and maintainable code via encapsulation, inheritance and polymorphism. OOP finds broad application in software development domains:

- Software Development
- GUI Development
- Game Development
- Database Systems
- Simulation and Modeling

Prerequisites:

- A course on Problem Solving Using C and C++

Course Objectives: The students will try to learn

- Concepts and features of object oriented programming
- Java Standard API library such as util, io, applets, GUI based controls.
- Exception handling mechanism, multithreading, packages and interfaces.
- How to use Collection framework
- Internet programming using applets and AWT.

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

- Solve real world problems using OOP concepts.
- Understand the use of abstract classes and Interfaces
- Develop multithreaded applications with synchronization.
- Solve problems using java collection framework
- Develop applications using Event Handling

Module - I **[10]**

Principles of OOPS: OOPS Paradigm, Objects, Classes and Methods, Abstraction, Encapsulation, Inheritance, Polymorphism, Dynamic Binding.

JAVA Introduction: History of Java, Java buzzwords, data types, variables, scope and life time of variables, Type conversion and casting, arrays, operators, Operator Precedence, control statements.

Java String Handling: String Constructors, Special string operations, Character Extraction, String Comparisons, Modifying a string, String Buffer.

Module - II **[9]**

Classes: Class fundamentals, Declaring Objects, methods, Constructors, this keyword, garbage collection, Overloading methods and constructors, Recursion.

Inheritance, Packages and Interfaces – Inheritance basics, Using super, Creating a multilevel hierarchy, method overriding, Dynamic method dispatch, abstract classes, Using final with inheritance, Defining a package, Finding package and class path, Access protection, importing packages, Defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces**.**

Module –III **[9]**

Exception handling - Exception types, uncaught exceptions, using try and catch, Multiple catch classes, nested try statements, throw, throws and finally. Java's built-in exceptions, creating own exception sub classes.

Multithreading - Thread life cycle, Thread Creation using thread class and runnable interface, Creating multiple threads, Thread priorities, Synchronizing threads, Inter thread communication.

Module –IV **[9]**

Collections Framework: Overview, Collection Interfaces, Collection Classes, Accessing a collection via Iterator, Working with Maps

Java Database Connectivity: Types of Drivers, JDBC architecture, JDBC Classes and Interfaces, Basic steps in Developing JDBC Application, Creating a New Database and Table with JDBC.

Module– V **[9]**

GUI Programming with Swing – Introduction, limitations of AWT, MVC architecture, components, containers, Layout Manager Classes, Simple Applications using AWT and Swing.

Event Handling- The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes.

TEXT BOOKS:

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.(Principles of OOPS in UNIT-

I)

REFERENCES:

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.
4. Programming in Java, S. Malhotra, S. Chudhary, 2nd edition, Oxford Univ. Press.
5. Java Programming and Object-oriented Application Development, R. A. Johnson, Cengage Learning

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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244EXL2: PROTOTYPE/ MODEL DEVELOPMENT AND ENTREPRENEURSHIP

II Year B.Tech. II - Sem.

L	T	P	C
0	0	2	1

Week 1
Entrepreneurial Journey
Entrepreneurial Discovery
Week 2
Ideation and Prototyping
Week 3
Testing and Validation
Commercialization and Disruption as Success Drivers
Week 5
Technological Innovation and Entrepreneurship
Week 6
Technology, Business, and Operations Strategies
Week 7
Raising Finances and Developing Financial Strategy
Week 8
Education and Entrepreneurship
Beyond Founders and Founder-Families
Week 9
Beyond Founders and Founder-Families
India as A Start-up Nation
Week 10
National Entrepreneurial Culture
Entrepreneurial Thermodynamics
Human Resources Strategy
Week 11
Entrepreneurship and Employment
Corporate Governance
Marketing Strategy
Week 12
Start-up Case Studies

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2440473: ELECTRONIC CIRCUITS LABORATORY

II Year B.Tech. ECE II – Sem.

L	T	P	C
0	0	2	1

Couse Overview:
This course illustrates the working of different feedback amplifier circuits, power amplifiers, Schmitt trigger, Miller sweep circuit and Bootstrap time base generator. The experiments in this laboratory provide essential hands-on experience and theoretical knowledge that are critical for a deep understanding of both analog and pulse circuits. Audio, RF and Instrumentation amplifiers, Radio and TV receivers, Loud speakers, Signal generators and sweep circuits for TV and radar displays.

Course Objectives:

The students will try to learn

- Single stage and multi stage amplifiers
- The feedback amplifiers and oscillators through simulation.
- Frequency response of Power Amplifiers
- Implementation of circuits for linear and nonlinear wave shaping
- The characteristics of different multivibrators

Course Outcomes:

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

- Compare the frequency of oscillations – Hartley oscillator and Colpitts oscillator RC phase shift oscillator and Wein Bridge Oscillator
- Analyze the bandwidth of power amplifiers
- Determine all multivibrator circuits
- Design Schmitt trigger
- Demonstrate about the output waveforms of Miller Sweep Circuit and Bootstrap Time Base Generator

LIST OF EXPERIMENTS:

Experiments marked with * has to be designed, simulated and verify in hardware laboratory.

1. Two Stage RC Coupled Amplifier **(*)**.
2. Cascade Amplifier circuit / Darlington Pair circuit **(*)**.
3. Current Shunt Feedback Amplifier **(*)**.
4. Voltage Series Feedback Amplifier **(*)**.
5. RC Phase Shift Oscillator using Transistors **(*)**.
6. Hartley and Colpitts's Oscillator circuit **(*)**.
7. Class A Power Amplifier (Transformer less) **(*)**.
8. Class B Complementary Symmetry Amplifier **(*)**.
9. Single Tuned Amplifier circuit **(*)**.
10. Monostable Multivibrator **(*)**.

11. Bistable Multivibrator **(*).**
12. Astable Multivibrator **(*)**.
13. Schmitt Trigger using transistor **(*)**.
14. Verify the output characteristics of Miller Sweep Circuit.
15. Verify the output characteristics of Bootstrap Time Base Generator.

NOTE: Minimum of 12 experiments to be conducted.

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(AUTONOMOUS)

2440474: ANALOG AND DIGITAL COMMUNICATION LABORATORY

II Year B.Tech. ECE II – Sem.

L	T	P	C
0	0	2	1

Couse Overview:

This course illustrates the working of generation and detection of different analog and digital modulation techniques. The experiments in this course provide essential hands-on experience and theoretical knowledge that are critical for a deep understanding of both analog and digital circuits. Analog and digital communication is used extensively in radio broadcasting, where analog signals carry music, news, and other audio content over the airwaves to be received by radios.

Pre-requisites: Basic concepts of analog and digital communications are required.

Course Objectives:

The students will try to learn

- Various analog & digital modulation techniques in communications
- Various spectrums of analog modulation systems using spectrum analyzer
- The importance of automatic gain control and Phase locked loop
- Receiver characteristics in analog & digital communications
- The performance of typical telecommunication system in presence of noise

Course Outcomes:

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

- Categorize different modulation & demodulation techniques used in communication system and implement the same using Hardware
- Design pre-emphasis and de-emphasis circuits used in frequency modulation
- Understand the concept of PLL, Digital phase detector and synchronous detector and implement the same using hardware
- Distinguish between NBFM and WBFM signals using Hardware
- Apply ASK, FSK, PSK, PCM, DPCM modulation scheme on a digital signal

List of Experiments:

1. Amplitude modulation: Generation and detection.
2. Double sideband modulation: Generation and detection.
3. Single modulation (phase shift method): Generation and detection.
4. Frequency modulation: Generation and detection.
5. Study of spectrum analyzer using AM/FM signals.
6. Design & Implementation of pre-emphasis & de-emphasis filters.
7. Time division multiplexing & de-multiplexing of any two band limited signals.
8. Verification of sampling theorem.
9. Pulse amplitude modulation: Generation and detection.
10. Pulse code modulation: Generation and detection.
11. Differential pulse code modulation: Generation and detection.
12. Delta modulation: Generation and detection.
13. Amplitude shift keying: Generation and detection.

14. Frequency shift keying: Generation and detection.
15. Phase shift keying: Generation and detection.

NOTE: Minimum of 12 experiments to be conducted.

24X0578: OOPS Through JAVA Laboratory

B.Tech. II Year II Sem.

L	T	P	C
0	0	2	1

Course Overview:

OOPs Through java makes it possible to create full reusable applications with less code and sorted development time. This course is about the fundamentals of Object-Oriented Programming (OOP) Concept and OOP-based software development methodology. It encourages modular objects for reusable code, ensure well organize and maintainable code via encapsulation, inheritance and polymorphism. OOP finds broad application in software development domains:

- Software Development
- GUI Development
- Game Development
- Database Systems
- Simulation and Modeling

Prerequisites:

- A course on Problem Solving Using C and C++

Course Objectives: The students will try to learn

- Concepts and features of object oriented programming
- Java Standard API library such as util, io, applets, GUI based controls.
- Exception handling mechanism, multithreading, packages and interfaces.
- How to use Collection framework
- Internet programming using applets and AWT.

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

- Solve real world problems using OOP concepts.
- Understand the use of abstract classes and Interfaces
- Develop multithreaded applications with synchronization.
- Solve problems using java collection framework
- Develop applications using Event Handling

UNIT-I:

List of Experiments:

1. a) Use Eclipse or Net bean platform and acquaint 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.

b) Write a java program that prints all real solutions to the quadratic equation ax2
+bx+c=0. Read in a, b, c and use the quadratic formula.

c) Write a java program to implement Fibonacci series.

d) Write a java program to print prime numbers between 1 to 100.

2. a) Write a java program to implement method overloading and constructors overloading.

   b) Write a java program to implement method overriding.

3. a) Write a java program to check whether a given string is palindrome.

   b)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.

4. a) 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.

   b).Write a java program to create user defined exception class and test this class.

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

   b) Write a java program that displays the number of characters, lines and words in a text file.

6. a) Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

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

7. 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).

8. Write Java Programs to perform following:

    a. To count occurrence of each character in a string.
    b. To remove duplicate words from a string.
    c. To print all permutations of a string.

9. Write programs to implement following using Collection Framework:
    a. to add, retrieve & remove element from ArrayList
    b. to Sort & reverse the LinkedList elements
    c. to sort ArrayList using Comparable and Comparator

10. Write programs to implement following using Collection Framework:
    a. to copy elements from HashSet to Array
    b. to remove duplicate key from hashtable
    c. to iterate TreeMap

11. 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. Write a java program to display the table using Labels in Grid Layout.

12. a) 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).

    b) Write a java program to demonstrate the key event handlers.

REFERENCES:

1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.
3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.
4. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell,

24X0574: DATA VISUALIZATION - POWER BI

B.Tech. II Year

L	T	P	C
0	0	2	1

Course Overview:

This course deals with report design and formatting in Power BI, which offers extraordinary visuals for building reports and dashboards. Additionally, gives acquaintance how to use report navigation to tell a compelling, data-driven story in Power BI.

Prerequisites: Nil

Course Objectives: The students will try to learn

- Importing of data from various sources.
- PowerBI Concepts
- Mapping of Visual Layouts and Graphical Properties.
- How to create Dashboard using PowerBI
- Developing of charts using PowerBI.

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

- Understand How to import data into Power BI
- Understand Power BI concepts of Dimensions and Measures.
- Develop Programs and understand how to map Visual Layouts and Graphical Properties.
- Create a Dashboard that links multiple visualizations.
- Use graphical user interfaces to create Frames for providing solutions to real world problems.

List of Experiments:

1. Understanding Data, What is data, where to find data, Foundations for building Data Visualizations, Creating Your First visualization?
2. Getting started with Power BI Software using Data file formats, connecting your Data to Power BI , creating basic charts(line, bar charts, Tree maps),Using the Show me panel.
3. Power BI Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculations and fields.
4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools and Menus, Formatting specific parts of the view.
5. Editing and Formatting Axes, Manipulating Data in Power BI data, Pivoting Power BI data.
6. Structuring your data, Sorting and filtering Power BI data, Pivoting Power BI data.
7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using

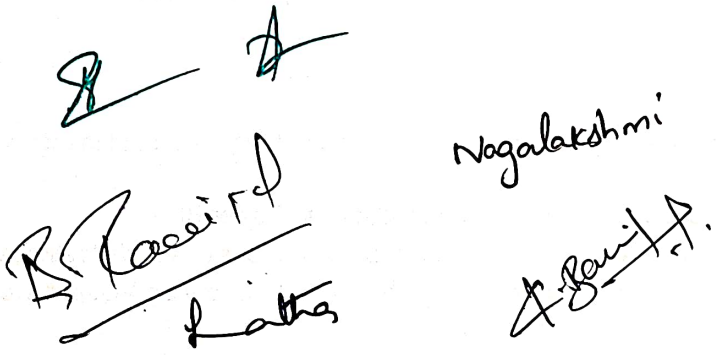
Nagalakshmi

the Size panels,
customizing filters, Using and Customizing tooltips, Formatting your data with colors.

8. Creating Dashboards, adding interactivity to your Dashboard, Distributing & Publishing your Visualization.
9. Power BI file types, publishing to Power BI Online, Sharing your visualizations, printing, and Exporting.
10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

REFERENCES:

1. Microsoft Power BI cookbook, Brett Powell, 2nd edition.
2. R Programming for Data Science by Roger D. Peng (References)
3. The Art of R Programming by Norman Matloff Cengage Learning India.



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, 4th Edition, New age international publishers.

III-I

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2450427: ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

III Year B.Tech. ECE I – Sem. **L T P C**

3 1 0 4

Couse Overview:
This course covers the fundamentals of electromagnetics, including vector systems, field concepts, and Maxwell's equations. Students will study wave propagation, reflection, refraction, and transmission line analysis using classical methods and Smith charts. By completion, they will be able to apply electromagnetic theory in communications, electronics, robotics, aerospace, and industrial systems.
Pre-requisites: Knowledge on Vector calculus.

Course Objectives:
The students will try to learn
- About 3D vector co-ordinate systems and electromagnetic field concepts
- Skills in selecting appropriate Maxwell's equations in electromagnetic theory for a given application and analyze the problem
- The propagation characteristics of electromagnetic waves at boundary of different media
- Tthe ability to compute various parameters for transmission lines using smith chart and classical theory
- Various line parameters by conventional and graphical methods

Course Outcomes:
After successful completion of the course, students shall be able to
- Understand the characteristics of electrostatics and magnetostatics for wave propagation
- Study time varying Maxwell's equations and their applications in electromagnetic problems
- Demonstrate the reflection and refraction of EM waves at boundaries
- Analyze basic transmission line parameters at various conditions
- Show how waves propagate in dielectrics and lossy media

Module – I: Electrostatics **7L**
Coulomb's law, Electric field intensity, Fields due to different charge distributions; Electric flux density, Gauss law and its applications; Scalar electric potential; Energy density, Illustrative problems; Conductors and dielectrics-characterization; Convection and conduction currents; Dielectric constant, isotropic and homogeneous dielectrics; Continuity equation and relaxation time, conductivity, power absorbed in conductor, Poisson's and Laplace's equations; Capacitance: Parallel plate, Co axial, Spherical capacitors; Illustrative problems.

Module – II: Magnetostatics **6L**
Biot-savart law; Ampere's circuital law and applications; Magnetic flux density; Magnetic scalar and vector potentials; Forces due to magnetic fields; Ampere's force law; Boundary conditions: Dielectric- dielectric, Dielectric conductor interfaces; Inductances and magnetic energy; Illustrative problems; Maxwell's equations (Time varying fields): Faraday's law; Inconsistency of ampere's law for time varying fields and definition for displacement current density; Maxwell's equations in differential form, Integral form and word statements.

Module – III: Uniform Plane Waves: **7L**
Wave equations for conducting and perfect dielectric media; Relation between E and H; Wave propagation in lossless and conducting media, Loss tangent, Intrinsic impedance; Skin depth;

Polarization, Illustrative problems.
Reflection/Refraction of Plane Waves: Reflection and refraction at normal incidence, Reflection and refraction at oblique incidence; Standing waves; Brewster angle, Critical angle, Total internal reflection, Surface impedance; Poynting vector and poynting theorem-applications; Power loss in plane conductor; Illustrative problems

Module – IV: Transmission Lines Characteristics 7L

Transmission line characteristics: Types; Transmission line parameters; Transmission line equations; Characteristic impedance, propagation constant; Phase and group velocities; Infinite line concepts, Loss less /low loss transmission line characterization; Condition for distortion less and minimum attenuation in transmission lines; Loading: Types of loading; Introduction to wave guides, Illustrative problems.

Module – V: UHF Transmission Lines and Applications \6L

Input impedance relations; SC and OC lines; Reflection coefficient, VSWR; UHF lines as circuit elements, λ/4, λ/2 and λ/8 lines, impedance transformations, significance of Z_{min} and Z_{max}; Smith chart: Configuration and applications, Illustrative problems.

TEXT BOOKS:

1. E.C. Jordan, K.G. Balmain, “Electromagnetic waves and Radiating Systems,” PHI 2nd Edition, 2000.
2. Matthew N.O. Sadiku, “Elements of Electromagnetics,” Oxford University Press, 4th Edition, 2009.

REFERENCES:

1. William H. Hayt Jr., John A. Buck, “Engineering electromagnetic,” Tata McGraw Hill, 7th Edition, 2006.
2. Nathan Ida, “Engineering Electromagnetic,’’ Springer (India) Pvt. Ltd, 2nd Edition, 2005
3. G. Sashibushana Rao, “Electromagnetic field theory and Transmission lines,’’ Wiley (India) 1st Edition, 2013.

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2450428: MICROPROCESSORS AND MICROCONTROLLERS

III Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course introduces the architecture and programming of microprocessors and microcontrollers, including ARM and STM32 systems. Students will learn interfacing techniques and develop assembly language programs for real-time applications. By the end, they will be able to design and integrate embedded systems for automation and modern technological solutions.

Pre-requisite: Knowledge on digital systems and designs.

Course Objectives:
The students will try to learn
- Architecture of microprocessors
- Programming of microprocessors
- Architecture of microcontrollers, interfacing devices, and interfacing techniques
- Basic concepts of ARM architecture
- Fundamentals of STM32 architecture

Course Outcomes:
After successful completion of the course, students shall be able to
- Understand the Architecture and Operation of the 8086 Microprocessor
- Develop Assembly Language Programs for Processor Applications
- Design and Implement Practical Applications Using Microprocessors
- Apply ARM Processor Architecture in System Design and Development
- Design and Integrate Embedded Systems for Practical Automation Applications

Module – I Introduction of microprocessors **6L**
Introduction to 8086 Processor**:** features of 8086, Register organization of 8086, Architecture of 8086, signal description of 8086, Memory Segmentation, Physical Memory Organization. Minimum mode and Maximum mode 8086 systems and timings diagram.

Module – II: Instruction Set and Assembly Language Programming of 8086 **7L**
Instruction formats, addressing modes, Instruction set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations. Interrupts of 8086, Interrupt Procedure.

Module – III: Introduction to Microcontrollers **7L**
Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes, and Instruction set of 8051.

Module – IV: Interrupts, and Interfaces **7L**
Interrupts and Interfaces: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Introduction to the various interfacings' chips like 8255, 8251, Interfacings key boards, LCD, Stepper motor, ADC, DAC.

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Module – V: ARM Architecture **6L**

ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions, and interrupts interrupt vector table.

ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

TEXT BOOKS:

1. A. K. Ray and K.M. Bhurchandani, “Advanced Microprocessors and Peripherals,” MHE, 3rd Edition 2017.
2. Kenneth. J. Ayala, “The 8051 Microcontroller,” Delmar Cengage Learning, 3rd Edition, 2015.

REFERENCE BOOKS:

1. D. V. Hall, "Microprocessors and Interfacing,” MGH, 3rd Edition 2017.
2. K. Uma Rao, Andhe Pallavi, “The 8051 Microcontrollers, Architecture and Programming and Applications,” Pearson, 3rd Edition, 2019.
3. Andrew Sloss, Dominic Symes, Chris Wright, “ARM System Developers guide,” Elsevier, 2nd Edition, 2012.

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2450429: INTEGRATED CIRCUITS APPLICATIONS

III Year B.Tech. ECE I - Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course introduces the fundamentals and applications of integrated circuits, operational amplifiers, and digital systems. Students will learn analog and digital circuit design using Op-Amps, IC timers, A/D and D/A converters, logic families, combinational and sequential logic ICs, and memory technologies. The concepts are applied to practical systems in communication, signal processing, and control.

Pre-requisites: Knowledge on Basic Electrical Engineering and Semiconductor Devices

Course Objectives:
The students will try to learn
- Basic building blocks of linear integrated circuits
- Theoretical aspects and applications of multivibrators and voltage regulators
- Analyzing the concepts of active filters and PLL
- Development of A/D and D/A converters
- Design and analysis of the various combinational and sequential circuits

Course Outcomes:
After successful completion of the course, students shall be able to
- Understand the basics of Op-Amps and ICs in analog/digital circuits
- Identify applications of Op-Amps and IC timers
- Analyze A/D and D/A converters for accuracy and suitability
- Implement digital systems using combinational logic ICs
- Apply sequential logic and memory for practical circuit design

Module – I: Integrated Circuits and Operational Amplifier **9L**
Introduction, Classification of IC's, IC chip size and circuit complexity, basic concepts of Op-Amp IC741 Op- Amp and its features, the ideal Op-Amp, Op- Amp internal circuit, Op-Amp characteristics - DC and AC analysis. Inverting and non-inverting amplifiers, adder, subtractor, Instrumentation amplifier, AC amplifier, V to I and I to V converters, Integrator and differentiator, Sample and Hold circuit, Log and Antilog amplifier, multiplier and divider, Comparators, Schmitt trigger.

Module – II: Applications of Op-Amp and IC-555 & IC-565 Timer Applications **10L**
Applications of Op-Amp: Triangular and Square waveform generators, Oscillators types and principle of operation –RC, Wein and Quadrature type, IC Voltage Regulators, IC 723 general purpose regulators, Introduction to filters: Butterworth, band pass, band reject and all pass filters.
IC-555 & IC-565 Timer Applications: Introduction to IC 555 timer, description of functional diagram, monostable, Astable operations and applications, PLL, Principles and description of individual blocks of 565.

Module – III: A/D and D/A Converters **9L**
Introduction, basic DAC techniques, D/A converter – specifications - weighted resistor type, R-2R Ladder DAC, A/D Converters – specifications – Counter type, Flash type - Successive Approximation type - Single Slope type – Dual Slope type ADC.

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Module – IV: Digital Integrated Circuits **10L**

Classification of Integrated Circuits, Comparison of Various Logic Families, Combinational Logic ICs– Specifications and Applications of TTL-74XX & Code Converters, Decoders, Demultiplexers, Encoders, Priority Encoders, Multiplexers Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

Module – V: Sequential Logic IC's and Memories: **10L**

Familiarity with commonly available 74XX & CMOS 40XX 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. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs," PHI, 4th Edition, 2003.
2. Floyd and Jain, "Digital Fundamentals," Pearson Education, 11th Edition, 2010

REFERENCES:

1. D. Roy Chowdhury, "Linear Integrated Circuits," New Age International (p) Ltd, 11th Edition, 2018.
2. K. Lal Kishore, "Operational Amplifiers with Linear Integrated Circuits," Pearson, 2nd Edition, 2009.
3. S. Salivahanan, "Linear Integrated Circuits and Applications," Tata McGraw-Hill Education, 3rd Edition, 2018.

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2450437: CELLULAR MOBILE COMMUNICATIONS

III Year B.Tech. ECE I – Sem. **L T P C**

3 0 0 3

Couse Overview:
This course introduces the fundamentals of cellular mobile communication, covering system architecture, frequency reuse, and interference management. It explores signal propagation, antenna design, and handoff mechanisms in mobile networks. Students will gain practical insights into applying these concepts in modern communication systems.

Prerequisite: Basics of Communication systems.

Course Objectives:
The students will try to learn
- Fundamental structure and evolution of cellular systems from 1G to 4G.
- Frequency reuse patterns, channel allocation techniques, and traffic handling in mobile systems.
- Evaluation of different types of interference and their effects on mobile communication systems.
- Examine antenna configurations used at both base stations and mobile units.
- Principles and types of handoffs, and how they influence call continuity and quality

Course Outcomes:
After successful completion of the course, students shall be able to
- Explain the architecture of cellular systems, including concepts such as frequency reuse, cell splitting, and cell sectoring
- Identify and analyze the effects of co-channel and adjacent-channel interference in mobile networks
- Apply propagation models to evaluate signal coverage and understand the effects of terrain, structures, and other environmental factors on signal quality
- Design and analyze mobile and base station antenna systems, and explain frequency management and channel assignment strategies
- Explain the process, types, and challenges associated with handoffs, including mobile-assisted and intersystem handoffs

Module – I: Cellular Systems **7L**
Limitations of Conventional System, Basic Cellular Mobile System, First, second, third and fourth Generation cellular wireless systems, operation of Cellular System, Fundamentals of cellular Radio System Design: concept of frequency reuse channels, Co-channel Interference, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system.

Module – II: Co-Channel & Non-Co-Channel Interference **6L**
Measurement of Real Time Co-Channel Interference, design of Antenna system, cell-splitting Non-co channel interference-adjacent channel interference, Near End far end interference

Module – III: Cell Coverage for Signal and Traffic **8L**
Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, foliage loss, and general formula for mobile propagation over water and flat open area, near and long-distance propagation

Module – IV: Cell Site and Mobile antennas **8L**

Space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, mobile Antennas. Frequency Management and Channel Assignment: Numbering and grouping, setup access and paging channels, channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells.

Module – V: Handoffs **6L**

Handoff Initiation, types of handoffs, delaying handoff, advantages of Handoff, power difference handoff, forced handoff, mobile assisted and soft handoff. Intersystem handoff.

TEXT BOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2nd Edition, 2006
2. Wireless Communications – Theodore S. Rappaport, Pearson Education, 2nd Edition, 2002

REFERENCES:

1. Principles of Mobile Communication – Gordon L. Stuber, Springer International, 2nd Edition, 2001
2. Modern Wireless Communication – Simon Haykin & Michael Moher, Pearson Education, 2005
3. Wireless and Mobile Network Architectures – Yi-Bang Lin & Imrich Chlamtac, Wiley, 2000.

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2450438: DIGITAL IMAGE PROCESSING

III Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course covers the fundamental concepts and techniques in digital image processing, including enhancement, restoration, segmentation, and compression. It introduces various spatial and frequency domain methods, as well as key image transforms. Students will learn to analyze and process images for practical applications in areas like computer vision and multimedia.

Pre-requisites: Knowledge on signals and transforms

Course Objectives:

The students will try to learn

- Fundamentals of digital Image Processing
- Various techniques of image enhancement
- Special purpose filters for image restoration
- Basic concepts of image morphology
- Design and analysis of different image compression coding techniques

Course Outcomes:

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

- Understand Fundamentals of digital Image Processing
- Acquire knowledge on the image enhancement techniques
- Learn the techniques in image enhancement and image restoration
- Design and analyze Image segmentation techniques
- Analyze the Image compression coding techniques

Module – I: Digital image fundamentals, Image Transforms **6L**

Digital image fundamentals: Sampling and quantization, Relationship between pixels.
Image Transforms: 2-D FFT, Properties, Walsh transform, Hadamard transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hottelling Transform.

Module – II: Image enhancement (spatial domain), Image enhancement (frequency domain) 7L

Image enhancement (spatial domain): Introduction, Image enhancement in spatial domain, enhancement through point operation, types of point operation, histogram manipulation, linear and non-linear gray level transformation, local or neighborhood operation, median filter, spatial domain high- pass filtering.

Image enhancement (frequency domain): Filtering in frequency domain, obtaining frequency domain filters from spatial filters, Generating filters directly in the frequency domain, Low pass (smoothing) and High pass (sharpening) Filters in Frequency Domain.

Module – III: Image restoration **6L**

Image restoration: Degradation model, Algebraic approach to restoration, Inverse filtering, least mean square filters, Constrained Least squares Restoration, Interactive Restoration.

Module – IV: Image segmentation **7L**

Image segmentation: Detection of discontinuities, Edge linking, boundary detection, Thresholding, Region oriented segmentation.
Morphological image processing**:** Dilation and Erosion, structuring Element Decomposition, Combining Dilation and Erosion, Opening and closing, the hit or miss Transformation.

Module – V: Image compression **8L**

Image compression: Redundancies and their removal methods, Fidelity criteria, Image Compression models, Huffman and Arithmetic Coding, Error Free Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 standards.

TEXT BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing,” Pearson, 4th Edition, 2018.
2. S Jayaraman, S. Esakkirajan, T Veerakumar, “Digital Image Processing,” TMH, 2nd Edition, 2010.

REFERENCES:

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins “Digital Image Processing using MATLAB,” Gatesmark Publishing, 4th Edition, 2020.
2. A. K. Jain, “Fundamentals of Digital Image Processing, PHI, 1st Edition, 2015.
3. Somka, Hlavac, Boyle, “Digital Image Processing and Computer Vision,” Cengage learning publisher, 1st Edition, 2008.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2450439: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

III Year B.Tech. ECE I - Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course introduces the principles and operation of electronic measuring instruments and systems, focusing on performance characteristics, signal generation, and analysis. It covers oscilloscopes, transducers, physical parameter measurement, and bridge circuits. Applications in biomedical instrumentation are also explored.

Prerequisite: Basics of Electrical and Electronics Engineering.

Course Objectives:
The students will try to learn
- Functioning of various measuring systems and performance characteristics
- Principle of operation and working of signal generators, signal analyzers,
- Characteristics of general and special purpose oscilloscopes
- Concepts related to various transducers
- Various measuring techniques for measurement of different physical parameters using different classes of transducers

Course Outcomes:
After successful completion of the course, students shall be able to
- Select the signal generators and wave analyzers for different applications
- Analyze general and special purpose oscilloscopes in measuring various parameters of signals
- Understand the concepts of various transducers
- Justify the significance of transducers in measuring various forms of energy
- Measure physical parameters using various transducers

Module – I: Performance Characteristics of Systems, Measuring Instruments 9L
Performance Characteristics of Systems: Static Characteristics: Accuracy, Precision, Resolution, Types of Errors, Dynamic Characteristics: Fidelity, Lag, Repeatability, Reproducibility.

Measuring Instruments: D' Arsonval Movement, DC Voltmeters, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range.

Module – II: Signal Generators, Signal Analyzers 10L
Signal Generators: Oscillators, AF, RF Signal Generators, Standard AF Sine and Square wave Generator, Pulse and Square wave Generators, Function Generators, Video Signal Generators.

Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters.

Module – III: General Purpose Oscilloscopes, Special Purpose Oscilloscopes 9L
General Purpose Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.
Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

Module – IV: Transducers, Measurement of Physical Parameters 10L

Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Thermistors and Sensistors, Hotwire Anemometers, LVDT, Thermocouples, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers, gyroscopes, accelerometers.

Measurement of Physical Parameters: Measurement of Humidity and Moisture, Velocity, Data Acquisition Systems.

Module – V: DC and AC Bridges, Bio-Medical Instrumentation 10L

DC and AC Bridges: DC: Wheat Stone Bridge, DC Kelvin Bridge, AC: Maxwell Bridge, Hay's Bridge, Schering Bridge, Resonance Bridge.

Bio-Medical Instrumentation: Basics of biomedical signals and electrodes, ECG, EEG and MRI.

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TEXT BOOKS:

1. H. S. Kalsi, "Electronic Instrumentation," TMH, 4th Edition, 2019.
2. A.D. Helbincs, W. D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques," PHI, 5th Edition 2003.

REFERENCES:

1. K. Lal Kishore, "Electronic Measurements and Instrumentation," Pearson Education, 2010, 2nd Edition, 2012.
2. David A. Bell, "Electronic Instrumentation and Measurements," Oxford Univ. Press, 3rd Edition, 2013.
3. Dr. R. S. Sedha, S. Chand, "Electronic Measurements and Instrumentation," 1st Edition 2013.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2450440: EMBEDDED SYSTEM DESIGN

III Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course provides a comprehensive introduction to embedded systems, covering their architecture, components, and design methodologies. It explores firmware development, real-time operating systems (RTOS), task communication, and device drivers. Students will gain practical knowledge for designing and developing embedded applications.

Pre-requisites: Microprocessor & Microcontroller concepts and applications, Operating system concepts.

Course Objectives:
The students will try to learn
- The basics of an embedded system
- Programing an embedded system
- Designing an embedded System for different applications
- Various operating systems concepts and choosing RTOS
- Design, implement and test an embedded system

Course Outcomes:
After successful completion of the course, students shall be able to
- Describe the design process and components involved in building embedded systems.
- Demonstrate understanding of basic operating systems and real-time operating systems (RTOS).
- Identify and categorize different types of memory used in embedded applications.
- Apply different embedded firmware design approaches for system development.
- Explain and implement task communication and synchronization techniques in embedded systems

Module I: Introduction to Embedded Systems
Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Module II: The Typical Embedded System
The Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off- The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

Module III: Embedded Firmware:
Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages. Difference between C and Embedded C, why C for Embedded.

Module IV: RTOS Based Embedded System Design

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling. Booting process of OS.

Module V: Task Communication

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization Issues, Device Drivers, How to Choose an RTOS. Linux basic and utilities UNIX/IINUX/Window, advantages of Linux, Linux Device drivers , Role of Drivers.

TEXT BOOKS:

1. Shibu K.V, “Introduction to Embedded Systems,” Mc Graw Hill, 3rd Edition, 2017.
2. Morgan Kaufmann, “Computers as Components,” Wayne Wolf, 4th Edition, 2019.

REFERENCES:

1. Raj Kamal, “Embedded Systems-Architecture, programming and Design,” TMH, 2nd Edition, 2007.
2. Frank Vahid, Tony Givargis, “Embedded System Design- Unified Hardware / Software Introduction,” John Wiley, 1st Edition, 2006.
3. Lyla B. Das, “Embedded Systems- An integrated approach,” Pearson, 1st Edition, 2013.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2450475: MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

III Year B.Tech. ECE I – Sem. **L T P C**

0 0 2 1

Couse Overview:
This course provides hands-on experience with **microprocessor (8086)** and **microcontroller (8051)** programming and interfacing. Students will develop assembly-level programming skills to perform arithmetic, logical, string, and control operations on the 8086. They will also implement interfacing techniques using the 8051 for devices such as ADCs, DACs, stepper motors, keyboards, and communication modules. The course emphasizes practical applications of instruction sets, interrupts, timers, and I/O operations, preparing students to design and test embedded systems in real-world scenarios.

Pre-requisites: Basic concepts of microprocessors and microcontrollers**.**

Course Objectives:
The students will try to learn
- Arithmetic and string operations on 16 bit and 32-bit data
- Sorting and searching operation an array for 8086
- Bit level logical operations, rotate, shift, swap and branch operations
- The interfacing of 8051
- Communication between 8051 to interfacing devices

Course Outcomes:
After successful completion of the course, students shall be able to
- Implement and Debug Complex Operations in Assembly Language for 8086 Microprocessor
- Apply Interfacing Techniques for External Devices with the 8051 Microcontroller
- Analyze and Optimize the Performance of Triangular Wave Generation Using 8051 and DAC.
- Write a program for establishing Serial Communication Using 8051
- Create Sequence Generation Using Serial Communication in 8051

List of Experiments:

The following experiments are performed using 8086 Processor Kits and/or Any Assembler (Free/Open)

1. Write a program for 16-bit arithmetic operations for 8086 (using Various Addressing Modes).
2. Write a program for sorting an array for 8086.
3. Write a program for searching for a number or character in a string for 8086.
4. Write a program for string manipulations for 8086.
5. Write a program for rotate, shift and branch instruction for 8086.
6. Parallel communication between two microprocessors.

The following experiments are performed using 8051 Processor Kits and interfacing Kits

7. Write a program using arithmetic, logical and bit manipulation instructions of 8051.
8. Perform interfacing ADC to 8051.

9. Generate Triangular wave through DAC interfacing with 8051.
10. Program and verify interrupt handling in 8051.
11. Perform Time delay Generation Using Timers of 8051.
12. Perform interfacing to 8086 and programming to control stepper motor.
13. Perform interfacing matrix/keyboard to 8051.

NOTE: Minimum of 12 experiments to be conducted.

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2450476: INTEGRATED CIRCUITS APPLICATIONS LABORATORY

III Year B.Tech. ECE I – Sem.

L	T	P	C
0	0	2	1

Couse Overview:

MATLAB plays a crucial role in Digital System Design Labs by providing essential tools and capabilities for simulation, algorithm development, testing, and education. Its versatility, ease of use, and integration with hardware platforms make it an indispensable tool for engineers and students alike in the field of digital system design. This Laboratory also serves as hardware implementation in various domains of digital system design, Signal and Image Processing, Data Visualization and Analysis, Control Systems Design, Machine Learning and Deep Learning, etc.

Pre-requisites: Basic concepts of linear and digital IC applications,

Course Objectives:

The students will try to learn

- The characteristics of op-amp
- Filter characteristics using IC741
- The operation of IC 555
- Designing of combinational circuits using ICs
- Implementation of the sequential circuits using ICs

Course Outcomes:

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

- Apply IC 741 and IC 555 in Practical Circuit Design
- Design and Implement Timer-Based Circuits Using IC 555
- Implement and Optimize IC 741 Filter Circuits for Signal Conditioning
- Analyze the Performance of Combinational Circuits
- Design sequential Circuits Using Digital ICs

List of Experiments:

1. Adder and Subtractor using Op Amp
2. Comparators using Op Amp.
3. Integrator and differentiator Circuits using IC 741.
4. Active Filter Applications –LPF, HPF (first order)
5. IC 741 Waveform Generators –Sine, Square wave and Triangular waves.
6. Mono-stable Multivibrator using IC 555
7. Three Terminal Voltage Regulators –7805, 7809, 7912
8. Design a 16-bit comparator using 4-bit Comparators.
9. Design a 450 KHz clock using NAND / NOR gates.

10. Design a 4-bit pseudo random sequence generator using 4 –bit ring counter.
11. Design a 16 x 1 multiplexer using 8 x 1 multiplexer.
12. Plot the transform Characteristics of 74H, LS, HS series IC's.
13. Design a 4 –bit Gray to Binary and Binary to Gray Converter
14. Design a Ring counter and Twisted ring counter using a 4-bit shift register
15. Design a 4-digit hex counter using synchronous one-digit hex counters

NOTE: Minimum of 12 experiments to be conducted

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2450477: SMART SENSORS AND SYSTEMS LABORATORY

III Year B.Tech. ECE I – Sem. **L T P C**

0 0 2 1

Couse Overview:
This course introduces Arduino and Raspberry Pi for IoT applications through hands-on experiments. Students learn to interface sensors, actuators, and communication devices, and design basic automation systems. Practical projects include smart home, health monitoring, and traffic control applications using embedded IoT solutions.

Pre-requisites: Computer Networks, Python Programming.

Course Objectives:
The students will try to learn

- Fundamentals of Arduino and Raspberry Pi for IoT applications
- Interface sensors, actuators, and communication devices with microcontrollers/microprocessors
- Design and implementation of basic automation systems using Arduino and Raspberry Pi
- Analyzing of sensor data and control real-time operations for embedded IoT applications
- Programming concepts to develop smart prototypes for health, automation, and traffic control

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

- Explain the fundamentals of Arduino and Raspberry Pi platforms for IoT-based applications
- Interface sensors, actuators, and communication devices with microcontrollers/microprocessors
- Design and implement automation systems using Arduino and Raspberry Pi
- Analyze sensor data to control and monitor real-time embedded IoT applications
- Apply programming skills to develop smart IoT prototypes for domains like health, automation, and traffic control

List of Experiments:

The following experiments are performed using any Software (Free/Open recommended like Arduino IDE / Tinkercad Circuits / PlatformIO/ Thonny / VS Code / Geany etc)

1. Programming Raspberry Pi with Python
2. Interfacing LED. DHT11- Temperature and, humidity sensor using Arduino
3. Interfacing Ultrasonic sensor and PIR sensor using Arduino
4. Design of Traffic Light Simulator using Arduino
5. Design of Water flow detection using an Arduino board
6. Interfacing of LED, Push button with Raspberry Pi and Python Program
7. Design of Motion Sensor Alarm using PIR Sensor
8. Interfacing DHT11-Temperature and Humidity Sensor with Raspberry Pi
9. Interfacing DS18B20 Temperature Sensor with Raspberry Pi

10. Implementation of DC Motor and Stepper Motor Control with Raspberry Pi
11. Raspberry Pi based Smart Phone Controlled Home Automation
12. Smart Traffic light Controller
13. Smart Health Monitoring System

NOTE: Minimum of 12 experiments to be conducted.

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B.Tech. III Year Syllabus **MLRITM R-24**

Gender Sensitization

L/T/P/C
Course Code: 24X0022 0/0/3/0

Course Objectives:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Course Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.

UNIT – I

UNDERSTANDING GENDER
Gender: Why Should We Study It? (*Towards a World of Equals:* Unit -1)
Socialization: Making Women, Making Men (*Towards a World of Equals:* Unit -2)
Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT - II
GENDER AND BIOLOGY
Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals:* Unit -4)
Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary (*Towards a World of Equals:* Unit -10)
Two or Many? Struggles with Discrimination.

UNIT - III
GENDER AND LABOUR
Housework: the Invisible Labour (*Towards a World of Equals:* Unit -3)
"My Mother doesn't Work." "Share the Load."
Women's Work: Its Politics and Economics (*Towards a World of Equals:* Unit -7)
Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT - IV
ISSUES OF VIOLENCE
Sexual Harassment: Say No! (*Towards a World of Equals:* Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".
Domestic Violence: Speaking Out (*Towards a World of Equals:* Unit -8)
Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.
Thinking about Sexual Violence (*Towards a World of Equals:* Unit -11)
Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT – V
GENDER: CO - EXISTENCE
Just Relationships: Being Together as Equals (*Towards a World of Equals:* Unit -12)
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

TEXTBOOK
All the five Units in the Textbook, **"*Towards a World of Equals: A Bilingual Textbook on Gender*"** written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by **Telugu Akademi, Hyderabad**,Telangana State in the year **2015**.

REFERENCE BOOKS:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. "I Fought For My Life…and Won."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

III-II

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2460430: ANTENNAS AND WAVE PROPAGATION

III Year B.Tech. ECE II – Sem.

L	T	P	C
3	1	0	4

Couse Overview:
This course covers the fundamentals of antennas and wave propagation, including parameters, radiation mechanisms, and performance characteristics. Students will learn about wire, loop, and array antennas with design principles and measurement techniques. It also explores advanced antennas such as Yagi-Uda, helical, horn, microstrip, and reflector types. The course concludes with wave propagation mechanisms: ground, space, and sky waves for modern communication systems.

Pre-requisite: Knowledge on Electromagnetic fields and Maxwell equations

Course Objectives:
The students will try to learn
- The basic concepts of antennas
- Characteristics of VHF, UHF and Microwave antennas
- Characteristics of microstrip antennas and antenna arrays
- Basic concepts of Microwave tubes
- Concepts of Microwave solid state devices and measurements

Course Outcomes:
After successful completion of the course, students shall be able to
- Explain the mechanism of radiation, distinguish between different antenna radiation characteristic parameters
- Configure the geometry and establish the radiation patterns of folded dipole, Yagi-Uda Antenna, Helical Antennas, Horn Antennas
- Analyze a micro strip rectangular patch antenna and a parabolic reflector antenna, and characteristics of N-element BSA, EFA, modified EFA, Binomial Arrays
- Distinguish between the performance characteristics of 2-Cavity and Reflex Klystrons, Magnetrons, and estimate their efficiency levels
- Understand the concepts of TEDs, and the S-Matrix for various microwave junctions, and to set up a microwave bench for measurements

Module – I: Antenna Basics and Thin Linear Wire Antennas **9L**

Antenna Basics: Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height.

Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Radiation, Retarded Potentials – Helmholtz Theorem

Thin Linear Wire Antennas – Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths. Loop Antennas - Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment).

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Module – II: Antenna Arrays and Antenna Measurements 9L

Antenna Arrays: Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays.

Antenna Measurements: Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods).

Module – III: VHF, UHF and Microwave Antennas - I 9L

VHF, UHF and Microwave Antennas - I: Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns.

Module – IV: VHF, UHF and Microwave Antennas - II 9L

VHF, UHF and Microwave Antennas - II: Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Reflector Antennas – Introduction, Flat Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features.

Module – V: Wave Propagation, Space Wave Propagation, Sky Wave Propagation 9L

Wave Propagation - Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts,

Ground Wave Propagation –Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections.

Space Wave Propagation –Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Troposphere Propagation.

Sky Wave Propagation –Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation.

TEXT BOOKS:

1. J.D. Kraus, R.J. Marhefka and Ahmad S. Khan "Antennas and Wave Propagation," MCH, New Delhi, 5th Edition, 2017.
2. E.C. Jordan and K.G. Balmain "Electromagnetic Waves and Radiating Systems," PHI, 2nd Edition, 2015.

REFERENCE BOOKS:

1. C.A. Balanis, "Antenna Theory," John Wiley & Sons, 4th Edition, 2021.
2. K.D. Prasad, Satya Prakashan, "Antennas and Wave Propagation," Tech India Publications, New Delhi, 1st Edition, 2019.
3. "Foundations for Microwave Engineering," – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2007

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2460424: DIGITAL SIGNAL PROCESSING

III Year B.Tech. ECE II – Sem. **L T P C**

3 1 0 4

Couse Overview:
This course introduces the fundamentals of digital signal processing (DSP), including discrete-time signals, systems, and their frequency domain representation. It covers Fourier analysis techniques such as DFS, DFT, and FFT with applications in convolution and spectral analysis. Students will learn the design and realization of IIR and FIR filters using various methods. The course also explores multirate DSP techniques like decimation, interpolation, and sampling rate conversion.

Pre-requisite: Signals and Systems.

Course Objectives:
The students will try to learn
- Basic concepts related to the analysis and processing of digital signals
- Fast computation of DFT and appreciate the FFT processing
- Designing of IIR digital filters and analyze and synthesize
- Designing of FIR digital filters and analyze and synthesize
- Realization of the structures of digital filters and acquaint in multi-rate processing techniques

Course Outcomes:
After successful completion of the course, students shall be able to
- Explain the fundamental concepts of digital signal processing for understanding system characteristics.
- Evaluate various discrete Fourier transformations for real world problems.
- Design IIR digital filters for evaluating their performance in discrete-time signal processing systems.
- Apply different design techniques for FIR filters for achieving specific frequency-domain requirements.
- Analyze the realization of digital filters in various forms, in relation to multi-rate digital signal processing systems

Module – I: Introduction to digital signal processing **10L**

Classification of discrete time signals & systems, Conversion of continuous to discrete time signal. Linear constant coefficient difference equations, Solution of linear constant coefficient difference equation: Zero input response, Zero state response, Impulse response, and Step response. Frequency domain representation of discrete time signals and systems.

Module – II: Discrete Fourier series, Fourier Transforms, Fast Fourier Transforms 8L

Discrete Fourier series: DFS representation of periodic sequences, Properties of DFS.
Discrete Fourier Transforms: Properties of DFT, Linear convolution of sequences using DFT, Computation of DFT: Over-lap Add method, Over-lap Save method, Relation between DTFT, DFS, DFT and Z-Transform.
Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT.

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Module – III: IIR Digital Filters **9L**

Analog filter approximations- Butterworth and Chebyshev filters, Design of IIR Digital Filters from Analog Filters, Step and Impulse invariant techniques, Bilinear transformation method, Spectral transformations.

Module – IV: FIR Digital Filters **10L**

Characteristics of FIR digital filters, Frequency response. Design of FIR Filters: Fourier method, Digital filters using window techniques, Frequency sampling technique, Comparison of IIR & FIR filters.

Module – V: Realization of Digital Filters, Multirate Digital Signal Processing **10L**

Realization of Digital Filters: Applications of Z-transforms, Solution of difference equations of digital filters, System function, Stability criterion, Frequency response of stable systems. Realization of digital filters – Direct, Canonic, Cascade and Parallel forms.

Multirate Digital Signal Processing: Introduction, Decimation by a factor D, Spectrum of decimator, Interpolation by a factor I, Spectrum of interpolator, Sampling rate conversion by a rational factor I/D, Spectrum of sampling rate converter.

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, “Digital signal processing, principles, algorithms and applications,” Prentice Hall, 4th Edition, 2015.
2. A.V. Oppenheim, R.W. Schaffer, “Discrete time signal processing,” PHI, 2nd Edition, 2015

REFERENCES:

1. S. Salivahanan, Vallavaraj, Gnanapriya, “Digital signal processing,” Tata McGraw-Hill Education, 2nd Edition, 2009.
2. A. Nagoorkani, “Digital signal processing,” Tata McGraw-Hill Education, 2nd Edition, 2012.
3. P. Ramesh Babu, “Digital signal processing,” SCI Tech, 6th Edition, 2015

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2460432: DIGITAL CMOS IC DESIGN

III Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course introduces IC fabrication processes, CMOS circuit design, and Verilog HDL modeling for digital system design. It covers static and dynamic behavior of CMOS circuits, hierarchical modeling methodologies, and programmable logic devices. Applications include VLSI design, embedded systems, and testing strategies for reliable CMOS circuit implementation.

Pre-requisite: Digital System Design, C Language.

Course Objectives:
The students will try to learn
- Different steps involved in the fabrication of ICs
- Static and dynamic behavior of CMOS logic circuits
- Logic circuits with Verilog HDL with its modelling concepts
- Modelling concepts to design CMOS logic circuits
- Basic programmable logic devices and testing of CMOS circuits

Course Outcomes:
After successful completion of the course, students shall be able to
- Acquire qualitative knowledge about the fabrication process of CMOS integrated circuits
- Analyze static and dynamic behavior of CMOS logic circuits
- Understand HDL top-down and bottom-up design methodology, design building blocks of CMOS logic circuits
- Understand building blocks of data path systems, memories and simple logic circuits using PLA, PAL, FPGA and CPLD
- Analyze standard cells and design a complex circuit

Module – I: Introduction to IC Technology **10L**
A Historical Perspective, Issues in Digital Integrated Circuit Design, Quality Metrics of a Digital Design, MOS, PMOS, NMOS, CMOS, BiCMOS. VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

Module – II: CMOS Inverter, Designing Logic Circuits in CMOS **9L**
The CMOS Inverter: Static CMOS Inverter, Static Behavior, Dynamic Behavior, Power, Energy, and Energy-Delay.
Designing Logic Circuits in CMOS: Static CMOS Design, Dynamic CMOS Design, Timing Metrics for Sequential Circuits, Static Latches and Registers, Dynamic Latches and Registers, Pipelining.

Module – III: Verilog HDL, Hierarchical Modeling Concepts **9L**
Overview of Verilog HDL: Evolution of CAD, emergence of HDLs, typical HDL-based design flow, why Verilog HDL trends in HDLs.
Hierarchical Modeling Concepts: Top-down and bottom-up design methodology, differences between modules and module instances, parts of a simulation, design block, stimulus block, Lexical conventions, data types, system tasks, compiler directives, Module definition, port declaration, connecting ports,

hierarchical name referencing.

Module – IV: Gate-Level Modeling, Dataflow Modeling, Behavioral Modeling 10L

Gate-Level Modeling: Modeling using basic Verilog gate primitives, description of and/or and buf/not type gates, rise, fall and turn-off delays, min, max, and typical delays.

Dataflow Modeling: Continuous assignments, delay specification, expressions, operators, operands, operator types.

Behavioral Modeling: Structured procedures, initial and always, blocking and nonblocking statements, delay control, generate statement, event control, conditional statements, multiway branching, loops, sequential and parallel blocks.

Module – V: Programmable Logic Devices: 10L

Programmable Logic Devices: Design Approach –PLA, PAL, Standard Cells, FPGAs, CPLDs. CMOS Testing: CMOS TESTING, Test Principles, Design Strategies for Test, Chip Level Test Techniques.

TEXT BOOKS:

1. Jan M Rabaey, “Digital Integrated Circuit: A Design Perspective”, PHI; 2nd Edition, 2016.
2. S.Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis, Pearson, 2nd Edition, 2003

REFERENCE BOOKS:

1. Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, “Essentials of VLSI Circuits and Systems,” PHI, 2nd Edition 2009.
2. Neil H. E. Weste, David Harris, Ayan Banarjee, “CMOS VLSI DESIGN - A Circuits and Systems Perspective,” 4th Edition, Pearson, 2nd Edition, 2015.
3. Wayne Wolf, “Modern VLSI Design,” Pearson Education, 4th Edition, 2015.

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(AUTONOMOUS)

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2460441: Wireless Communications

III Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course covers This course covers the fundamentals of Wireless Sensor Networks (WSNs), including architecture, constraints, node design, enabling technologies, and communication protocols. Students will explore WSN applications across industries and learn to analyze, design, and evaluate WSNs for real-world use in healthcare, industry, military, and environmental monitoring

Pre-requisites: Basics of communication systems.

Course Objectives:
The students will try to learn
- Fundamentals, challenges, and constraints of WSNs
- Applications of WSNs in real-world domains
- Architecture and subsystems of sensor nodes
- Enabling technologies for WSNs (ZigBee, Bluetooth, UWB)
- Analyzing physical layer aspects like propagation, error, and sensing models

Course Outcomes:
After successful completion of the course, students shall be able to
- Explain WSN concepts, challenges, and applications
- Describe WSN architecture and its subsystems
- Compare sensor node structures and technologies
- Apply propagation, error, and sensing models in WSNs
- Evaluate protocols and technologies for WSN deployment

Module – I: Introduction **7L**
Introduction: Introduction to Wireless sensor networks, Definitions and background, Challenges and constraints, Single-sink single-hop WSN, Single-sink multi-hop WSN, Multi-sink multi-hop WSN, Advantages of sensor networks

Module – II: Applications of WSNs **6L**
Applications of WSNs: Positioning and animals tracking, Entertainment, Logistics, Transportation, Industrial Control and Monitoring, Home Automation and Consumer Electronics, Security and Military Sensing, Asset Tracking and Supply Chain Management, Intelligent Agriculture and Environmental monitoring, Health Monitoring.

Module – III: Node Structure **7L**
Node Structure: The Sensing Subsystem, Analog-to-Digital Converter, The Processor Subsystem, Architectural Overview, Microcontroller, Digital Signal Processor, Application-specific Integrated Circuit, Field Programmable Gate Array, Comparison Communication Interfaces, Serial Peripheral Interface, Inter-Integrated Circuit, Prototypes, The IMote Node Architecture, The XYZ Node Architecture, The Hogthrob Node Architecture.

Module – IV: Technologies for WSNs **5L**
Technologies for WSNs: ZigBee technology, Ultrawide bandwidth technology, Bluetooth technology,

Comparison among technologies.

Module – V: Physical Layer **7L**

Introduction, Wireless Propagation Models: The Free Space Propagation Model, The Two-Ray Ground Model, The Log-Distance Path Model, Energy Dissipation Model, Error Models: The Independent Error Model, The Two-State Markov Error Model, Sensing Models: The Binary Sensing Model, The Probabilistic Sensing Model.

TEXT BOOKS:

1. Holger Karl and Andreas Willig – Protocols and Architectures for Wireless Sensor Networks, Wiley, 2005.
2. Kazem Sohraby, Daniel Minoli, and Taieb Znati – Wireless Sensor Networks: Technology, Protocols, and Applications, Wiley, 2007.

REFERENCES:

1. Raghavendra, C. S., Sivalingam, K. M., & Znati, T. – Wireless Sensor Networks, Springer, 2004.
2. Waltenegus Dargie and Christian Poellabauer – Fundamentals of Wireless Sensor Networks: Theory and Practice, Wiley, 2010.
3. Anna Hac – Wireless Sensor Network Designs, Wiley, 2003.

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2450428: 2460442 SPEECH SIGNAL PROCESSING

III Year B.Tech. ECE II – Sem. **L T P C**
3 0 0 3

Couse Overview:
This course introduces the fundamentals of speech production, the nature of speech signals, and digital processing methods for speech analysis. It covers short-time spectrum analysis, linear prediction, stochastic modeling, and speech recognition techniques using Hidden Markov Models and neural networks. Students will also explore applications such as speech enhancement, speech synthesis, and speaker recognition.

Pre-requisite: Knowledge of signals & systems, digital signal processing, and probability theory

Course Objectives:

The students will try to learn

- Fundamentals of speech production and characteristics of speech signals
- Application of digital signal processing concepts to model and analyze speech signals
- Random processes and stochastic modeling for speech representation
- Implementation of speech analysis methods including short-time spectrum and linear prediction
- HMMs and neural networks for speech recognition and related applications

Course Outcomes:

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

- Explain the mechanisms of speech production and the properties of speech signals
- Apply DSP techniques to represent and analyze speech
- Use short-time spectrum and linear prediction analysis for speech feature extraction
- Implement models such as HMMs and neural networks for speech recognition
- Design and evaluate applications in speech enhancement, synthesis, and speaker recognition

Module – I: Fundamentals of Speech and DSP **8L**
Background to speech signal processing, Speech production mechanism and nature of the speech signal Basics of digital signal processing (review), Equivalent representations of signals and systems

Module – II: Random Processes & Signal Characterization **7L**
Introduction to random processes, Stochastic properties of speech signals, Statistical modelling approaches in speech.

.

Module – III: Speech Analysis Methods **7L**
Short-time spectrum analysis, Linear prediction analysis, Cepstral analysis (optional enrichment)

Module – IV: Hidden Markov Models (HMMs): basics & applications **6L**
Hidden Markov Models (HMMs): basics & applications, Neural network models for speech recognition, Hybrid HMM-DNN frameworks (advanced option)

.

Module – V: Applications of Speech Signal Processing **6L**
Speech enhancement (noise reduction, filtering), Speech synthesis (text-to-speech, vocoders), Speaker

recognition & verification systems, Emerging applications in AI and voice interfaces

TEXT BOOKS:

1. Rabiner L R, Huang B H and Yegnanarayana B, Fundamentals of Speech Recognition (Indian Subcontinent Adaptation), 1st Edition, Pearson Education (2009).
2. Deller J R Jr., Hansen J H L and Proakis J G, Discrete-time Processing of Speech Signals, 1st Edition, IEEE Preas (2000).

REFERENCE BOOKS:

1. Quatieri T F, Discrete-time Speech Signal Processing, 1st Edition, Prentice-Hall (2002).
2. Rabinder L R and Juang B H, Fundamentals of Speech Recognition, 1st Edition, Pearson Education (1993).
3. Rabiner L R and Schafer R W, Theory and Applications of Digital Speech Processing, 1st Edition, Pearson Education (2011).

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2460443: Micro Electronics

III Year B.Tech. ECE II - Sem. **L T P C**
3 0 0 3

Couse Overview:
This course introduces IC technologies and VLSI design. Covers MOSFET scaling, CMOS inverter characteristics, digital/analog circuit design, IC fabrication, layout rules, and low-power/high-speed techniques for modern microelectronics.

Pre-requisites: Electronic Devices, Analog & Digital Circuits

Course Objectives:
The students will try to learn
- IC technologies, MOSFET scaling, and VLSI design flow
- CMOS inverters and design digital circuits
- Analog VLSI building blocks in circuit design
- IC fabrication steps and layout rules
- Evaluation of power, delay, and performance in VLSI systems

Course Outcomes:
After successful completion of the course, students shall be able to
- Explain IC scaling, design flow, FPGA/PAL/PLA architectures
- Analyze CMOS inverters and design combinational, sequential & memory circuits
- Estimate parameters in analog sub-circuits, current mirrors, references, switched-capacitor circuits
- Apply layout design rules and describe fabrication steps
- Evaluate delay & power in CMOS circuits; explain low-power/high-speed design concepts

Module – I: Introduction to ICs **7L**
IC advantages/limitations, SSI–ULSI, Moore's Law, MOSFET scaling, short channel effects, VLSI design flow, IC classification, PAL/PLA/FPGA.

Module – II: Digital VLSI Circuits **8L**
CMOS inverter characteristics, combinational logic (CMOS, pseudo NMOS, TG, pass transistor, dynamic, domino, NORA), sequential circuits (latches, flip-flops), SRAM/DRAM.

Module – III: Analog VLSI Circuits **8L**
MOS small-signal model, MOS switch/diode, current mirror, references (divider, threshold, bandgap), switch-capacitor circuits, CMOS differential amplifier, op-amp basics.

Module – IV: Layout & Fabrication **8L**
Lambda/micron rules, stick diagrams & layouts (inverter, NAND, NOR), IC fabrication steps (wafer, oxidation, lithography, diffusion, metallization, packaging), CMOS N-well/P-well/twin-tub.

Module – V: Low Power & High Speed **9L**

Power dissipation (dynamic, short-circuit, leakage), switching activity, logical effort, timing parameters (setup/hold, delay, slack, skew), CMOS inverter delay (expressions only), intro to adiabatic logic.

TEXT BOOKS:

1. J. M. Rabaey, A. Chandrakasan, and B. Nikolic, Digital Integrated Circuits: A Design Perspective, 2nd ed., Pearson Education, 2003.
2. P. E. Allen and D. R. Holberg, CMOS Analog Circuit Design, 3rd ed., Oxford University Press, 2011.

REFERENCES:

1. S.-M. Kang and Y. Leblebici, CMOS Digital Integrated Circuits: Analysis and Design, 3rd ed., Tata McGraw-Hill, 2003.
2. B. Razavi, Design of Analog CMOS Integrated Circuits, Tata McGraw-Hill, 2002.
3. A. S. Sedra and K. C. Smith, *Microelectronic Circuits*, 7th ed., Oxford University Press, 2015.

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24X0540: BLOCKCHAIN TECHNOLOGY

L T P C
3 0 0 3

Prerequisites: cryptography and Network security, Computer Networks

Course Objectives:

- To learn the fundamentals of Blockchain and various types of block chain and consensus mechanisms.
- To understand the public block chain system, Private block chain system and consortium blockchain.
- Able to know the security issues of blockchain technology.
- Exploring cryptocurrency principles, Bitcoin, altcoins, tokens, and their usage in digital economy.
- Applying knowledge of public, private, and consortium blockchains for real-world problem-solving.

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

- Understand concepts behind crypto currency
- Apply of smart contracts in decentralized application development
- Explain public, private, and consortium blockchain architectures with relevant use cases.
- Implement smart contracts and blockchain applications using Ethereum, Python, or Hyperledger Fabric.
- Analyze blockchain security, privacy, scalability, and performance challenges across domains.

MODULE – I [10]

Fundamentals of Blockchain: Introduction, Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future. Blockchain Types and Consensus Mechanism: Introduction, Decentralization and Distribution, Types of Blockchain, Consensus Protocol. Cryptocurrency – Bitcoin, Altcoin and Token: Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

MODULE – II [10]

Public Blockchain System: Introduction, Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain.

Smart Contracts: Introduction, Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

MODULE – III [10]

Private Blockchain System: Introduction, Key Characteristics of Private Blockchain, Need of Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E- commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, ByzantineFault, Multichain.

Consortium Blockchain: Introduction, Key Characteristics of Consortium Blockchain, Need of Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda. Initial Coin Offering: Introduction, Blockchain Fundraising Methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.

MODULE – IV [10]

Security in Blockchain: Introduction, Security Aspects in Bitcoin, Security and Privacy Challenges of Blockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart Contract (DApp), Security Aspects in Hyperledger Fabric.

Applications of Blockchain: Introduction, Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain In Supply Chain, The Blockchain and IoT. Limitations and Challenges of Blockchain.

MODULE – V [8]

Blockchain Case Studies: Case Study 1 – Retail, Case Study 2 – Banking and Financial Services, Case Study 3 – Healthcare, Case Study 4 – Energy and Utilities.

Blockchain Platform using Python: Introduction, Learn How to Use Python Online Editor, Basic Programming Using Python, Python Packages for Blockchain.

Blockchain platform using Hyperledger Fabric: Introduction, Components of Hyper ledger Fabric Network, Chain codes from Developer.ibm.com, Blockchain Application Using Fabric Java SDK.

TEXT BOOK:

1. "Blockchain Technology", Chandramouli Subramanian, Asha A. George, **Abhilasj K A and Meena Karthikeyan, Universities Press.**

REFERENCE BOOKS:

1. Michael Juntao Yuan, Building Blockchain Apps, Pearson, India.
2. Blockchain Blueprint for Economy, Melanie Swan, SPD O'reilly.
3. Blockchain for Business, Jai Singh Arun, Jerry Cuomo, Nitin Gaur, Pearson.

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2466649: IOT TECHNOLOGY AND APPLICATIONS

III Year B.Tech. II - Sem. **L T P C**

3 0 0 3

Course Objectives:

The students will try to learn

- Study the basics of IoT Network architecture and design.
- Familiarize with IoT access technologies.
- Understand the application protocols for IoT.

Course Outcomes:

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

- Comprehend the basics of IoT Network architecture.
- Discuss about various Access technologies.
- Explain IoT network layer.
- Analyze the various IoT Application layer Protocols.
- Describe the protocols in securing IoT

MODULE - I: IoT Network Architecture and Design **8L**

Network Architecture, IoT Architectures, M2M IoT, IoT World Forum (IoTWF), IT and OT Responsibilities, Simplified IoT Architecture, Core IoT Functional Stack: Layer 1, Layer 2, Layer 3.

MODULE - II: IoT Access Technologies **8L**

IoT Access Technologies, IEEE 802.15.4, LoRa WAN, NB-IoT, Physical Layer, MAC Layer, Topology, Securities

MODULE - III: IoT Network Layer **8L**

Need for optimization, Optimizing IP for IoT 6LoWPAN to 6Lo, Header compression, Fragmentation, Mesh, 6TiSCH, RPL, Objection Function (OF), Authentication and Encryption on Constrained Nodes

MODULE – IV: Application Protocols for IoT **7L**

Transport layer, SCADA, Adopting SCADA for IP, Tunneling legacy, Protocol Translation IoT Application layer protocols, CoAP, MQTT

MODULE – V: Securing IoT **7L**

Common challenges in OT Security, Modbus, DNP3, ICCP, OPC, IEC Protocols, Purdue model for control Hierarchy, OT network characteristics Impacting Security, Security Priorities.

TEXT BOOKS:

1. David Hanes “IoT Fundamentals: Networking technologies, Protocols, and Use Cases for the Internet of Things”, Cisco Press.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things – Key applications and Protocols”, Wiley, 2012

REFERENCE BOOKS:

1. Rahul Dubey, “An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications”, Cengage India Publication.
2. 4. https://nptel.ac.in/noc21_ee85.

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.2460478: DIGITAL SIGNAL PROCESSING LABORATORY

III Year B.Tech. ECE II – Sem.

L	T	P	C
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Couse Overview:
This course offers practical exposure to digital signal processing using MATLAB. Students implement convolution, design FIR/IIR filters, and analyze signals using DFT/FFT techniques. Experiments include spectral analysis, sampling rate conversion, and DSP applications in real-world systems.

Pre-requisites: Basic concepts of digital signal processing

Course Objectives:
The students will try to learn
- Implementation of Linear and Circular Convolution
- Implementation of FIR and IIR filters
- Time and frequency response of discrete-time systems using various techniques like Z Transform, DFT, FFT
- The architecture of DSP processor
- Demonstration of Finite word length effects

Course Outcomes:
After successful completion of the course, students shall be able to
- Understand the handling of discrete/digital signals using MATLAB
- Learn the basic operations of Signal processing
- Analyze the spectral parameter of window functions
- Design IIR, and FIR filters for band pass, band stop, low pass, and high pass filters
- Design the signal processing algorithm using MATLAB

List of Experiments:
1. Generate Sinusoidal Waveform / Signal based on Recursive Difference Equations.
2. Histogram of White Gaussian Noise and Uniformly Distributed Noise.
3. Find DFT/IDFT of a DT signal/Sequence.
4. Find Frequency Response of a given System given in Transfer Function/ Differential equation form.
5. Obtain Fourier series coefficients by formula and using FET and compare for half sine wave.
6. Implement FFT for a given Sequence.
7. Determine Power Spectrum of a given Signal (s).
8. Implement LP FIR Filter for a given Sequence/Signal.
9. Implement HP IIR Filter for a given Sequence/Signal.
10. Generate Narrow Band Signal through Filtering.
11. Generate DTMF Signals.
12. Implement Decimation Process.

13. Implement Interpolation Process.
14. Implement of I/D Sampling Rate Converters.
15. Impulse Response of First order and Second Order Systems.

NOTE: Minimum of 12 experiments to be conducted.

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2460479: DIGITAL CMOS IC DESIGN LABORATORY

III Year B.Tech. ECE II – Sem.

L	T	P	C
0	0	2	1

Couse Overview:
This course provides hands-on experience in CMOS digital design using HDL and FPGA platforms. Students learn MOS/CMOS characteristics, design and analysis of combinational and sequential circuits, and development of complex systems such as ALUs, FSMs, and memories. The course also emphasizes CMOS layout design, verification checks, and practical implementation of digital circuits for real-world applications.

Pre-requisites: Basics of VLSI Design.

Course Objectives:

The students will try to learn

- MOSFET and CMOS characteristics for digital circuit design
- Combinational and sequential CMOS circuits and evaluate their performance
- Layouts of CMOS circuits and validate them using DRC, LVS, and RC checks
- Application of HDL to design, simulate, and synthesize digital systems such as ALUs, FSMs, and memories
- Implementation and verify digital designs on FPGA/CPLD platforms for practical applications

Course Outcomes:

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

- Analyze MOSFET/CMOS characteristics and basic digital logic design
- Design and implement combinational circuits such as adders, multipliers, and encoders/decoders
- Develop sequential circuits including flip-flops, counters, shift registers, and sequence detectors
- Simulate and synthesize complex systems like ALUs, FSMs, and memories using HDL
- Perform layout verification checks and implement CMOS circuits on FPGA/CPLD

List of Experiments:

Digital CMOS IC design - Simulate it using any HDL tool or equivalent and implement by FPGA

1. Design and realization of all basic logic gates.
2. Design and implementation of an 8-bit Adder.
3. Design and implementation of a 4-bit Multiplier.
4. Design of an 8-to-3 Encoder (with and without priority) and a 2-to-4 Decoder.
5. Design and implementation of an Arithmetic Logic Unit (ALU).
6. Design of a 4-bit Binary-to-Gray Code Converter.
7. Design and implementation of a Universal Shift Register.
8. Design of a 4-bit Comparator.
9. Design and realization of Flip-Flops: SR, D, JK, and T.
10. Design and implementation of Ripple Counters (Mod-10 and Mod-12).

11. Design and simulation of a Finite State Machine (Moore/Mealy Model).
12. Design and implementation of Memory Elements.
13. Design and implementation of a 4-bit Parity Generator and Checker.
14. Design of a Sequence Detector using Finite State Machine.

NOTE: Minimum of 12 experiments to be conducted.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2460480: COMPUTATIONAL ELECTROMAGNETICS AND ANTENNA LABORATORY

III Year B.Tech. ECE II – Sem. **L T P C**

0 0 2 1

Couse Overview:
This course introduces the fundamentals of antennas, wave propagation, and waveguide structures. Students will gain hands-on experience with ANSYS HFSS for designing and simulating various antenna types and arrays. The course also covers practical applications through the modeling of coaxial cables, waveguides, and striplines

Prerequisites: Electromagnetics and Electromagnetic Wave Theory, familiarity with antenna fundamentals and radiation concepts

Course Objectives:
The students will try to learn
- Fundamentals of antennas, types, and key performance parameters
- Basics of electromagnetic wave propagation and different propagation models
- Proficiency in using ANSYS HFSS for 3D antenna modeling and simulation
- Designing and simulation of various antennas including dipole, microstrip patch, and waveguides
- Antenna arrays and stripline structures with a focus on their design and analysis in HFSS

Course Outcomes:
After successful completion of the course, students shall be able to
- Explain antenna fundamentals and wave propagation concepts
- Use HFSS software to model and simulate basic and advanced antenna structures
- Design and analyze dipole, microstrip, and circular patch antennas
- Simulate and evaluate waveguide structures such as coaxial, rectangular, and circular waveguides
- Design and simulate antenna arrays and striplines for real-world applications

List of Experiments:

Use ANSYS High-Frequency Structure Simulator (HFSS) software to model, design, and simulate both basic and advanced antenna structures through the following experiments.

1. Design and Simulate Dipole Antenna
2. Design and Simulate Rectangular Microstrip Patch Antenna
3. Design and Simulate Circular Patch Antenna
4. Design and Simulate Coaxial Cable.
5. Design and Simulate Rectangular Waveguide
6. Design and Simulate Circular Waveguide
7. Design and Simulate Rectangular slotted Waveguide
8. Design and Simulate Circular Waveguide Array
9. Design and Simulate strip line.

10. Design and Simulate Rectangular Array Waveguide
11. Design and Simulate Yagi–Uda Antenna
12. Design and Simulate Horn Antenna
13. Design and Simulate Frequency Selective Surface (FSS)
14. Design and Simulate Dual-Band Microstrip Patch Antenna

NOTE: The minimum 12 experiments to be conducted

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2460025: HUMAN VALUES AND PROFESSIONAL ETHICS

III Year B.Tech. II - Sem. **L T P C**

0 0 0 0

Course Objective: To enable the students to imbibe and internalize the Values and Ethical Behavior in the personal and Professional lives. Course Outcome: The students will understand the importance of Values and Ethics in their personal lives and professional careers. The students will learn the rights and responsibilities as an employee, team member and a global citizen.

Course Learning Outcomes

- Ability to engage in informed critical reflection on the nature of professionalism and ethical challenges inherent in professionalism
- Awareness of types of ethical challenges and dilemmas confronting members of a range of professions (business, media, police, law, medicine, research)
- Ability to bring to bear ethical analysis and reasoning in the light of normative ethics frameworks on a selection of ethical challenges and dilemmas across the chosen range of professions
- Ability to relate ethical concepts and materials to ethical problems in specific professions and professionalism

UNIT - I Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

UNIT - II Basic Theories: Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

UNIT - III Professional Practices in Engineering: Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers - The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

UNIT - IV Work Place Rights & Responsibilities, Ethics in changing domains of Research, Engineers and Managers; Organizational Complaint Procedure, difference of Professional Judgment within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation.

Ethics in changing domains of research - The US government wide definition of research misconduct, research misconduct distinguished from mistakes and errors, recent history of attention to research misconduct, the emerging emphasis on understanding and fostering responsible conduct, responsible authorship, reviewing & editing.

UNIT - V Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

TEXT BOOKS:

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015. 2. Ethics in Engineering Practice & Research, Caroline Whit beck, 2e, Cambridge University Press 2015.

REFERENCES

1. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, Cengage learning, 2015.
2. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

IV-I

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2470433: MICROWAVE AND OPTICAL COMMUNICATIONS

IV Year B.Tech. ECE I – Sem. **L T P C**

3 0 0 3

Couse Overview:
This course introduces microwave engineering and optical communication, covering tubes, solid-state devices, waveguide components, and scattering parameters. It emphasizes microwave measurements, performance evaluation, and optical fiber transmission media. Students gain the skills to analyze and apply microwave and optical systems in modern engineering applications.
Pre-requisites: Antennas and Propagation.

Course Objectives:
The students will try to learn
- Microwave frequency bands, applications, and tube limitations
- Types of microwave tubes and power generation principles
- Formulation and applications of the Scattering Matrix
- S-Matrix for various microwave junctions
- Applications of optical fibers in communication

Course Outcomes:
After successful completion of the course, students shall be able to
- Explain microwave power generation and performance characteristics
- Understand the need and principles of solid-state microwave devices
- Distinguish and select appropriate waveguide and ferrite components
- Apply S-parameters in design and measurement of microwave components
- Explain light propagation mechanisms in optical fibers

Module – I: Microwave Tubes, Helix TWTs: **7L**
Microwave Tubes: Limitations and Losses of conventional Tubes at Microwave Frequencies, Microwave Tubes – O Type and M Type Classifications, O-type Tubes: 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for O/P Power and Efficiency. Reflex Klystrons – Structure, Velocity Modulation and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating Modes and O/P Characteristics.
Helix TWTs: Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations

Module – II: M-Type Tubes, Microwave Solid State Devices **6L**
M-Type Tubes: Introduction, Cross-field Effects, Magnetrons – Different Types, Cylindrical Traveling Wave Magnetron Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI- Mode, o/p characteristics,
Microwave Solid State Devices: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diodes – Principle, RWH Theory, Characteristics, Modes of Operation - Gunn Oscillation Modes, Principle of operation of IMPATT and TRAPATT Devices

Module – III: Waveguide Components **7L**
Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide Windows, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Different Types,

Resistive Card and Rotary Vane Attenuators; Waveguide Phase Shifters-Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions - E plane and H plane Tees. Ferrites– Composition and Characteristics, Faraday Rotation, Ferrite Components – Gyrator, Isolator.

Module – IV: Scattering matrix, Microwave Measurements 7L

Scattering matrix: Scattering Matrix Properties, Directional Couplers – 2 Hole, Bethe Hole, [s] matrix of Magic Tee and Circulator.

Microwave Measurements: Description of Microwave Bench – Different Blocks and their Features, Errors and Precautions, Measurement of Attenuation, Frequency. Standing Wave Measurements, measurement of Low and High VSWR, Cavity Q, Impedance Measurements

Module – V: Optical Fiber Transmission Media: 6L

Optical Fiber types, Light Propagation, Optical fiber Configurations, Optical fiber classifications, Losses in Optical Fiber cables, Light Sources, Optical Sources, Light Detectors, LASERS, WDM Concepts, Optical Fiber System link budget.

TEXT BOOKS:

1. Microwave Devices and Circuits – Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Electronic Communications Systems- Wayne Tomasi, Pearson, 5th Edition.

REFERENCE BOOKS:

1. Optical Fiber Communication – Gerd Keiser, TMH, 4th Ed., 2008.
2. Microwave Engineering - David M. Pozar, John Wiley & Sons (Asia) Pvt Ltd., 3rd., 2011.
3. Microwave Engineering - G.S. Raghuvanshi, Cengage Learning India Pvt. Ltd., 2012.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2470434: ANALOG CMOS IC DESIGN

IV Year B.Tech. ECE I – Sem.

L	T	P	C
2	0	0	2

Couse Overview:
This course introduces the architecture and programming of microprocessors and microcontrollers, including ARM and STM32 systems. Students will learn interfacing techniques and develop assembly language programs for real-time applications. By the end, they will be able to design and integrate embedded systems for automation and modern technological solutions.

Pre-requisite: Knowledge on circuit design and microelectronics, familiarity with SPICE tool

Course Objectives:
The students will try to learn
- MOS devices and its modeling
- Designing of analog CMOS circuits
- CMOS based amplifiers frequency response and noise
- Design of operational amplifiers with CMOS technology
- Stability and frequency compensation of analog CMOS circuits

Course Outcomes:
After successful completion of the course, students shall be able to
- Analyze different MOS device models and circuits
- Design and differential amplifiers and current mirror circuits
- Analyze trade-offs in frequency response and noise models
- Design and analyze two-stage Op-Amp with measurement techniques
- Analyze two-stage Op-Amp's frequency compensation and stability

Module – I Basic MOS Device Physics **6L**
MOS I/V Characteristics, Second-Order Effects, MOS Device Models, Single-Stage Amplifiers, Common-Source Stage, Source Follower, Common-Gate Stage, Cascode Stage

Module – II: Differential Amplifiers and Current Mirrors: **7L**
Single-Ended and Differential Operation, Basic Differential Pair, Common-Mode Response, Differential Pair with MOS Loads, Gilbert Cell, Basic Current Mirrors, Cascode Current Mirrors, Active Current Mirrors, Biasing Techniques

Module – III: Frequency Response and Noise: **7L**
Common-Source Stage, Source Followers, Differential Pair, Gain-Bandwidth Trade-Offs, Statistical Characteristics of Noise, Types of Noise, Representation of Noise in Circuits, Noise in Single-Stage Amplifiers, Noise-Power Trade-Off, Noise Bandwidth

Module – IV: CMOS Operational Amplifiers **6L**
General Considerations, One-Stage Op Amps, Two-Stage Op Amps, Gain Boosting, Comparison, Output Swing Calculations, Common-Mode Feedback, Slew Rate, High-Slew-Rate Op Amps

Module – V: Stability and Frequency Compensation **6L**
Multipole Systems, Phase Margin, Basic Frequency Compensation, Compensation of Two-Stage Op Amps, Slewing in Two-Stage Op Amps, Nyquist's Stability Criterion, Nonlinearity, Mismatch

TEXT BOOKS:

1. Behzad Razavi, “Design of Analog CMOS Integrated Circuits”, TMH, 2nd Edition, 2017.
2. Philip E. Allen and Douglas R. Holberg, “CMOS Analog Circuit Design,” Oxford University Press, International 2nd Edition, 2010.

REFERENCES:

1. David A. Johns, Ken Martin, “Analog Integrated Circuit Design,” Wiley, 2nd Edition, 2011.
2. Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, “Analysis and Design of Analog Integrated Circuits,” Wiley India, 5th Edition, 2010.
3. Baker, Li and Boyce, “CMOS: Circuit Design, Layout and Simulation”, PHI, 3rd Edition, 2002.

2480010: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

B.Tech. **L T P C**

3 0 0 3

Course Objective: To learn the basic Business types, impact of the Economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

Course Outcome:

1.The students will understand the various Forms of Business
2.The impact of economic variables on the Business.
3.The Demand, Supply, Production, Cost,
4.Market Structure, Pricingaspects are learnt.
5.The Students can study the firm's financial position by analysing the Financial Statements of a Company.

UNIT – I: Introduction to Business and Economics

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT – II: Demand and Supply Analysis

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT – III: Production, Cost, Market Structures & Pricing

Production Analysis: Factors of Production, Production Function, Production

Function with onevariable input, two variable inputs, Returns to Scale, Different Types of Production Functions.
Cost analysis: Types of Costs, Short run and Long run Cost Functions.
Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly,Monopolistic Competition.
Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume ProfitAnalysis.

UNIT – IV: Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

UNIT – V: Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, TurnoverRatios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).Introduction to Fund Flow and Cash Flow Analysis (simple problems).

TEXT BOOKS:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, InternationalBook House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGrawHill Education Pvt. Ltd. 2012.

REFERENCE BOOKS:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, VikasPublications, 2013.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2470445: SATELLITE COMMUNICATIONS

IV Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course introduces the fundamentals of satellite communication, orbital mechanics, and launch vehicles. It covers satellite subsystems, link design, multiple access techniques, and earth station technologies. Students also learn deep space communication, satellite navigation, GPS principles, and recent trends in satellite systems.

Pre-requisites: Knowledge on analog and digital communication systems.

Course Objectives:
The students will try to learn
- Basic knowledge of satellite communication principles
- Types of orbits and satellites for the satellite communication
- Basic knowledge of link design of a satellite and multiple access systems
- Concepts of earth station technology and their various types
- Various missions like MOM, Chandrayaan, other missions

Course Outcomes:
After successful completion of the course, students shall be able to
- Understand the historical background, basic concepts and frequency allocations for satellite communication
- Demonstrate orbital mechanics, launch vehicles and launchers
- Design satellite links for specified C/N with system design examples
- Visualize various earth station technology and their various types
- Understand the deep space communications

Module – I: Introduction, Orbital Mechanics, and Launchers **8L**

Origin of Satellite Communications, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications.

Orbital Mechanics and Launchers: Types of orbits and types of satellites, Look Angle determination, Orbital Perturbations, Orbit determination, Launches and Launch vehicles, Reusable launch vehicles, Orbital Effects in Communication Systems Performance.

Module – II: Satellite Subsystems **7L**

Attitude and Orbit Control System, Telemetry, Tracking, Command and Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification.

Module – III: Satellite Link Design, Multiple Access **8L**

Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Up Link Design, Design of Satellite Links for Specified C/N.

Multiple Access: Frequency Division Multiple Access (FDMA), Intermodulation, Calculation of C/N, Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite Switched TDMA Onboard Processing, DAMA, Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

Module – IV: Earth Station Technology **8L**

Introduction, Types of Earth stations, applications and its limitations Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods, high-power amplifier (HPA) transmitter, LNA receiver, Very Small Aperture Terminal (VSAT) and its applications.

Module – V: Deep Space Communications, Satellite Navigation & Global Positioning System 9L

MOM missions, Chandrayan missions, and other missions.

Satellite Navigation & Global Positioning System**:** Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, GPS Receiver Operation, GPS C/A Code Accuracy, Differential GPS. Latest trends in Satellite Communications.

TEXT BOOKS:

1. Timothy Pratt, Charles Bostian and Jeremy Allnutt, “Satellite Communications,” WSE, Wiley Publications, 3rd Edition, 2020.
2. Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, “Satellite Communications Engineering,” 2nd Edition, Pearson Publications, 2003.

REFERENCES:

1. M. Richharia, “Satellite Communications: Design Principles,” BS Publications, 2nd Edition, 2003.
2. D.C Agarwal, “Satellite Communication,” Khanna Publications, 5th Edition,1989.
3. K.N. Raja Rao, “Fundamentals of Satellite Communications,” PHI, 2nd Edition, 2004.
4. https://onlinelibrary.wiley.com/doi/book/10.1002/9781119169079

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2470446: MICROWAVE PHOTONICS

IV Year B.Tech. ECE I – Sem. **L T P C**
3 0 0 3

Couse Overview:
This course introduces the integration of microwave and photonic technologies for high-speed communication systems. It covers principles of electro-optic modulation, radio-over-fiber, photonic signal processing, and optical-wireless convergence. Students will gain insights into system design, performance analysis, and emerging applications of microwave photonics.

Pre-requisite: Basics of optics, fundamentals of microwave engineering, signals & systems

Course Objectives:
The students will try to learn
- Fundamentals of lightwave–microwave interactions
- Electro-optic components including sources, modulators, and detectors
- Microwave photonic link design and radio-over-fiber systems
- Photonic techniques for signal processing, beamforming, and wireless transport
- Familiarize with modern applications in 5G, satellite links, and optical networking

Course Outcomes:
After successful completion of the course, students shall be able to
- Explain principles of microwave photonics and electro-optic modulation
- Design and evaluate simple microwave photonic links
- Compare multiple access and photonic signal processing methods
- Assess performance trade-offs in optical transport of RF signals
- Apply microwave photonics concepts in modern communication and sensing applications

Module – I: Fundamentals of Microwave Photonics **6L**
Introduction, microwave–optical interactions, overview of electro-optic systems, modulation formats (intensity, phase, frequency), system impairments.

Module – II: Electro-Optic Devices **7L**
Optical sources, modulators (Mach-Zehnder, electro-absorption), photodetectors, optical amplifiers, SNR, linearity, intermodulation.

Module – III: Microwave Photonic Links **8L**
Radio-over-fiber principles, link gain and noise analysis, CNR & SFDR, antenna remoting, photonic beamforming techniques.

Module – IV: Optical–Wireless Convergence **7L**
Mobile broadband architecture, fronthaul and backhaul, optical transport of wireless signals, WDM, PON, optical networking for 5G and beyond.

Module – V: Applications and Trends **7L**
Photonic signal processing, radar and sensing applications, microwave photonics in satellite links,

optical beamforming, emerging research in integrated microwave photonics.

TEXT BOOKS:

1. Yao, Microwave Photonics, CRC Press, 2009.
2. G. P. Agrawal, Fiber-Optic Communication Systems, 5th ed., Wiley, 2021.

REFERENCE BOOKS:

1. R. Minasian, Microwave Photonics: From Components to Applications and Systems, Wiley, 2015.
2. S. O. Kasap, Optoelectronics and Photonics: Principles and Practices, Pearson, 2013.
3. N. H. E. Weste and D. Harris, CMOS VLSI Design: A Circuits and Systems Perspective, Pearson, 2011 (for integrated photonic circuits background).

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2470447: DIGITAL DESIGN THROUGH VHDL

IV Year B.Tech. ECE I - Sem. **L T P C**
3 0 0 3

Couse Overview:
This course introduces the principles of digital design using VHDL as a hardware description language. Students learn modeling techniques at different abstraction levels, simulation, verification, and synthesis. Emphasis is placed on implementing combinational and sequential systems on FPGA/ASIC platforms.

Pre-requisites: Basics of Digital Circuits.

Course Objectives:
The students will try to learn
- VHDL syntax, semantics, and modeling levels (behavioral, structural, RTL)
- Combinational and sequential logic using VHDL
- Test benches and verify digital designs
- Synthesis and implementation on FPGA/ASIC platforms using VHDL
- Coding practices and design optimization in terms of area, speed, and power

Course Outcomes:
After successful completion of the course, students shall be able to
- Describe different styles of VHDL modeling and abstraction levels
- Design combinational logic circuits using VHDL (e.g., adders, multiplexers, encoders)
- Implement sequential circuits like flip-flops, counters, FSMs in VHDL
- Write test benches to simulate, verify, and debug their designs
- Deploy designs on FPGA/ASIC and assess resource usage, timing, and performance

Module – I: VHDL Basics & Modeling Styles **6L**
VHDL fundamentals, entities, architectures, libraries, and packages. Covers behavioral, dataflow, and structural modeling, concurrent and sequential statements, signals vs. variables, delay modeling, and hierarchical design with coding standards.

Module – II: Combinational Logic Design **7L**
Design and modeling of combinational circuits: multiplexers, encoders, decoders, and arithmetic units, conditional and selected signal assignments, parameterized designs, synthesis considerations, and FPGA implementation examples.

Module – III: Sequential Logic & FSMs **8L**
Sequential circuits including flip-flops, registers, counters, and finite state machines (Mealy and Moore). State encoding, minimization, sequential modeling using processes, and simple memory elements (RAM/ROM).

Module – IV: Verification & Testbenches **7L**
VHDL simulation, waveform analysis, and testbench design for functional verification, Stimulus generation, assertions, file I/O, debugging techniques, functional vs. timing simulation, and modern verification concepts.

Module – V: FPGA/ASIC Implementation **7L**

RTL coding, synthesis, place & route, constraints, and timing analysis, optimization for area, speed, and power, FPGA resources, clock management, metastability, and case studies, ASIC design flows.

TEXT BOOKS:

1. Volnei A. Pedroni, Circuit Design with VHDL, MIT Press, 2008.
2. Douglas L. Perry, VHDL Programming by Example, 5th ed., McGraw-Hill, 2002.

REFERENCES:

1. Peter J. Ashenden, The Designer's Guide to VHDL, 3rd ed., Morgan Kaufmann, 2007.
2. J. Bhasker, A VHDL Primer, 3rd ed., Star Galaxy, 1999.
3. Sudarshan K. V. and Srinivasan, VHDL for Designers, Universities Press, 2007.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2470448: FPGA BASED DESIGN

IV Year B.Tech. ECE I - Sem.

L	T	P	C
3	0	0	3

Couse Overview:

This course introduces digital system design using FPGA technologies, covering architecture, design methodologies, and trade-offs. Students learn behavioral modeling, hardware description languages, combinational and sequential circuits, and state machine design. Practical exercises include simulation and implementation of digital and DSP systems on Xilinx and Altera FPGAs.

Pre-requisites: Basics of Digital Electronics

Course Objectives:

The students will try to learn

- FPGA architectures, technologies, and vendor-specific design considerations
- Digital system design methodologies, behavioral modeling and HDL-based design
- Design of combinational, sequential, and state machine circuits using FPGAs
- Development of test benches and verify digital systems through simulation
- FPGA design skills to embedded systems, DSP, and reconfigurable applications

Course Outcomes:

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

- Explain FPGA architectures, logic blocks, I/O blocks, and programmable interconnects
- Model digital systems using VHDL or Verilog for combinational and sequential designs
- Design and implement FSMs, DSP kernels, and other digital systems on FPGA boards
- Create and use test benches to verify functionality and performance
- Evaluate and apply FPGA-based design for embedded and reconfigurable systems

Module – I: Digital System Design & Methodology **8L**

Introduction to digital system design options, trade-offs, design methodology, and technology overview. Covers high-level system architecture, behavioral modeling, simulation, and hardware description languages.

Module – II: Combinational and Sequential Design **7L**

Design of combinational and sequential circuits using VHDL/Verilog, state machine design, synthesis considerations, and test bench creation.

Module – III: FPGA Architectures and Technologies **7L**

Overview of FPGA architectures, granularity of function and wiring resources, coarse vs. fine-grained designs, and vendor-specific issues (Xilinx and Altera).

Module – IV: Logic and I/O Block Design **6L**

FPGA logic cells, timing and power models, input/output cell characteristics, clock inputs, programmable interconnect, placement, routing, and delay analysis.

Module – V: Applications and Implementation **8L**

Embedded system design, DSP implementation, dynamic and reconfigurable architectures, case studies, and practical simulation/implementation exercises on Xilinx/Altera boards.

TEXT BOOKS:

1. P. Ashenden, Digital Design using VHDL, Elsevier, 2007.
2. P. Ashenden, Digital Design using Verilog, Elsevier, 2007.

REFERENCES:

1. M. J. S. Smith, Application Specific Integrated Circuits, Pearson, 2000.
2. C. Maxfield, The Design Warrior's Guide to FPGAs, Elsevier, 2004.
3. I. Grout, Digital Systems Design with FPGAs and CPLDs, Elsevier, 2008.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

24X0538: COMPUTER VISION &ROBOTICS

L T P C
3 0 0 3

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

- Implement fundamental image processing techniques used in computer vision.
- Use boundary tracking and region descriptors.
- Apply codes for Hough Transform (line, circle, ellipse).
- Analyze 3D vision techniques and implement motion-related methods.
- Develop computer vision applications.

Module-I: **[10]**

CAMERAS:-Pinhole Cameras

Radiometry :- Measuring Light in Space, Light Surfaces, Important Special Cases, Sources, Shadows, And Shading:- Qualitative Radiometry, Irradiance, The Irradiance Equation, Ideal Shading Models, Applications: Photometric Stereo, Interreflections: Global Shading Models

Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image

Module-II **[10]**

Linear Filters : Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transform

Edge Detection: Noise, Estimating Derivatives, Detecting Edges Texture: Representing Texture, Analysis and Synthesis Using Oriented Pyramids, Applications: Synthesizing Textures, Shape from Texture

Module-III: **[8]**

The Geometry of Multiple Views: Two Views

Stereopsis: Binocular Stereopsis, Multiple Baseline Stereo, Hierarchical Fusion, Using More Cameras

Segmentation by Clustering: Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Techniques

Module-IV: **[10]**

Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem

Tracking with Linear Dynamic Models Alignment: 2D and 3D, Problems of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Pose and Affine Projection Equations

Applications of Alignment: Last-Squares Parameter Estimation, Planning, Obstacle Avoidance and Control, Building Maps and Locating in them, Analytical Photogrammetry, An Application: Augmented Reality

Module-V: **[8]**

Introduction to Robotics: Social Implications of Robots, Brief history of Robotics, Attributes of Robots, Application areas of Robots and well as future potential, Robot Mechanisms Architectures, Attributes of Reactive Paradigm, Subsumption Architecture, Potential fields and perceptual servoing Common sensing techniques for Reactive Robots: Logical sensors, Behavioural Sensor Fusion, Pro- prioceptive sensors, Proximity Sensors, Topological Planning and Metric Path Planning

TEXTBOOKS:

1. David A. Forsyth & Jean Ponce, Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.
2. Robin Murphy, Introduction to AI Robotics, MIT Press

REFERENCE BOOKS:

1. E. R. Davies, Computer and Machine Vision, Elsevier, 4th Edition, 2013.
2. Maja J. Mataric, The Robotics Primer, MIT Press.
3. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer- Verlag, 2011.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2470449: RADAR SYSTEMS

IV Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course introduces the principles and applications of radar systems, covering CW, FM-CW, MTI, and tracking radars. Students learn radar range equations, detection in noise, and matched filter design. Practical aspects include radar receivers, displays, duplexers, and phased array antenna fundamentals.

Pre-requisites: Knowledge on Analog and Digital Communications.

Course Objectives:

The students will try to learn

- Fundamental concepts of radar and its frequency bands
- Doppler effect and principles of CW and FM-CW radars
- MTI radar operation and its limitations
- Design and working of various tracking radars
- Matched filter design and performance analysis in radar receivers

Course Outcomes:

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

- Derive the complete radar range equation and predict radar performance
- Explain the need, working principles, and applications of CW, FM-CW, and MTI radars
- Identify and analyze different tracking radar methods and scanning techniques
- Derive and interpret the matched filter response characteristics for radar receivers
- Understand noise performance, receiver design, and basic phased array antenna principles

Module – I: Basics of Radar, Radar Equation **9L**

Basics of Radar: Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation.

Radar Equation: SNR, Envelope Detector – False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets, Transmitter Power, PRF and Range Ambiguities, System Losses.

Module – II: CW and Frequency Modulated Radar, FM-CW Radar **7L**

CW and Frequency Modulated Radar: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar.

FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter.

Module – III: MTI and Pulse Doppler Radar **8L**

MTI and Pulse Doppler Radar: Principle, MTI Radar - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.

Module – IV: Tracking Radar **8L**

Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar-Amplitude Comparison Mono pulse (one- and two- coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

Module – V: Detection of Radar Signals in Noise, Radar Receivers **9L**

Detection of Radar Signals in Noise Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

Radar Receivers – Noise Figure and Noise Temperature, Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Applications, Advantages and Limitations

TEXT BOOKS:

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2ndEd., 2007.
2. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.

REFERENCES:

1. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.
2. Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm, Yesdee, 2013.
3. Radar Handbook - Merrill I. Skolnik, 3rd Ed., McGraw Hill Education, 2008.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2470450: SIGNAL PROCESSING FOR BIOMEDICAL APPLICATIONS

IV Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course introduces the application of signal processing techniques to biomedical signals such as ECG, EEG, and EMG. Students learn filtering, waveform analysis, event detection, and frequency-domain analysis of physiological signals. Practical tutorials using MATLAB enable hands-on implementation of biomedical signal processing methods.

Pre-requisite: Basics of Signals and Systems, Familiarity with the basic definition of probability

Course Objectives:

The students will try to learn

- Origin and dynamics of key biomedical signals like ECG, EEG, and EMG.
- Time-domain, frequency-domain, and optimal filtering techniques for noise and artifact removal.
- Detection and analyze important events in biomedical signals using derivative, correlation, and matched filter methods.
- Waveform and frequency-domain analysis, including PSD and spectral estimation.
- Biomedical systems using parametric methods such as AR, ARMA, and system identification techniques.

Course Outcomes:

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

- Analyze and characterize biomedical signals in time and frequency domains
- Apply filtering and noise-reduction techniques to enhance signal quality
- Detect physiological events such as QRS complexes, P and T waves, and EEG rhythms
- Perform waveform analysis including RMS, zero-crossing, envelop extraction, and correlation
- Model biomedical systems using parametric approaches and implement algorithms in MATLAB

Module – I: Biomedical Signals and Preliminaries **7L**

Introduction to biomedical signals, including ECG, EEG, and EMG. Study of signal origin, dynamics, and characteristics relevant for processing**.**

Module – II: Filtering Techniques **7L**

Time-domain filtering (moving average, derivative-based operators), frequency-domain filtering (notch filters), optimal Wiener filtering, and adaptive filter selection for artifact removal.

Module – III: Event Detection **7L**

Detection of physiological events such as P, QRS, and T waves in ECG, dicrotic notch detection, and EEG correlation analysis. Includes derivative-based methods and Pan-Tompkins algorithm for QRS detection.

Module – IV: Waveform and Frequency Analysis **6L**

Morphological analysis of signals, RMS, zero-crossing, envelop extraction, turns count, form factor,

periodogram, averaged periodogram, Blackman-Tukey and Daniell spectral estimators, and measures derived from PSD.

Module – V: System Modeling and Tutorials **8L**

Parametric modeling of biomedical systems using AR, ARMA models, Levinson-Durbin algorithm, covariance method, spectral matching, and MATLAB-based tutorials for filter design, QRS detection, cross-correlation, and PSD computations.

TEXT BOOKS:

1. R. M. Rangayyan, Biomedical Signal Analysis: A Case-Based Approach, IEEE Press, John Wiley & Sons, 2002.
2. W. J. Tompkins, Biomedical Digital Signal Processing, PHI, 2004.

REFERENCE BOOKS:

1. D. C. Reddy, Biomedical Signal Processing: Principles and Techniques, Tata McGraw-Hill, 2005.
2. J. G. Webster, Medical Instrumentation: Application & Design, John Wiley & Sons, 2001.
3. A. V. Oppenheim and R. W. Schafer, Discrete-Time Signal Processing, Prentice Hall, 1989.

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(AUTONOMOUS)

2470451: SoC Design

IV Year B.Tech. ECE I - Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course introduces the design and architecture of System-on-Chip (SoC) systems, including processors, memory, interconnects, and reconfigurable components. Students will learn SoC design methodologies, customization, and configuration techniques. Practical examples cover processor selection, memory hierarchy, bus architectures, and trade-offs in reconfigurable systems.

Pre-requisites: Basics of Embedded System Design

Course Objectives:
The students will try to learn
- System-level design approaches and the architecture of SoCs.
- Processor selection, microarchitecture, and instruction handling in SoC systems.
- Memory design, cache strategies, and processor-memory interactions.
- Interconnect architectures, bus models, and SoC customization techniques.
- Reconfiguration technologies, customizable soft processors, and trade-off analysis in SoC designs.

Course Outcomes:
After successful completion of the course, students shall be able to
- Describe SoC architectures, system components, and design complexity
- Select and analyze processors suitable for different SoC applications
- Design and evaluate memory systems, including caches and scratchpads
- Model and optimize interconnects and bus-based communication in SoCs
- Apply reconfigurable design techniques, analyze trade-offs, and configure SoC systems for specific applications

Module – I: Introduction to the System Approach: **8L**
System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

Module – II: Processors **9L**
Introduction, Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

Module – III: Memory Design for SOC **9L**
Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation, SOC Memory System, Models of Simple Processor – memory interaction.

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Module – IV: Interconnect Customization **7L**

Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization

Module – V: Configuration **9L**

An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

TEXT BOOKS:

1. M. J. Flynn and W. Luk, Computer System Design: System-on-Chip, Wiley India Pvt. Ltd., 2001.
2. S. Furber, ARM System on Chip Architecture, 2nd ed., Addison Wesley Professional, 2000.

REFERENCES:

1. R. Reis, Design of System on a Chip: Devices and Components, 1st ed., Springer, 2004.
2. J. Andrews, Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology), Newnes, 2001.
3. P. Rashinkar, P. Paterson, and L. Singh, System on Chip Verification – Methodologies and Techniques, Kluwer Academic Publishers, 2001.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

24X0529: DATA SCIENCE

L	T	P	C
3	0	0	3

Course Overview

This course introduces the fundamentals of Data Science, including statistical concepts, R programming, data types, data manipulation, control structures, and data visualization. Students learn to analyze datasets, summarize information, and perform basic modeling and regression using R. The course provides a foundation for data-driven decision making and prepares students for advanced analytics and machine learning applications.

Prerequisites: Data Base Management Systems

Course Objectives:

- To understand the fundamentals of data science, statistical inference, and basic programming concepts using R.
- To learn different data types and apply statistical measures for summarizing and describing data.
- To explore and manipulate data structures in R including vectors, matrices, arrays, factors, data frames, and lists.
- To develop programming logic in R through conditionals, loops, and user-defined functions for problem solving.
- To apply graphical techniques for data visualization and perform regression analysis for predictive modeling.

Course Outcomes: The students should be able to

- Describe the data using various statistical measures
- Utilize R elements for data handling
- Understand basic terms of statistical modeling and data science
- Implementation of R programming concepts
- utilize R elements for data visualization and prediction

UNIT – I **[09 Periods]**

Introduction

Definition of Data Science- Big Data and Data Science Life Cycle, Big Data and Data Science hype – and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting.

Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types.

UNIT –II **[10 Periods]**

Data Types & Statistical Description Types of Data: Attributes and Measurement, Attribute, The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard

Deviation, and Interquartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT –III **[10 Periods]**

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting, Matrices: Creating and Naming Matrices, Matrix Sub setting, Arrays, Class. Factors and Data Frames: Introduction to Factors: Factor Levels, summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, sub setting of Data Frames, Extending Data Frames, Sorting Data Frames. Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors.

UNIT – IV **[09 Periods]**

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements. Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List. Functions in R: Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

UNIT – V **[10 Periods]**

Charts and Graphs: Introduction, Pie Chart: Chart Legend, Bar Chart, Box Plot, Histogram, Line Graph: Multiple Lines in Line Graph, Scatter Plot. Regression: Linear Regression Analysis, Multiple Linear regression

TEXT BOOK:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014.
2. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCES:

1. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
3. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition,
4. LLC, 2014. 4. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
5. Paul Teetor, "R Cookbook", O'Reilly, 2011.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2476650: HARDWARE ARCHITECTURES FOR IOT

IV Year B.Tech. I - Sem. **L T P C**

3 0 0 3

Course Objectives:

The students will try to learn

- Understand the fundamentals of IoT hardware components and architectures.
- Learn about sensors, actuators, and embedded systems used in IoT devices.
- Study microcontrollers, processors, and system-on-chip (SoC) platforms for IoT.
- Explore power management, energy efficiency, and hardware constraints in IoT.
- Develop the ability to select suitable hardware platforms for specific IoT applications.

Course Outcomes:

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

- Explain the structure and functioning of IoT hardware architectures.
- Identify appropriate sensors and actuators for different IoT applications.
- Compare microcontrollers, processors, and SoC-based IoT platforms.
- Analyze hardware constraints related to power, memory, and processing.
- Design basic IoT systems using suitable hardware components and modules.

MODULE - I: Introduction to IoT Hardware **9L**

Overview of IoT device architecture; basic building blocks; embedded system concepts; hardware requirements for IoT applications.

MODULE - II: Sensors and Actuators **8L**

Types of sensors (temperature, humidity, motion, light); actuator types; analog vs. digital interfaces; sensor calibration and interfacing basics.

MODULE - III: Microcontrollers and Processors for IoT **8L**

Overview of microcontrollers (ARM Cortex-M, AVR, ESP32); IoT processors; SoC platforms; GPIO, ADC, DAC; clocking and timers.

MODULE – IV: IoT Development Boards and Modules **8L**

Raspberry Pi, Arduino, NodeMCU, BeagleBone; wireless modules (Wi-Fi, BLE); basic interfacing; peripheral expansion; simple hardware integration.

MODULE – V: Power Management and Hardware Design **7L**

Battery technologies; low-power design techniques; energy harvesting basics; hardware reliability; simple PCB design considerations.

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TEXT BOOKS:

1. A. Bahga and V. Madisetti, *Internet of Things: A Hands-On Approach*, 1st ed., Universities Press, 2014.
2. R. Kamal, *Embedded Systems: Architecture, Programming and Design*, 2nd ed., McGraw Hill, 2017.

REFERENCE BOOKS:

1. O. Hersent, D. Boswarthick, and O. Elloumi, The Internet of Things: Key Applications and Protocols, Wiley, 2012.
2. D. Evans, Arduino: A Technical Reference, O'Reilly, 2017.
3. J. Lever, Raspberry Pi Hardware Reference, Apress, 2017.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2470481: ANALOG COMS IC DESIGN LABORATORY

IV Year B.Tech. ECE I – Sem. **L T P C**

0 0 2 1

Couse Overview:
This course introduces the design and analysis of CMOS analog circuits including current mirrors, differential amplifiers, operational amplifiers, and comparators. Students will perform AC, DC, and OP analyses while evaluating parameters such as gain, bandwidth, and noise margins. Emphasis is placed on analog layout design, verification, and simulation for real-world VLSI applications.

Pre-requisites: Knowledge on circuit design and microelectronics, familiarity with cadence tool**.**

Course Objectives:
The students will try to learn
- Operating principles of NMOS and PMOS devices.
- CMOS current mirrors, differential amplifiers, and operational amplifiers.
- The AC, DC, and OP analyses of CMOS circuits.
- Comparator design and performance evaluation in analog circuits.
- Hands-on experience in analog layout design, verification, and simulation

Course Outcomes:
After successful completion of the course, students shall be able to
- Analyse the characteristics and operating points of MOS devices.
- Design and evaluate CMOS current mirrors and differential amplifiers.
- Implement and simulate CMOS operational amplifiers with AC and noise margin analysis.
- Develop and test comparators and other analog circuit applications.
- Create, simulate, and verify CMOS layouts while analysing key parameters like gain, bandwidth, and CMRR

List of Experiments:

Simulate the following experiments with any HDL tool or equivalent

1. Analyze the NMOS and PMOS operating point characteristics
2. Design a CMOS current mirror and find out the AC, DC, OP analysis
3. Design NMOS differential amplifier and find out the AC, DC, and OP analysis
4. Design a PMOS differential amplifier and find out AC, DC, and OP analysis
5. Design a CMOS Operational Amplifier and find out the AC analysis and noise margin analysis
6. Design a comparator using Operational Amplifier and find out the AC analysis
7. Draw the Analog Layout for CMOS current Mirror and perform DRC, LVS, RC Extraction
8. Design and simulate simple 5 transistor differential amplifier and analyze gain, bandwidth,

and CMRR by performing schematic simulations.

9. Design a CMOS ring oscillator and analyze its frequency and power consumption through simulations
10. Implement a CMOS logic inverter, obtain its VTC (Voltage Transfer Characteristic), and calculate noise margins
11. Design a two-stage CMOS operational amplifier and evaluate stability using phase margin analysis
12. Simulate a CMOS Schmitt Trigger and analyze its hysteresis characteristics
13. Design a basic CMOS NAND and NOR gate, perform transient analysis, and extract propagation delay

NOTE: Minimum of 12 experiments to be conducted.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2470482: MICROWAVE AND OPTICAL COMMUNICATIONS LABORATORY

IV Year B.Tech. ECE I – Sem.

L	T	P	C
0	0	2	1

Couse Overview:

This course introduces the characteristics and measurements of microwave sources, devices, and waveguide components. Students will perform experiments on attenuation, impedance, VSWR, and scattering parameters, along with optical sources such as LEDs and laser diodes. Emphasis is placed on fiber optic links, including modulation, numerical aperture, losses, and data rate analysis for communication applications

Pre-requisites: Basics of antennas and microwave engineering.

Course Objectives:

The students will try to learn

- Defining the range of frequencies for operation in microwave engineering.
- Functioning of microwave components.
- Verification of the Characteristics of Active and Passive Microwave Devices Practically.
- Measurement of the characteristics of optical devices.
- Measurement of the various parameters of the optical sources

Course Outcomes:

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

- Study the characteristics of microwave sources
- Estimate the guide wave length and free space wave length of a wave
- Analyse the characteristics of microwave devices
- Measurement of the various characteristics of different optical devices
- Measurement of the different parameters of the optical sources

List of Experiments:

1. Analyse the Reflex Klystron Characteristics.
2. Analyse the Gunn diode Characteristics.
3. Attenuation Measurement.
4. Analyse the Directional Coupler Characteristics & Coupling, Directivity and Isolation Measurements.
5. Scattering parameters of wave guide components
6. Measurement of Frequency
7. Measurement of impedance
8. VSWR measurement, Low & High VSWR.
9. Characterization of LED.
10. Characterization of Laser Diode.
11. Intensity modulation of Laser output through an optical Fiber.

12. Measurement of Data rate for Digital Optical link.
13. Measurement of Numerical Aperture of Fiber cable.
14. Measurement of losses for Optical link

NOTE: Minimum of 12 experiments to be conducted

2470023: Constitution of India

IV Year B.Tech. **L T P C**

0 0 0 0

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement haveresulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court ofIndia and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world".

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights

5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and theStates
8. Parliamentary Form of Government in India – The constitution powers and status of thePresident of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

IV-II

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2480452: GLOBAL NAVIGATION SATELLITE SYSTEM

IV Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course covers the fundamentals of radar and GPS-based navigation systems, including principles, architecture, and signal structures. It explores GPS error models, DGPS modernization, and global constellations such as GLONASS, Galileo, BeiDou, and NavIC. Students gain knowledge of satellite-based augmentation systems (SBAS/GBAS) for improved positioning accuracy.

Pre-requisites: Knowledge on the communication systems

Course Objectives:
The students will try to learn
- Principles and operation of radar and GPS navigation systems
- Signal structures, datums, and coordinate systems used in global navigation satellite systems
- Various GPS error sources and their impact on positioning accuracy
- Design, operation, and modernization of DGPS and related constellations
- Satellite-based and ground-based augmentation systems

Course Outcomes:
After successful completion of the course, students shall be able to
- Learn global positioning
- Know types of signals used in the GPS systems and accuracy limits
- Evaluate the different types of GPS errors
- Understand DGPS modernization and GPS coordinate system
- Gain knowledge on various satellite-based Augmentation systems

Module – I: GPS Fundamentals **7L**
GPS Fundamentals: INS, Trilateration, Hyperbolic navigation, Transit, GPS principle of operation, architecture, operating frequencies, orbits, Keplerian elements, Solar and Sidereal day, GPS, and UTC Time.

Module – II: GPS Signals, GNSS Datums **9L**
GPS Signals: Original and modernized GPS, GLONASS and Galileo signal structure, Signal components and modulation schemes, Important components of a receiver for the acquisition and tracking of GPS signals, link budget, types of GPS receivers.
GNSS Datums: Datums used for GPS and Galileo (ECEF and WGS 84). Datum used by Russian GLONASS and Indian Datums

Module – III: GPS Error Models **8L**
GPS Error Models: Ionospheric error, Tropospheric error, Ephemeris error, Clock errors, Satellite and receiver instrumental biases, Antenna Phase center variation, multipath; estimation of Total Electron Content (TEC) using dual frequency measurements, Various DOPs, UERE. Spoofing and Anti-spoofing. Link budget. Klobuchar model, Hopfield model and modeling of multipath error.

Module – IV: DGPS Modernization **8L**
DGPS Modernization**:** Future GPS satellites, new signals and their benefits, principle of operation of

DGPS, architecture and errors, types of DGPS, Spoofing and Anti-spoofing, LADGPS and WADGPS, Constellations: GLONASS, Galileo and BEiDou, and NaviC Systems

Module – V: Satellite based Augmentation systems **8L**

Satellite based Augmentation systems: Relative advantages of SBAS and GBAS, SBAS Features and Principle of operation of Wide area augmentation system (WAAS) and GAGAN, EGNOS and MSAS, Local area augmentation system (LAAS) concept and its applications.

TEXT BOOKS:

1. Hoffman-Wellenhof, B., H. Lichtenegger and Collins., J., "GPS Theory and Practice," Springer, New York, 5th Edition, 2005.
2. E. D. Kaplan and Christopher J. Hegarty, "Understanding GPS Principles and Applications," Artech House Boston, 2nd Edition 2006.

REFERENCES:

1. Mohinder S. Grewal, Lawrence R. Weill, Angus P. Andrews, "Global positioning systems – Inertial Navigation and Integration," John wily & sons, 2nd Edition, 2007.
2. Misra Pratap and Per Enge, "Global Positioning System: Signals, Measurements and Performance," Ganga- Jamuna Press, Lincoln, Massachusetts, USA, 2nd Edition, 2010.
3. Bradford W, Parkinson and James J.Spilker Jr., "Global Positioning System: Theory and Application Volume I and II," American Institute of Aeronautics and Astronautics Inc., Washington DC, 1st Edition, 1996.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2480453: WAVELETS AND APPLICATION

IV Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course introduces time-frequency signal analysis with a focus on wavelet theory and its applications. It covers STFT limitations, origins of wavelets, continuous and discrete wavelet transforms, and biorthogonal wavelets. Practical tutorials emphasize signal denoising, compression, and transient detection using MATLAB.

Pre-requisite: Basics of Signals and Systems

Course Objectives:

The students will try to learn

- Limitations of STFT and the motivation for wavelet transforms
- Foundations and origins of wavelet theory.
- Continuous and discrete wavelet transforms in detail.
- Orthogonal, biorthogonal, and Daubechies wavelets.
- Wavelet techniques to real-world signal and image processing problems.

Course Outcomes:

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

- Explain the time-frequency nature of signals and resolution trade-offs
- Apply wavelet transforms to analyze and process signals
- Perform mathematical analysis of systems using appropriate wavelet functions
- Implement wavelet-based techniques for denoising, compression, and detection
- Demonstrate knowledge of wavelets and their engineering applications

Module – I: Short Time Fourier Transform (STFT): **7L**

Signal representation with continuous and discrete STFT, concept of time-frequency resolution, Resolution problem associated with STFT, Heisenberg's Uncertainty principle and time frequency tiling, why wavelet transform?

Module – II: Introduction to Wavelet Transform **7L**

The origins of wavelets, Wavelets and other wavelet like transforms, History of wavelet from Morlet to Daubechies via Mallat, Different communities and family of wavelets, Different families of wavelets within wavelet communities

Module – III: Continuous Wavelet Transform **7L**

Wavelet transform-A first level introduction, Continuous time-frequency representation of signals, Properties of wavelets used in continuous wavelet transform, Continuous versus discrete wavelet transform

Module – IV: Discrete Wavelet Transform **10L**

: Haar scaling functions and function spaces, Translation and scaling of $\phi(t)$, Orthogonality of translates of $\phi(t)$, Function space V0, Finer Haar scaling functions, Concepts of nested vector spaces,

Haar wavelet function, Scaled and translated Haar wavelet functions, Orthogonality of ϕ(t) and ψ(t), Normalization of Haar bases at different scales, Refinement relation with respect to normalized bases, Support of a wavelet system, Daubechies wavelets, Plotting the Daubechies wavelets,

Module – V: System Modeling and Tutorials **7L**

Applications of Wavelets: Application of wavelet theory to signal denoising, image and video compression, multi-tone digital communication, transient detection.

TEXT BOOKS:

1. K. P. Soman, K. I. Rmachandran, N. G. Resmi, —Insight into Wavelets: From Theory to Practice, (Third Edition)‖, PHI Learning Pvt. Ltd., 2010.
2. A.N. Akansu and R.A. Haddad, —Multiresolution signal Decomposition: Transforms, Subbands and Wavelets‖, Academic Press, Oranld, Florida, 1992.

REFERENCE BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, —Digital Signal Processing‖, Pearson Prentice Hall, 2007.
2. Rafael C. Gonzalez, Richard E. Woods —Digital Image Processing (Third Edition), Pearson International Edition, 2009.
3. C. S. Burrus, Ramose and A. Gopinath, Introduction to Wavelets and Wavelet Transform, Prentice Hall Inc.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2480454: VLSI PHYSICAL DESIGN WITH TIMING ANALYSIS

IV Year B.Tech. ECE I - Sem. **L T P C**
3 0 0 3

Couse Overview:
This course introduces the fundamentals of VLSI physical design flow, covering partitioning, floor planning, placement, routing, and clock tree synthesis. It emphasizes static timing analysis (STA) including delay models, clock skew, jitter, and statistical timing methods. Students gain exposure to algorithms, EDA tools, and open-source design flows for modern VLSI systems.

Pre-requisites: Basics of digital design course.

Course Objectives:
The students will try to learn
- Physical design stages of VLSI systems and their algorithmic foundations
- Concepts and methods of static timing analysis for sequential and combinational circuits
- Techniques for partitioning, floor planning, placement, and routing in chip design
- Clock tree synthesis, timing closure, and signal integrity issues
- VLSI design tools and standard input file formats used in industry

Course Outcomes:
After successful completion of the course, students shall be able to
- Explain the physical design flow and its importance in VLSI design
- Perform timing analysis considering skew, jitter, OCV, and CRPR
- Apply algorithms for partitioning, placement, and routing of circuits
- Analyze timing closure challenges and advanced timing concepts
- Use open-source tools for implementing and validating a physical design flow

Module – I: Introduction & Static Timing Analysis **8L**.
VLSI design and physical design flow, Graph algorithms for physical design. Timing arcs, unateness, delay models, STA for combinational and sequential circuits (skew, jitter, OCV, CRPR)

Module – II: Partitioning & Floor planning **9L**
Partitioning & Floor planning: Partitioning algorithms (KL, FM), Floor planning concepts, representations, and algorithms, Pin assignment, power and ground routi

Module – III: Placement & Clock Tree Synthesis **9L**
Placement & Clock Tree Synthesis, Placement objectives and algorithms (min-cut, legalization), Clock routing principles and clock tree synthesis algorithms

Module – IV: Routing & Advanced Timing **7L**
Global and detailed routing (rectilinear, channel, switchbox), Crosstalk analysis, latch timing, time borrowing, Statistical static timing analysis (SSTA).

Module – V: Input Files & Open-Source Physical Design Flow **9L**
Input Files & Open-Source Physical Design Flow, Standard cell libraries, timing libraries, PDKs, Low-power and sub-threshold cells, Open-source tools: YOSYS, OpenSTA, OpenROAD flow.

TEXT BOOKS:

1. A.B. Kahng, J. Lienig, I.L. Markov, J. Hu, VLSI Physical Design: From Graph Partitioning to Timing Closure, Springer.
2. N.A. Sherwani, Algorithms for VLSI Physical Design Automation, 2nd Ed., Kluwer.

REFERENCES:

1. J. Bhasker and R. Chadha, Static Timing Analysis for Nanometer Designs: A Practical Approach, Springer, 2009.
2. H. Bhatnagar, Advanced ASIC Chip Synthesis: Using Synopsys Design Compiler, Physical Compiler, and PrimeTime, Kluwer, 2002.
3. S. K. Lim, Practical Problems in VLSI Physical Design Automation, Springer.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2480520: CYBER SECURITY

IV Year B.Tech. **L T P C**
3 0 0 3

Prerequisites: Cryptography and Network Security, Cyber Laws
Course Outcomes: Students should be able to

- Analyse and evaluate the cyber security needs of an organization.
- Understand Cyber Security Regulations and Roles of International Law.
- Design and develop a security architecture for an organization.
- Know about Security issues in Social media Marketing
- Understand fundamental concepts of data privacy attacks

MODULE - I
Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

MODULE - II
Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics

MODULE - III
Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Organizational security Policies and Measures in Mobile Computing Era, Laptops.

MODULE- IV
Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations

MODULE - V
Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc Cybercrime: Examples and Mini-Cases Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. MiniCases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B.B. Gupta, D.P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335,2018.

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REFERENCE BOOKS:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

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2486651: COMMUNICATION AND NETWORKING TECHNOLOGIES IN IOT

IV Year B.Tech. II - Sem. **L T P C**

3 0 0 3

Course Objectives:

The students will try to learn

- Understand the basic principles and architectures of IoT communication.
- Learn short-, medium-, long-range, and cellular IoT communication technologies.
- Study protocol stacks across physical, MAC, network, transport, and application layers.
- Identify performance issues like latency, energy use, reliability, and security.
- Develop skills to choose and design suitable IoT communication solutions.

Course Outcomes:

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

- Explain communication needs of low-power and constrained IoT devices.
- Compare IoT technologies such as Zigbee, BLE, Wi-Fi, LoRaWAN, NB-IoT, and 5G.
- Apply proper protocols for device-to-device and device-to-cloud communication.
- Analyze IoT network performance in terms of latency, energy, and reliability.
- Design effective communication solutions for various IoT applications.

MODULE - I: Introduction to IoT Communication & Networking **9L**

Overview of IoT communication fundamentals, IoT communication models (D2D, D2C, C2C, Gateway-based), IoT reference architectures: 3-layer, 5-layer, 7-layer models, IoT functional stack, Requirements for IoT communication: Scalability, interoperability, Latency, throughput, Security, reliability, Challenges in IoT networking: low power, constrained nodes, heterogeneous networks

MODULE - II: Short-Range Communication Technologies **9L**

RFID & NFC, Identification and short-range data transfer, Bluetooth & BLE, Device discovery, pairing, GATT, low-energy modes, Zigbee IEEE 802.15.4, mesh networking, PAN architectures, Z-Wave – Low-power home automation networking, Wi-Fi for IoT, Wi-Fi HaLow, IEEE 802.11ah, Power constraints and optimizations, Comparison of short-range technologies

MODULE - III: Medium-Range & Long-Range IoT Networking **9L**

IEEE 802.15.4 Networks, 6LoWPAN: IPv6 adaptation, header compression, fragmentation, RPL: Routing for Low Power and Lossy Networks, LPWAN Technologies, LoRa and LoRaWAN architecture, Sigfox communication model, NB-IoT (Narrowband IoT), Medium-range wireless networks, Wi-SUN, Thread protocol, Use cases: agriculture, smart metering, environment monitoring

MODULE – IV: IoT Protocol Stack (Network, Transport & Application Layers) **12L**

Network Layer, IPv4/IPv6 in IoT, Addressing constraints, RPL routing modes (storing, non-storing), ICMPv6 for IoT, Transport Layer, TCP vs UDP in IoT, Lightweight transport protocols, CoAP message exchange patterns, Application Layer, MQTT: publish/subscribe model, QoS levels, broker functionality CoAP: RESTful architecture, confirmable messages, AMQP, HTTP/REST for IoT Protocol selection

guidelines,

MODULE – V: Cellular, Satellite & Future Networks for IoT 10L

GSM/GPRS for IoT, LTE Cat-0/Cat-M1, NB-IoT architecture & use cases, 5G for IoT (URLLC, mMTC, eMBB), Satellite IoT Communication, LEO satellite IoT networks, Integration of satellite + terrestrial IoT, Future IoT Communication Trends, 6G and ultra-massive IoT, Edge computing & fog networking integration, Software-defined networking (SDN) in IoT, Network slicing for IoT, Autonomous IoT networks

TEXT BOOKS:

1. R. Herrero, *Fundamentals of IoT Communication Technologies*, 1st ed., Springer Nature Switzerland AG, 2022
2. D. Hanes, G. Salgueiro, P. Grossetete, R. Barton, and J. Henry, *IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things*, 1st ed., Cisco Press, 201

REFERENCE BOOKS:

1. R. Herrero, *Fundamentals of IoT Communication Technologies*, 1st ed., Springer Nature Switzerland AG, 2022..
2. D**.** Hanes, G. Salgueiro**,** P. Grossetete**,** R. Barton, and J. Henry, *IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things*, 1st ed., Cisco Press, 2017.
3. O. Hersent**,** D. Boswarthick**,** and O. **Elloumi**, *The Internet of Things – Key Applications and Protocols*, 1st ed., Wiley, 2012.

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2480455: 5G WIRELESS COMMUNICATIONS

IV Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course introduces the principles of 5G wireless communications, covering evolution from 1G–5G, key usage scenarios, and requirements. It emphasizes waveform design, multiple access schemes, architecture, and core network innovations in 5G.

Pre-requisites: The student must prior knowledge in Communication systems, Wireless & Mobile Communications.

Course Objectives:

The students will try to learn

- Requirements, features, and standards of 5G wireless systems
- Various waveform designs and multiple access schemes for 5G and beyond
- 5G architecture and NextGen core network concepts
- Advanced topics including Massive MIMO communications
- The SDN, NFV, and network slicing in enabling flexible 5G services

Course Outcomes:

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

- Recall the requirements and key functionalities of 4G LTEA/5G NR technology
- Compare various channel access technologies and modulation techniques used in 5G wireless systems
- Illustrate the architecture of 5G and its NextGen core network
- Apply the 5G concepts to D2D communications
- Demonstrate the concept of massive MIMO

Module – I: Basics of Radar, Radar Equation **9L**

Overview of 5G Wireless Communications: Evolution of mobile technologies (1G-5G), 3GPP Releases & its key aspects, Overview of 5G, three high level 5G usage scenarios (eMBB, URLLC, mMTC), Key capabilities & requirements, 5G vs. LTE-A Comparison, 5G frequency bands, 5G Use cases.

Module – II: Waveform Design for 5G & Beyond 9**L**

Introduction - 5G Waveform Design and Waveform Requirements – Flexible OFDM comparison with CP-OFDM, generalized frequency division multiplexing (GFDM), filter bank multicarrier (FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques –non-orthogonal multiple accesses (NOMA), Sparse Code Multiple Access (SCMA) – Comparison of multiple access methods

Module – III: 5G Architecture **8L**

5G Architecture: Introduction, 5G Architecture framework, 3GPP 5G architecture, Non-Roaming 5G system architecture, overall RAN architecture, Functional Split Between NG-RAN and 5G Core Network.

Module – IV: 5G NextGen core network **8L**

5G NextGen core network: Modern network requirements, SDN architecture, NFV benefits and

requirements, – NFV Reference Architecture, Network Slicing concepts & requirements

Module – V: Massive Multiple-Input Multiple-Output (MIMO) Systems 9L

Introduction to multi-antenna system, Theoretical background: MIMO requirement, MIMO vs. massive MIMO, Massive MIMO benefits, single user and multi-user MIMO, capacity of MIMO for unknown CSIT, massive MIMO capacity, Massive MIMO OFDM transmitter employing digital precoding, analog beamforming and hybrid of digital precoding and analog beamforming.

TEXT BOOKS:

1. Saad Z. Asif, “5G Mobile Communications Concepts and Technologies” CRC Press, 2019.
2. Suvra Sekhar Das and Ramjee Prasad, “Evolution of Air Interface Towards 5G: Radio Access Technology and Performance Analysis”, Gistrup, Denmark: River Publishers series in Communication, 2018.

REFERENCES:

1. Wei Xiang, Kan Zheng, Xuemin (Sherman) Shen, “5G Mobile Communications”, Springer publications-2016.
2. William Stallings “5G Wireless: A Comprehensive Introduction”, Pearson Education, 2021.
3. Afif Osseiran, Jose F. Monserrat, Patrick Marsch, “5G Mobile and Wireless Communications Technology” Cambridge University Press-2016.

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2480456: QUANTUM COMMUNICATION AND COMPUTING

IV Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Couse Overview:
This course introduces fundamentals and applications of quantum communication and computing. Covers qubits, gates, QKD protocols, teleportation, entanglement, quantum algorithms, and hardware issues.

Pre-requisite: Linear Algebra, Probability, Signals & Systems.

Course Objectives:

The students will try to learn

- Qubits, superposition, entanglement
- Quantum communication protocols (QKD, teleportation, dense coding)
- Photonic hardware, fiber/free-space/satellite channels
- Quantum circuits and algorithms (Deutsch-Jozsa, Grover, Shor)
- How to Simulate protocols using Qiskit/Matlab

Course Outcomes:

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

- Represent and manipulate quantum states & gates
- Implement and analyze QKD & teleportation protocols
- Explain hardware considerations for quantum links
- Design and simulate basic quantum circuits/algorithms
- Understand noise, decoherence, and basic error correction

Module – I: Foundations of Quantum Information **7L**

Quantum postulates, qubits, entanglement, density matrices, no-cloning, quantum vs classical information.

Module – II: Quantum Communication Protocols **8L**

QKD (BB84, E91, B92), teleportation, superdense coding, security & eavesdropping

Module – III: Quantum Channels & Networks **8L**

Photonics (sources, detectors, waveplates), fiber/free-space/satellite communication, quantum repeaters, decoherence.

Module – IV: Quantum Gates & Algorithms **6L**

Quantum gates (Pauli, Hadamard, CNOT), circuits, Deutsch-Jozsa, Grover, Shor overview, QFT

Module – V: Error, Noise & Tutorials **8L**

Noise models, basics of error correction, Qiskit/Matlab labs: QKD simulation, teleportation, Grover, small Shor demo.

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TEXT BOOKS:

1. M. A. Nielsen and I. L. Chuang, Quantum Computation and Quantum Information. Cambridge, U.K.: Cambridge Univ. Press, 2010.
2. A. Pathak, Elements of Quantum Computation and Quantum Communication. Boca Raton, FL, USA: CRC Press, 2015.

REFERENCE BOOKS:

1. IBM, Qiskit Textbook and Tutorials. [Online]. Available: https://qiskit.org
2. Rajiv Chopra, Quantum Computing and Techniques (Khanna Publishing House, 2024).
3. Manenti R., Motta M., Quantum Information Science, Oxford Univ. Press (2023).

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2480457: DSP ARCHITECTURES IN VLSI

IV Year B.Tech. ECE II - Sem. **L T P C**
3 0 0 3

Couse Overview:
This course introduces the design and architecture of VLSI systems for Digital Signal Processing (DSP). It covers mapping DSP algorithms to architectures, SoC design components, processor architectures, memory hierarchy, interconnects, and reconfigurable technologies. Practical case studies highlight processor selection, memory trade-offs, bus protocols, and FPGA-based customization.

Pre-requisites: Design basics of Embedded System Design; Fundamentals of Digital Signal Processing

Course Objectives:
The students will try to learn
- DSP algorithm mapping into VLSI architectures (pipelining, retiming, folding/unfolding)
- Processor architectures (CISC, RISC, DSP, VLIW, superscalar)
- Memory hierarchy design: caches, scratchpads, multilevel memory
- Interconnect architectures, bus protocols, and SoC customization
- Reconfigurable architectures: FPGA, soft cores, and SoC verification techniques

Course Outcomes:
After successful completion of the course, students shall be able to
- Describe SoC architectures and DSP mapping techniques
- Select and analyze processors for DSP applications
- Design and evaluate memory systems, including cache and scratchpads
- Model interconnect architectures and bus-based communication in SoCs
- Apply reconfigurable design and optimization techniques for DSP systems

Module – I: DSP Algorithm to Architecture Mapping **8L**
Mapping DSP algorithms (FIR, IIR, FFT, convolution) onto hardware, Optimization techniques: pipelining, retiming, unfolding, folding, Systolic array processors, throughput vs. area trade-offs.

Module – II: Processor Architectures for DSP **8L**
CISC, RISC, DSP processors: instruction set design, Superscalar, VLIW, SIMD/vector processors and extensions, Instruction pipelines, hazards, branch handling, buffers.

Module – III: Memory Hierarchy & SoC Interfaces **8L**
Cache organization: write policies, replacement strategies, split I/D caches, Scratchpads, multilevel caches, memory–processor interaction, SoC bus architectures, interconnect models, contention analysis.

Module – IV: Interconnect & Reconfigurable Architectures **8L**.
Standard SoC buses: AMBA, Wishbone, AXI, Customization techniques and integration of IP cores, FPGA and soft processors: reconfiguration and trade-offs.

Module – V: Optimization & Verification **9L**

Power and performance optimization: retiming, folding, low-power design, Reconfiguration overheads and trade-off analysis, SoC verification methodologies: simulation, testbenches, FPGA prototyping

TEXT BOOKS:

1. K. K. Parhi, VLSI Digital Signal Processing Systems: Design and Implementation. New York, NY, USA: Wiley, 1999.
2. P. Pirsch, Architectures for Digital Signal Processing. Hoboken, NJ, USA: Wiley, 2009.

REFERENCES:

1. M. J. Flynn and W. Luk, Computer System Design: System-on-Chip. New Delhi, India: Wiley India, 2001.
2. S. Furber, ARM System-on-Chip Architecture, 2nd ed. Boston, MA, USA: Addison-Wesley, 2000.
3. R. Reis, Design of System on a Chip: Devices and Components. Berlin, Germany: Springer, 2004.

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2480458: UNMANNED AERIAL VEHICLES

IV Year B.Tech. ECE II - Sem. **L T P C**
3 0 0 3

Couse Overview:
This course introduces the fundamentals of Unmanned Aerial Vehicle (UAV) systems, including their evolution, classification, and applications. It covers UAV design, aerodynamics, components, theory of flight, and navigation with emphasis on DGCA regulations and piloting. Students gain practical knowledge of drone assembly, AI applications, waypoint navigation, and ground/in-flight testing through case studies.

Pre-requisites: Basics of Embedded System Design.

Course Objectives:
The students will try to learn
- Basic concepts of UAV/DRONE systems and its applications
- Different hardware configurations for UAV
- Designing, integration and testing of UAV
- GCS Software & applications
- Flight configurations and Practical implementation

Course Outcomes:
After successful completion of the course, students shall be able to
- Identify different hardware for UAV
- Prepare preliminary design requirements for an unmanned aerial vehicle
- Perform system testing for unmanned aerial vehicles
- Integrate various systems of unmanned aerial vehicle
- Design micro aerial vehicle systems by considering practical limitations. Understanding of GCS Software & Practical implementation

Module – I: Introduction to Unmanned Aerial Vehicle Systems **6L**
Introduction to Unmanned Aerial Vehicle Systems -- evolution of UAV – classification – models and prototypes – System Composition-applications.

Module – II: Design and Selection of the System **9L**
Introduction to Design and Selection of the System- Aerodynamics and Airframe Configurations- Characteristics of Aircraft Types- Regulations of DGCA- Fixed Wing Operations and Aerodynamics - Drone Piloting-Weather and Meteorology- ATC Procedures & Radio Telephony.

Module – III: Components of Drone **7L**
Basic Components of Drone - Different Types of Drones- Assembling of Drone, Artificial Intelligence in Drone -Drone Mapping.

Module – IV: Theory of Flight **7L**
Theory of Flight-Three Axes of Fight-Take –Off - Landing – Hover- Turning- Forwards and Sideway-Aerodynamic of Drone.

Module – V: Waypoints Navigation **8L**

Waypoints Navigation-Introduction to Ground Control software (GCS) - System Ground Testing System In-flight Testing of Mini and Micro UAVs- Case study on the usage of UAV/Drone.

TEXT BOOKS:

1. Paul G Fahlstrom, Thomas J Gleason, “Introduction to UAV Systems”, UAV Systems, Inc, 1998.
2. Reg Austin “Unmanned Aircraft Systems UAV design, development and deployment”, Wiley, 2010.

REFERENCES:

1. Armand J. Chaput, “Design of Unmanned Air Vehicle Systems”, Lockheed Martin Aeronautics Company, 2001.
2. Kimon P. Valavanis, “Advances in Unmanned Aerial Vehicles: State of the Art and the Road to Autonomy”, Springer, 2007.
3. Robert C. Nelson, Flight Stability and Automatic Control, McGraw-Hill, Inc, 1998

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2486604: ARTIFICIAL NEURAL NETWORKS

IV Year B.Tech. ECE II - Sem. **L T P C**
3 0 0 3

Prerequisites: Data Structures, Linear Algebra
Course Outcomes: students will be able to:

- Understand different neural network models
- Create different neural networks of various architectures both feed forward and feed backward.
- Perform the training of neural networks using various learning rules.
- Perform the testing of neural networks
- perform analysis of these networks for various pattern recognition applications.

MODULE - I
Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process

MODULE - II
Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection

MODULE - III
Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning

MODULE - IV
Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification.

MODULE - V
Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm
Hopfield Models – Hopfield Models, Computer Experiment

TEXT BOOKS:
1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.

REFERENCE BOOKS:
1.Artificial Neural Networks - B. Vegnanarayana Prentice Hall of India P Ltd 2005
2. Neural Networks in Computer Inteligance, Li Min Fu MC GRAW HILL EDUCATION 2003

3. Neural Networks -James A Freeman David M S Kapura Pearson Education 2004.
4. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.