I YEAR I SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2210001	Matrix Algebra & Calculus	BS	3	1	0	4	40	60	100
2	2210008	Applied Physics	BS	3	1	0	4	40	60	100
3	2210501	Programming for Problem Solving	ES	3	0	0	3	40	60	100
4	2210372	Engineering Workshop	ES	0	1	3	2.5	40	60	100
5	2210010	English for Skill Enhancement	HS	2	0	0	2	40	60	100
6	2210421	Elements of Electronics and Communication Engineering	PC	0	0	2	1	50	-	50
7	2210071	Applied Physics Laboratory	BS	0	0	3	1.5	40	60	100
8	2210571	Programming for Problem Solving Laboratory	ES	0	0	2	1	40	60	100
9	2210073	English Language and Communications Skills Laboratory	HS	0	0	2	1	40	60	100
10	2210021	Environmental Science	*MC	3	0	0	0	-	-	-
		Induction Programme	-	-	-	-	-	-	-	-
TOTAL				**14**	**3**	**12**	**20**	**370**	**480**	**850**

I YEAR II SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2220002	Differential Equations and Vector Calculus	BS	3	1	0	4	40	60	100
2	2220009	Engineering Chemistry	BS	3	1	0	4	40	60	100
3	2220371	Engineering Drawing Practice	ES	1	0	4	3	40	60	100
4	2220201	Basic Electrical Engineering	PC	2	0	0	2	40	60	100
5	2220422	Electronic Devices and Circuits	PC	2	0	0	2	40	60	100
6	2220572	Data Structures Laboratory	ES	0	1	2	2	40	60	100
7	2220072	Engineering Chemistry Laboratory	BS	0	0	2	1	40	60	100
8	2220271	Basic Electrical Engineering Laboratory	PC	0	0	2	1	40	60	100
9	2220476	Electronic Devices and Circuits Laboratory	PC	0	0	2	1	40	60	100
TOTAL				**11**	**3**	**12**	**20**	**360**	**540**	**900**

***MC- Satisfactory/Unsatisfactory**

I-I

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2210001: MATRIX ALGEBRA AND CALCULUS (Common to all)

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

3 1 0 4

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: 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 and eigen vectors and to reduce the quadratic form to canonical form
- 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:

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

- Recall the concepts of rank, Echelon form, Normal form, and the properties of non-singular matrices.
- Explain the process of finding eigenvalues and eigenvectors of a matrix and their role in diagonalization.
- Relate Beta and Gamma functions to standard integrals and solve related problems.
- Apply Euler's theorem and compute total derivatives for multivariable functions..
- Understand the methods for changing variables in double and triple integrals, including transformations to polar, spherical, and cylindrical coordinates.

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 by Gauss elimination method, Gauss Seidel Iteration Method.

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

Eigen values, Eigen vectors and their properties, 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 **10 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). Definition of Improper Integral: Beta and Gamma functions and their applications.

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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) 8 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 double integrals and triple integrals).

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, NewDelhi.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2210008: APPLIED PHYSICS

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

3 1 0 4

Prerequisites: 10 + 2 Physics

Course Objectives:

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

Course Outcomes:

At the end of the course the student will be able to:

- Illustrate the concepts of the dual nature of matter and the Schrödinger wave equation

  Of a particle confined in a basic system.
- Classification of semiconductors and their roles in different types of optoelectronic Devices utilized in a range of engineering applications.
- Understand the properties of dielectric and magnetic materials and their applicability in engineering contexts.
- Explain the key factors, fabrication methods, characterization techniques, and Applications of nano materials.
- Relate the concepts of lasers and optical fibers, when used with normal light, in terms of their mechanisms and applications across various fields and scientific Practices.

UNIT - I: QUANTUM PHYSICS AND SOLIDS

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

Solids: Free electron theory (Drude & Lorentz, Sommerfeld) (qualitative), Bloch's theorem - Kronig-Penney model, Effective mass of an 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) - LED, PIN diode, Avalanche photo diode (APD) and solar cells, their structure, Materials, Working principle and characteristics.

UNIT - III: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS

Dielectric Materials: Basic definitions, Types of polarizations (qualitative), Ferroelectric, Piezoelectric, and Pyroelectric materials, Applications.

Magnetic Materials: Domain theory of ferromagnetism, Soft and Hard magnetic materials, Magnetostriction, Magnetoresistance, Applications.

Energy Materials: Conductivity of liquid and solid electrolytes, Superionic conductors, Materials and electrolytes for super capacitors.

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 nano materials.

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, Nd:YAG laser, Applications of laser.

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

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, Mc Graw Hill, 4th Edition, 2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition,2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

REFERENCE BOOKS:

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons,11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1stEdition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group.
7. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.

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2210501: PROGRAMMING FOR PROBLEM SOLVING

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

3 0 0 3

Course Objectives:

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

Course Outcomes: The student will learn

- Illustrate Problem solving steps in-terms of algorithms, Pseudo code and Flow charts for mathematical and engineering problems
- Construct programs involving decision structures, Loops, Arrays and Strings
- Apply fundamental programming concepts in C by manipulating strings, utilizing structures and unions for complex data representation, and employing pointers for efficient memory access and data manipulation, including self-referential structures and enumerated data types.
- Design and implement efficient C programs using structured programming principles, including function declarations and parameter passing techniques, recursion, and dynamic memory allocation for flexible and optimized memory management.
- Use file Input and output operations in implementation of real time applications

UNIT - I: Introduction to Programming

Compilers, compiling and executing a program.

Algorithm – Flowchart / Pseudocode withexamples, Program design and structured programming

Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops

I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments

UNIT - II: Arrays, Strings, Structures and Pointers:

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings

Structures: Defining structures, initializing structures, unions, Array of structures

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation) Enumeration data type.

UNIT - III: Preprocessor and File handling in C:

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef Files:

Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

UNIT - IV: Function and Dynamic Memory Allocation:

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

UNIT - V: Searching and Sorting:

Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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2210372: ENGINEERING WORK SHOP

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

0 1 3 2.5

Course Objectives:

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

Course Outcomes:

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

UNIT I - CARPENTRY & FITTING

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

Learning Outcomes: Students should be able to,

- Understand the trade of carpentry and fitting. (L2)
- Explain the tools involved in manufacturing operations. (L3)
- Evaluate the applications of carpentry and fitting. (L4)

UNIT II - TIN SMITHY AND BLACKSMITHY

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

Learning Outcomes: Students should be able to,

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

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UNIT III - HOUSE WIRING AND WELDING

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

Learning Outcomes:

- Students should be able to,
- Discuss the topic of Heat engines.(L3)
- Identify types of Heat engines cycles.(L5)
- Evaluate the Factors affecting routing procedure, Route Sheet.(L4)

Text Books:

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

References:

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

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2210010: ENGLISH FOR SKILL ENHANCEMENT

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

2 0 0 2

Course Objectives: This course will enable the students to:

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: Students will 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.
6. Acquire basic proficiency in reading and writing modules of English.

UNIT - I

Chapter entitled '***Toasted English*' by R. K. Narayan** from ***"English: Language, Context and Culture"*** published by Orient Black Swan, 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 with Reference to 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.

UNIT - II

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 with Reference to 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.

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UNIT - III

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 with Reference to 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.

UNIT - IV

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.

UNIT - V

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 units*)

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 Unit-6 in AICTE Model Curriculum are covered in the syllabus of 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 **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

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

TEXT BOOKS:

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. Vishwa Mohan, 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

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(AUTONOMOUS)

2210421: ELEMENTS OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year B.Tech. ECE I – Sem.

L	T	P	C
0	0	2	1

Course outcomes: Students will be able to

- Identify the different components used for electronics applications
- Measure different parameters using various measuring instruments
- Distinguish various signal used for analog and digital communications

List of Experiments:

1. Understand the significance of Electronics and communications subjects
2. Identify the different passive and active components
3. Color code of resistors, finding the types and values of capacitors
4. Measure the voltage and current using voltmeter and ammeter
5. Measure the voltage, current with Multimeter and study the other measurements using Multimeter
6. Study the CRO and measure the frequency and phase of given signal
7. Draw the various Lissajous figures using CRO
8. Study the function generator for various signal generations
9. Study of Spectrum analyzer and measure the spectrum
10. Operate Regulated power supply for different supply voltages
11. Study the various gates module and write down the truth table of them
12. Identify various Digital and Analog ICs
13. Observe the various types of modulated signals.
14. Know the available Softwares for Electronics and communication applications

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2210071: APPLIED PHYSICS LABORATORY

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

0 0 3 1.5

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

- Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
- 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 and Resistivity of semiconductor materials.
- Able to measure the characteristics of dielectric constant of a given material.
- Study the behavior of B-H curve of ferromagnetic materials.
- Understanding the method of least squares fitting.

Course Outcomes: The students will be able to:

- Demonstrate the Planck's constant using Photo electric effect and identify the Material whether it is n-type or p-type by Hall experiment.
- Illustrate quantum physics in semiconductor devices and optoelectronics.
- Understand the properties for dielectric materials.
- Compare the variation of magnetic field and behavior of hysteresis curve.
- Interpret 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 BOOKS:

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

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2210571: PROGRAMMING FOR PROBLEMSOLVING LABORATORY

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

0 0 2 1

[Note: The programs may be executed using any available Open Source/ Freely available IDESome of the Tools available are:
CodeLite: https://codelite.org/ Code: Blocks:
http://www.codeblocks.org/
DevCpp: http://www.bloodshed.net/evcpp.html Eclipse:
http://www.eclipse.org
This list is not exhaustive and is NOT in any order of preference]

Course Objectives: The students will learn the following:

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

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

- Demonstrate problem solving steps in terms of algorithms, pseudo-code and flowcharts for Mathematical and Engineering problems
- Apply the concept of pointers, arrays, and strings for solving real-time problems
- Analyze the complexity of problems, modularize the problems into small modules and then convert them into programs.
- Implement the programs with concept of file handling functions and pointer with real time applications of C.
- Explore the concepts of searching and sorting methods with real time applications using c.

Simple numeric problems:

a. Write a program for the simple, compound interest.
b. Write a program to implement bit-wise operators.
c. Write a program for converting Fahrenheit to Celsius.
d. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values from standard input.
e. Write a simple program to find largest of two and three numbers using conditional operator.
f. Write a program for swapping two numbers with and without using third variable and using bitwise operators.

Condition branching and statements:

a. Write a program for finding larges of three numbers.

b. Write a program that declares Class awarded for a given percentage of marks, where marks<40%=Failed, 40% to<60% = Second class, 60% to<70%=First class, >=70%=Distinction. Read percentage from standard input.

c. Write a C program to find the roots of a Quadratic equation.

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

Condition branching and loops:

a. Write a program to find whether the given number is a prime or not.

b. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

c. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, number=5 and no. of rows = 3, the output should be:

5x1=5
5x2=10
5x3=15

d. Write a program that shows the binary equivalent of a given positive number between0to255.

e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

g. Write a C program to calculate the following ,where x is a fractional value.1-$x/2+x^2/4-x^3/6$

h. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:$1+x+x^2+x^3+….+x^n$. For example: if n=3 and x=5, then the program compute1+5+25+125.

i. Write a C program to construct a pyramid of numbers as follows:

1	*	1	1	*
12	**	23	22	**
123	***	456	333	***
			4444	**
				*

j. Write a C program to find given number is Armstrong number or not.

k. Write a C program to find given number is Perfect number or not.

Arrays, Strings, Pointers and Structures:

a. Write a C program to find the minimum, maximum and average in an array of integers.

b. Write a program to compute Mean, Variance, Standard Deviation, Sorting of n elements in single dimension array.

c. Write a C program that perform the following:
   i. Addition of Two Matrices
   ii. Multiplication of Two Matrices
   iii. Transposeofamatrixwithmemorydynamicallyallocatedforthenewmatrixasro wandcolumncounts may not be same.
d. Write a C program that sorts a given array of names.
e. Write a C program that perform the following operations:
   i. To insert a sub-string into a given main string from a given position.
   ii. To delete n Characters from a given position in a given string.
f. Write a program for reading elements using pointer in to array and display the values using array.
g. Write a program for display values reverse order from array using pointer.
h. Write a program through pointer variable to sum of n elements from array.
i. Write a program to implement student information by using structure to function.
j. Write a program to sort student id or name using structures.

Functions:

a. Write a C program to find factorial of a given number using functions.
b. Write a C program to perform swapping using functions.
c. Write a C program to find LCM, GCD of two numbers using functions.
d. Write a C program to implement sorting using functions.
e. Write a C program to create and print two dimensional array using functions.
f. Write a C program to find factorial of a given number using recursion.
g. Write a C program to find Fibonacci series using recursion
h. Write a C program to implement Towers of Hanoi problem using recursion.

Files:

a. Write a C program to display the contents of a file to standard out put device.
b. Write a C program which copies one file to another, replacing all lower case characters with their upper case equivalents.
c. Write a C program to count the occurrence of a character in a text file. The file name and the character are supplied as command line arguments.
d. Write a C program to merge two files in to a third file (i.e. ,the contents of the first file followed by those of these cond are put in the third file).

CASE STUDY I: Develop Sample Student Data base

Create a structure to specify data on students given below: Roll number, Name, Department, Course, Year of joining

Assume that there are not more than 15 students in the collage.

(a) Write a function to print names of all students who joined in a particular year.
(b) Write a function to print the data of a student whose roll number is given.

CASE STUDY 2: Perform simple Bank Transactions

Create a structure to specify data of customers in a bank. The data to be stored is: Account

number, Name, Balance in account. Assume maximum of 20 customers in the bank.

(a) Write a function to print the Account number and name of each customer with balance below Rs. 100.

(b) If a customer request for withdrawal or deposit, it is given in the form: Acct. no, amount, code (1 for deposit, 0 for withdrawal)

Write a program to give a message, "The balance is insufficient for the specified with drawal".

CASE STUDY 3: Provide Serial Numbers for Engine parts

An automobile company has serial number for engine parts starting from AA0 to FF9. The other characteristics of parts to be specified in a structure are: Year of manufacture, material and quantity manufactured.

(a) Specify a structure to store information corresponding to a part.

(b) Retrieve information on parts with serial numbers between BB1 and CC6.

Reference Books

1. Byron Gottfried, Schaum"s Outline of Programming with C, Mc Graw-Hill
2. Let us C by Yashavant Kanetkar BPB publications(16th Edition)
3. B.A.Forouzan and R.F.Gilberg C Programming and Data Structures, CengageLea rning (3rd Edition)
4. BrianW. Kernighan and Dennis M.Ritchie, The CProgramming Language, Prentice Hall of India
5. R. G. Dromey, How to solve It by Computer, Pearson(16th Impression)
6. Programming in C, Stephen G.Kochan, Fourth Edition, and Pearson Education.
7. Herbert Schildt, C:The Complete Reference, McGrawHill,4th Edition.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2210073: ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

I Year B.Tech. ECE 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, in to nation 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 English language by interpreting audio-visual content and recognizing different accents and dialects used in diverse contexts.
- ✓ Exhibit improved pronunciation and accent neutrality through accurate speech production, articulation, and the use of neutral English accent features.
- ✓ Apply listening and comprehension strategies to effectively understand and respond to various English language inputs.
- ✓ Participate confidently in oral communication tasks such as group discussions, role-plays, and presentations, showcasing clarity, fluency, and coherence in speech.
- ✓ Communicate effectively and professionally in both formal and informal settings, demonstrating enhanced verbal skills relevant to academic, social, and workplace environments

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, develop their listening skills so that they may appreciate the role in theLSRW 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 recognize and use the right intonation in sentences.

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

- Listening for specific information

Speaking Skills:

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students 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 SkillsLab**.

Exercise – ICALL 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 – IICALL 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 - IIICALL 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 – IVCALL 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 – VCALL 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)

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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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2210021: ENVIRONMENTAL SCIENCE

I Year B.Tech. ECE I – Sem. **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

Course Outcomes:

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development.

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, ecosystem value, services and carrying capacity, Field visits.

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.

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.

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 of pollution, 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. **Global Environmental**

Issues and Global Efforts: Climate 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.

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,R22 B.Tech. ECE Syllabus JNTU HYDERABAD biological and Socio-economical aspects. Strategies for risk assessment, 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, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

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 Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications

I-II

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2220002: DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS (Common to all)

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

3 1 0 4

Pre-requisites: Mathematical Knowledge at pre-university level

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

- Utilize the methods of differential equations for solving Newton's law of cooling and Law of Natural growth and decay.
- Understand the solutions of linear differential equations with constant coefficients.
- Explain the concept of the Laplace transform and its significance in solving differential equations and evaluating integrals.
- Interpret the vector differential operators and their relationships for solving engineering problems.
- Apply the integral transformations to surface, volume and line of different geometrical models

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

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

UNIT-II: Ordinary Differential Equations of Higher Order **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, 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.

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UNIT-IV: Vector Differentiation **10 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, Gauss and Stokes (without proofs) 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, 9thEdition, 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, NewDelhi.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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2220009: ENGINEERING CHEMISTRY

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

3 1 0 4

Course Objectives:

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

Course Outcomes:

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

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 ion- selective electrode method. 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 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 and Solid oxide 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.

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UNIT - III: Polymeric materials: [8]

Definition – Classification of polymers with examples – Types of polymerization – addition (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. 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 – Transesterification, advantages.

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

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

Smart materials and their engineering applications

Shape memory materials- Poly L- Lactic acid. Thermoresponse materials- Polyacryl amides, Poly vinyl amides

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, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

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)

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2220371: ENGINEERING DRAWING PRACTICE

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

1 0 4 3

Pre-requisites: Knowledge in dimensions and units, Usage of geometrical instruments and analytical ability

COURSE OBJECTIVES

- To provide basic concepts in engineering drawing.
- To impart knowledge about standard principles of orthographic projection of objects.
- To draw sectional views and pictorial views of solids.

COURSE OUTCOMES: After completion of the course the student is able to

- Design different types of scales used in engineering, conics sections, and cycloids.
- Deduce orthographic projections of points, lines, and planes inclined to one or both reference planes.
- Draw orthographic projections of regular solids to one or both reference planes.
- Construct the surface developments for regular solids.
- Sketch isometric projections and convert orthographic to isometric views and vice-versa.

UNIT – I

Introduction To Engineering Drawing

Principles of Engineering Graphics and their Significance-Drawing Instruments and their Uses-Conventions in Drawing-BIS -Lettering and Dimensioning.

Geometrical Constructions: Bisecting a Line, Arc. Dividing A Line into 'N' Equal Parts, Construction of Polygons, Division of Circle into Equal Parts (8 And 12)

Construction of Scales: Plain and Diagonal Scale.

Conic Sections: Ellipse, Parabola, Hyperbola and Rectangular Hyperbola- GeneralMethods only.

Engineering Curves: Cycloid, Epicycloid, Hypocycloid.

Involutes: For Circle, Triangle, Square, Pentagon and Hexagon.

UNIT –II

Orthographic Projections

Principles- Assumptions- Different Angles of Projection.

Projections of Points- Located in all the quadrants

Projections of Lines- Parallel, Perpendicular, inclined to one plane and inclined to bothplanes.

Projections of Planes: Simple and auxiliary position of a plane.

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UNIT–III

Projections Of Solids

Classification of solids- simple and inclined to one plane position of Prisms, Pyramids, Cylinder and Cone

UNIT – IV

Section Of Solids

Types of Section Planes, Sectioning of Prisms, Pyramids, Cylinders and Cones.

Development Of surfaces

Development of surfaces of right Regular Solids- Parallel Line Method, Radial Line Method.

UNIT – V

Isometric Projections

Principles, Isometric Views of Planes, Solids- Box Method, Offset Method, Compound solids, Sectioned Solids. Conversion of Isometric to Multi view projection. And vice versa

TEXT BOOKS:

1. N.D.Bhatt, Elementary Engineering Drawing, Charotar Publishers,2012.
2. K.Veenugopal, –Engineering Drawing and Graphics + AutoCAD New Age International Pvt. Ltd, 2011.

REFERENCE BOOKS:

1. Engineering graphics with Auto CAD- R.B. Choudary/Anuradha Publishers Engineering Drawing- Johle/Tata Macgraw Hill.
2. Basanth Agrawal and C M Agrawal –Engineering Drawing 2nd Edition -McGraw-Hill Education (India) Pvt.Ltd

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2220201: BASIC ELECTRICAL ENGINEERING
(Common to ECE, CSE, CSC,CSD, CSM, CSIT & IT)

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

2 0 0 2

Course Prerequisites: Nil

Course Objectives:

- To analyse and solve electric circuits.
- To provide an understanding of basics in Electrical circuits.
- To identify the types of electrical machines for a given application.
- To explain the working principles of Electrical Machines and single phase transformers.

Course Outcomes:

After completion of this course the student is able to

- Get practical knowledge related to electrical
- Fabricate basic electrical circuit elements/networks
- Trouble shoot the electrical circuits
- Design filter circuit for application and Get hardware skills such as soldering, winding etc.
- Get debugging skills.

UNIT-I: DC Circuits:

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin's and Norton's Theorems.

Unit-II: 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). Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III: Transformers:

Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV: Electrical Machines:

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque- speed characteristic and speed control of separately excited dcmotor. Construction and working of synchronous generators.

UNIT-V: Electrical Installations:

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Text Books:

1. Basic Electrical Engineering - By M.S.Naidu and S. Kamakshaiah – TMH.
2. Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford University

Press.

Reference Books:

1. Theory and Problems of Basic Electrical Engineering by D.P.Kothari & I.J. Nagrath PHI.
2. Principles of Electrical Engineering by V.K Mehta, S.Chand Publications.
3. Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin Pearson.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2220422: ELECTRONIC DEVICES AND CIRCUITS

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

2 0 0 2

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

Course Objectives:

- To introduce components such as Diodes, BJTs and FETs
- To know the applications of semiconductor devices
- To study special purpose semiconductor devices
- To give understanding of various types of amplifier circuits
- To design and analyze the different small-signal amplifier circuits

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

- Understand the fundamental principles of semiconductor diodes, including their construction, operation and applications for evaluating the device parameters.
- Analyze the performance characteristics of BJT configurations based on parameters like gain and impedance.
- Analyze transistor circuits with appropriate biasing and stabilization techniques for operating BJTs and MOSFETs in different regions.
- Apply the low-frequency small signal equivalent circuit models of BJTs for measuring amplifier parameters, including gain and impedance
- Demonstrate the working principle of special purpose semiconductor diodes and transistors for triggering and voltage regulation applications

UNIT– I

PN Junction Diode and Applications:

Operation and characteristics of PN junction diode, PN junction current, Static and Dynamic resistances, Load line analysis, Diffusion and Transition Capacitances, Diode Configurations, Rectifiers – HWR, FWR, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters; Clippers and Clampers.

UNIT – II

Bipolar Junction Transistor (BJT): 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, Bias Compensation using Diodes.

UNIT – III

Field Effect Transistor (FET): 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.

UNIT – IV

Analysis and Design of Small Signal Low Frequency BJT Amplifiers: 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 Amplifier, Low frequency response of BJT Amplifiers, Effect of coupling and bypass capacitors on CE Amplifier.

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UNIT – V

FET Amplifiers: FET Small Signal Model**,** Analysis of JFET Amplifiers- CS, CD, CG configurations; Basic Concepts of MOS Amplifiers.

Special Purpose Devices: Zener diode, Voltage Regulator, SCR, Photo diode 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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2220572: DATA STRUCTURES LABORATORY

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

0 1 2 2

Prerequisites: A Course on “Programming for problem solving”.

Course Objectives:

- It covers various concepts of C programming language
- It introduces searching and sorting algorithms
- It provides an understanding of data structures such as stacks and queues

.

Course Outcomes:

- Apply various types of linear data structures such as singly linked lists, doubly linked lists, and circular linked lists to solve computational problems involving dynamic memory allocation and sequential data processing.
- Implement and analyze stack and queue operations using arrays and linked representations, and apply these structures to solve problems like infix-to-postfix conversion and postfix expression evaluation.
- Apply and compare different searching algorithms such as linear and binary search, and sorting algorithms like bubble sort, selection sort, insertion sort, merge sort, and quick sort to organize and retrieve data efficiently.
- Construct tree to perform different traversal techniques
- Select Appropriate graph traversal techniques to visit the vertices of a graph

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 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
9. 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
10. 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
11. Write a program to implement the tree traversal methods

12. Write a program to implement the graph traversal methods.

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.

TEXT BOOKS:

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

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2220072: ENGINEERING CHEMISTRY LABARORARY

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

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 and pH metry methods.
- Students will learn to prepare polymers such as Bakelite and nylon-6 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 hardness of water and rate of corrosion of mild steel in various conditions.
- Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
- Students are able to prepare polymers like bakelite and nylon-6.
- Estimations 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 acid by Conductometry.

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

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

V. **Preparations:**

1. Preparation of Bakelite.
2. Preparation Nylon – 6.

VI. **Lubricants:**

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

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

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).

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2220271: BASIC ELECTRICAL ENGINEERING LABORATORY
(Common to ECE, CSE, CSC, CSD, CSM, CSIT& IT)

I Year B.Tech. ECE II – Sem.

L	T	P	C
0	0	2	1

Course Objectives:

To analyze a given network by applying various electrical laws and network theorems

- To know the response of electrical circuits for different excitations
- To calculate, measure and know the relation between basic electrical parameters.
- To analyze the performance characteristics of DC and AC electrical machines

Course Outcomes:

- Get practical knowledge related to electrical
- Fabricate basic electrical circuit elements/networks
- Trouble shoot the electrical circuits
- Design filter circuit for application and Get hardware skills such as soldering, winding etc.
- Get debugging skills.

List of experiments/demonstrations:

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Verification of superposition theorem.
4. Verification of Thevenin's and Norton's theorem.
5. Resonance in series RLC circuit.
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits.
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer.
8. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor.
9. Torque-Speed Characteristics of a Three-phase Induction Motor.

   Any two experiments from the given list
10. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
11. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
12. Measurement of Active and Reactive Power in a balanced Three-phase circuit
13. No-Load Characteristics of a Three-phase Alternator

TEXT BOOKS:

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

REFERENCE BOOKS:

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

6. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.

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2220476: ELECTRONIC DEVICES AND CIRCUITS LABORATORY

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

0 0 2 1

Course Objectives:

- To know the characteristics of PN junction diode
- To measure the efficiency of half wave and full wave rectifiers
- To study the BJT operation
- To know the switching characteristics of SCR
- To design the clipper and clamper circuits

Course Outcomes:

At the end of the laboratory work, students will be able to

- Analyze the characteristics and applications of semiconductor devices, including PN junction diodes, Zener diodes, and SCRs.
- Design rectifiers with and without filters, and evaluate clippers and clampers for voltage shaping.
- Examine the input and output characteristics of BJTs and FETs in different configurations and Analyze their applications.
- Employ transistors as switches for on-off control of devices and design circuits like voltage level indicators using BJTs.
- Implement Zener diodes as voltage regulators and test diode-powered backup systems.

List of Experiments:

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

II YEAR I SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2230003	Numerical Methods and Complex Variables	BS	3	1	0	4	40	60	100
2	2230423	Digital System Design	PC	3	0	0	3	40	60	100
3	2230424	Signals and Systems	PC	3	1	0	4	40	60	100
4	2230425	Probability Theory and Stochastic Processes	ES	3	0	0	3	40	60	100
5	2230426	Analog and Pulse Circuits	PC	3	0	0	3	40	60	100
6	2230477	Digital System Design Laboratory	PC	0	0	2	1	40	60	100
7	2230478	Basic Simulation Laboratory	PC	0	0	2	1	40	60	100
8	2230479	Analog and Pulse Circuits Laboratory	PC	0	0	2	1	40	60	100
9	2230022	Gender Sensitization	*MC	3	0	0	0	-	-	-
TOTAL				**18**	**2**	**6**	**20**	**320**	**480**	**800**

II YEAR II SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2240016	Business Economics and Financial Analysis	HS	3	0	0	3	40	60	100
2	2240427	Electromagnetic Theory and Transmission Lines	PC	2	1	0	3	40	60	100
3	2240428	Analog and Digital Communication	PC	2	1	0	3	40	60	100
4	2240429	Linear and Digital IC Applications	PC	3	0	0	3	40	60	100
5	2240503	Python Programming	ES	3	0	0	3	40	60	100
6	2240480	Analog and Digital Communication Laboratory	PC	0	0	2	1	40	60	100
7	2240481	Linear and Digital IC Applications Laboratory	PC	0	0	2	1	40	60	100
8	2240573	Python Programming Laboratory	ES	0	0	2	1	40	60	100
9	2240491	Field Based Project	PS	0	0	4	2	50	-	50
10	2240023	Constitution of India	*MC	3	0	0	0	-	-	-
TOTAL				**16**	**2**	**10**	**20**	**370**	**480**	**850**

***MC- Satisfactory/Unsatisfactory**

II-I

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2230003: NUMERICAL METHODS AND COMPLEX VARIABLES

II Year B.Tech. ECE I – Sem.

L	T	P	C
3	1	0	4

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

Course Objectives: To learn

- Various numerical methods to find roots of polynomial and transcendental equations.
- Concept of finite differences and to estimate the value for the given data using interpolation.
- Evaluation of integrals using numerical techniques
- Solving ordinary differential equations of first order using numerical techniques.
- Expressing periodic function by Fourier series and a non-periodic function by Fourier transforms
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
- 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

- Apply the Bisection method, Iteration method, Newton-Raphson method, and Regula-Falsi method to solve polynomial and transcendental equations.
- Compare the accuracy and efficiency of the different numerical integration methods and ODE solution techniques.
- Summarize the process of changing the interval and the concept of half-range Fourier series
- Illustrate the Milne-Thomson method for constructing analytic functions.
- Identify the Taylor and Laurent series expansions for analytic functions

.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).

Finite differences: forward differences, backward differences, central differences, symbolic relations and separation of symbols, Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae, Lagrange's method of interpolation.

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 & Fourier Transforms **10L**

Fourier series - Dirichlet's Conditions - Half-range Fourier series - Fourier Transforms: Fourier Sine and cosine transforms-Inverse Fourier transforms.

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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 **10 L**

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 Proofs).

TEXTBOOKS:

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

REFERENCE BOOKS:

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

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2230423: DIGITAL SYSTEM DESIGN

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

Pre-requisite: Nil

Course Objectives:

- Understand the number systems in logic circuits
- Learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems
- Implement simple logical operations using combinational logic circuits and design of sequential logic circuits
- Analyze sequential circuits systems in terms of state machines
- Analyze the concepts of programmable logic devices

Course Outcomes:

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

- Understand the concepts of Number Systems, Perform conversions between different number systems
- Implement optimized digital circuits with minimal gate count and reduced power consumption by applying simplification methods.
- Explore practical considerations in flip-flop design, such as meta stability and timing errors, while learning techniques for converting one type of flip-flop to another.
- Design small sequential circuits and devices while utilizing standard sequential function blocks for constructing larger, more complex circuits.
- Synthesize complex switching functions and logic designs by programming PLDs for efficient digital circuit design and optimization.

UNIT – I

Number Systems: 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.

UNIT – II

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.

UNIT – III

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.

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UNIT – IV

Sequential Machines: 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.

UNIT – V

Programmable Logic Devices, **Threshold Logic**: 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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2230424: SIGNALS AND SYSTEMS

II Year B.Tech. ECE I - Sem.

L	T	P	C
3	1	0	4

Pre-requisites: Basics of Mathematics

Course Objectives:

- Acquire the knowledge of signals and systems
- Understand the behavior of signals in time and frequency domain
- Analyze the characteristics of LTI systems
- Study the concepts of Signals and Systems and its analysis using different Transform techniques
- Obtain the relation between two same signals and two different signals

Course Outcomes:

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

- Classify and Perform Operations on Signals for Practical Applications
- Analyze and Represent Signals Using Fourier Series and Fourier Transforms
- Analyze Signal Transmission Through Linear Systems and their Characteristics
- Utilize Laplace and Z-Transforms for assessing continuous and discrete signals in time and frequency domains.
- Understand the necessity of Sampling Theorem and Correlation Techniques in Signal Processing

UNIT – I

Signal Analysis: Analogy between vectors and signals, Orthogonal signal space, Signal approximation using orthogonal functions, mean square error, Closed or complete set of orthogonal functions, Orthogonality in complex functions, Classification of signals and systems, operations on signals, Exponential and sinusoidal signals, Concepts of impulse function, Unit step function, Signum function.

UNIT – II

Fourier Series: Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier series and exponential Fourier series, Complex Fourier spectrum.

Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signals, Fourier Transform of standard signals, Fourier Transform of periodic signals, Properties of Fourier Transform, Fourier Transforms involving impulse function and signum function, Introduction to Hilbert Transform.

UNIT – III

Signal Transmission through Linear Systems: Linear system, Impulse response, Response of a linear system, 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, Causality and paley-wiener criterion for physical realization, Relationship between bandwidth and rise time, Convolution and correlation of signals, Concept of convolution in time domain and frequency domain, Graphical representation of convolution

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UNIT – IV

Laplace Transforms: Laplace Transforms (L.T), Inverse Laplace Transform, Concept of region of convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis, and it's Applications.

Z–Transforms: Concept of Z-Transform of a discrete sequence, Distinction between Laplace, Fourier and Z Transforms, Region of convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-Transform, Properties of Z-Transforms, and it's Applications.

UNIT – V

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, Introduction to band pass sampling.

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, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

TEXT BOOKS:

1. B.P. Lathi, "Signals, Systems & Communications," BSP, 2nd Edition 2001.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, "Signals and Systems," Pearson India 2nd Edition, 1996.

REFERENCES:

1. Simon Haykin and Van Veen, "Signals and Systems," John Wiley 2nd Edition, 2007.
2. A. Anand Kumar, "Signals and Systems," PHI, 3rd Edition, 2013.
3. Michel J. Robert, "Fundamentals of Signals and Systems," MGH International, 2nd Edition, 2008.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2230425: PROBABILITY THEORY AND STOCHASTIC PROCESSES

II Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Pre-requisite: Knowledge on probability and integration

Course Objectives:

- Learn the basic concepts of probability and its various concepts
- Understand different types of random variables, their density distribution functions and its operations
- Gain knowledge on the functions of two random variables probability density distribution of the joint random variables
- Acquire the knowledge on concepts of the random processes or distribution functions
- Learn the concepts of temporal and spectral characteristics of random process

Course Outcomes:

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

- Understand the concepts of probability for solving problems involving sample space, determining the likelihood of various outcomes in random experiments.
- Apply concepts of probability density functions (PDF) in communication systems for analyzing signal behavior and noise characteristics.
- Comprehend the properties and behavior of vector random variables, joint distribution functions, and marginal distributions for analyzing multiple random variables in real-world systems.
- Analyze stationary and non-stationary processes, including first-order, second-order, wide-sense, and strict-sense stationary processes, and their significance in modeling real-world random phenomena.
- Characterize the response of Linear Time-Invariant (LTI) systems when driven by a stationary random process for analyzing system behavior in communication and signal processing applications.

UNIT I

Probability: 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

UNIT II

Distribution & Density Functions: Distribution and density functions and their properties - Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and conditional distribution, Methods of defining conditional event, Conditional density, and its properties.

Operations on One Random Variable: Introduction, 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.

UNIT III

Multiple Random Variables: Vector random variables, Joint distribution function, Properties of joint distribution, Marginal distribution functions, Conditional distribution and density – Point conditioning, Conditional distribution and density – Interval conditioning, Statistical independence, Sum of two random

variables, Sum of several random variables, Central limit theorem (proof not expected).

Operations on Multiple Random Variables: Expected value of a function of random variables: Joint moments about the origin, Joint central moments, Joint characteristic function, Jointly gaussian random variables - two random variables case.

UNIT – IV

Stochastic Processes – Temporal Characteristics: 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-sensestationary, N^{th} order and strict-sense stationary. Time averages and ergodicity, Mean-ergodic processes, Correlation-ergodic processes, Autocorrelation function and its properties, Cross-correlation function and its properties, Covariance and its properties. Linear system response of mean, mean-squared value, Autocorrelation and cross-correlation functions. Gaussian and Poisson random process.

UNIT - V

Stochastic Processes – Spectral Characteristics: The power spectrum: Properties, Relationship between power spectrum and autocorrelation function, Cross-power density spectrum, Properties of PSD, Relationship between cross-power spectrum and cross-correlation function. Spectral characteristics of linear system response: Power density spectrum of linear system response, Cross-power density spectrums of input and output of a linear system.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2230426: ANALOG AND PULSE CIRCUITS

II Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Pre-requisite: Knowledge on Electronic Devices and Circuits.

Course Objectives:

- To understand the design concepts of multistage amplifiers
- To study the design concepts of transistor amplifiers at high frequency
- To know the concepts of feedback in amplifier circuits
- To design various multi-vibrators using transistors and sweep circuits
- To analyze different types of Oscillators and Large Signal Amplifiers

Course Outcomes:

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

- Analyze the different types of amplifiers, operation and its characteristics.
- Explains the concepts of feedback in amplifier circuits.
- Understand different classes of power amplifiers and tuned amplifiers.
- Design the transistor amplifiers at high frequency.
- Know about multivibrators for various applications using transistors and sweep circuits.

UNIT – I

Multistage Amplifiers: Classification of Amplifiers, BJT AND MOSFET Amplifiers, Differential 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, fα, β and Unity gain bandwidth, and Gain bandwidth product.

UNIT – II

Feedback Amplifiers: 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.

UNIT – III

Oscillators: 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 – Operations and Applications.

UNIT – IV

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.

UNIT – V

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(AUTONOMOUS)

Multivibrators: Introduction to Multivibrators, Types of Triggering, Analysis and Design of Bistable, Monostable, A stable Multivibrators and 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)

2230477: DIGITAL SYSTEM DESIGN LABORATORY

II Year B.Tech. ECE I – Sem.

L	T	P	C
0	0	2	1

Course Objectives:

- To acquire the basic knowledge of digital logic levels and to design and verify basic digital electronics circuits
- To introduce to the students the topics that include combinational and sequential circuit analysis and design
- To design optimization methods using random logic gates, multiplexers, decoders, registers, counters

Course Outcomes:

At the end of the laboratory work, students will be able to

- Apply the principles of Boolean algebra to Implement basic logic gates and clock generation using NAND/NOR gates.
- Develop combinational circuits such as adders, subtractors, converters, multiplexers, and comparators.
- Construct sequential circuits including shift registers and counters using flip-flops.
- Analyze the behavior of digital circuits using NAND/NOR gates and the conversion between Gray and Binary codes.
- Develop finite state machines (FSMs) for real-time applications such as sequence detection and control systems.

List of Experiments:

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

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2230478: BASIC SIMULATION LABORATORY

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

0 0 2 1

Course Objectives:

- To introduce MATLAB and use it as a computation and visualization tool
- To expose the applications of signal analysis

Course Outcomes:

At the end of the laboratory work, students will be able to

- Apply fundamental matrix operations and signal processing techniques for manipulating different types of signals and sequences.
- Demonstrate signal operations like convolution, correlation, and transformations in time and frequency domains.
- Analyze the properties of Linear Time-Invariant (LTI) systems, including stability, physical realizability, and response to different input signals.
- Evaluate the spectral characteristics of signals using Fourier and Laplace Transforms
- Verify key signal processing concepts such as the Sampling Theorem, noise removal techniques, and stationarity of random processes

LIST OF EXPERIMENTS:

1. Basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Convolution for Signals and sequences.
6. Auto Correlation and Cross Correlation for Signals and Sequences.
7. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
8. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realiazability and stability properties.
9. Gibbs Phenomenon Simulation.
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform Synthesis using Laplace Transform.
12. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function.
13. Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value and its Skew, Kurtosis, and PSD, Probability Distribution Function.
14. Verification of Sampling Theorem.
15. Removal of noise by Autocorrelation / Cross correlation.
16. Extraction of Periodic Signal masked by noise using Correlation.
17. Verification of Weiner-Khinchine Relations.
18. Checking a Random Process for Stationarity in Wide sense.

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Note:

- All the experiments are to be simulated using MATLAB or equivalent software
- Minimum of 15 experiments are to be completed

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(AUTONOMOUS)

2230479: ANALOG AND PULSE CIRCUITS LABORATORY

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

0 0 2 1

Course Objectives:

- Analyze single stage and multi stage amplifiers
- Design the feedback amplifiers and oscillators through simulation.
- Find the frequency response of Power Amplifiers
- Implementation of circuits for linear and nonlinear wave shaping
- Measure the characteristics of different multivibrators

Course Outcomes:

At the end of the laboratory work, students will be able to

- Develop practical skills in designing oscillators for real-world applications, ensuring stable frequency generation and reliable operation within electronic systems.
- Verify the performance of feedback amplifiers and oscillators, ensuring that the designs meet real-world applications and system requirements.
- Analyze the performance of linear and nonlinear wave shaping circuits, using theoretical and practical approaches for ensuring proper signal conditioning and quality
- Design various multivibrator circuits by analyzing their behavior and applications in digital and analog systems.
- Design single-stage and multi-stage amplifiers, and review their behavior, performance, and applications

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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2230022: GENDER SENSITIZATION LAB
(An Activity-based Course)

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

3 0 0 0

COURSE DESCRIPTION

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questionsabout the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

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.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that

provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT - I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towardsGender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

UNIT – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

UNIT – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. - Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

UNIT – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*

Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life"

UNIT – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks- The Brave Heart.

Note: **Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.**

- ***Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to thetopics given in the syllabus on "Gender".***

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ESSENTIAL READING: The Textbook, "*Towards a World of Equals: A Bilingual Textbook on Gender" written* by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu **published by Telugu Akademi, Telangana Government in 2015.**

ASSESSMENT AND GRADING:

- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

II-II

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2240016: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

II Year B.Tech. ECE II – Sem. **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:

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

- To understand the basic concepts of economics (including National Income, Inflation, etc.,), business (with an overview on sources of finance, business cycle, etc.,) and their inter-relationship
- To understand and apply the measurement techniques of Demand and Supply, their forecasting methods and concepts of elasticity
- To analyse and demonstrate on production functions, production and cost analysis, market models (like perfect competition, monopoly, monopolistic competition, oligopoly, etc.), know the price and quantity and their determination in each model
- To understand concepts and conventions of accounting, analyse and demonstrate preparation of accounting statements, interpret the solutions for real time problems in business and projects
- Develop the ability to use a basic accounting system along with the application of ratios to create (record, classify, and summarize) the data needed to know the financial position of the organization.

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, Turnover Ratios, 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)

2240427: ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

II Year B.Tech. ECE II – Sem. **L T P C**
2 1 0 3

Pre-requisite: Knowledge on Vector calculus

Course Objectives:

- Familiarize about 3D vector co-ordinate systems and electromagnetic field concepts
- Have skills in selecting appropriate Maxwell's equations in electromagnetic theory for a given application and analyze the problem
- Investigate the propagation characteristics of electromagnetic waves at boundary of different media
- Demonstrate the ability to compute various parameters for transmission lines using smith chart and classical theory
- To calculate various line parameters by conventional and graphical methods

Course Outcomes:

At the end of this course, the students are able to

- Apply electrostatics principles in real-world systems, calculating electric field intensity from point charges and various charge distributions.
- Understand magnetostatic principles for solving problems involving induced electromotive force (EMF) and current due to changing magnetic fields.
- Learn the concepts of wave attenuation, loss tangent, intrinsic impedance, and their implications in electromagnetic wave propagation, while interpreting surface impedance in wave propagation and reflection problems.
- Analyze different types of transmission lines and use the concept of infinite lines for calculating key transmission line parameters
- Illustrate input impedance for UHF transmission lines and its significance in signal transmission

UNIT – I

Electrostatics: 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

UNIT – II

Magnetostatics: 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

UNIT – III

Uniform Plane Waves: 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

UNIT – IV

Transmission Lines Characteristics: 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; Illustrative problems

UNIT – V

UHF Transmission Lines and Applications: 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 Zmin and Zmax; 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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2240428: ANALOG AND DIGITAL COMMUNICATIONS

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

2 1 0 3

Pre-requisite: Knowledge on Signals and Fourier Transforms.

Course Objective:

- Develop ability to analyze system requirements of analog and digital communication systems
- Design the generation and detection of various analog and digital modulation techniques
- Acquire theoretical knowledge of each block in AM/FM transmitters and receivers
- Understand the concepts of baseband transmissions and various source & channel coding techniques
- Study of various noise sources and SNR/Figure of Merit calculations

Course Outcome:

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

- Understand the necessity and significance of modulation in efficient transmission, noise reduction, multiplexing, and bandwidth optimization.
- Analyze the principles of angle modulation and their respective performance in terms of bandwidth efficiency, noise immunity and signal power requirements.
- Explain the fundamental concepts of digital modulation schemes for converting analog signals into digital form through sampling, quantization, and encoding.
- Compare the efficiency, robustness, and power requirements of ASK, FSK, PSK for assessing trade-offs in terms of complexity, bandwidth and error rate.
- Analyze the impact of noise in communication systems for enhancing performance based on noise characteristics and coding methods.

UNIT– I

Amplitude Modulation: Significance of modulation, Amplitude Modulation - Time and frequency domain description, power relations in AM waves, Generation of AM waves -Switching 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, Vestigial side band modulation. AM receivers-tuned radio frequency and super heterodyne receivers.

UNIT – II

Angle Modulation: 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. FM receiver, Comparison of TDM and FDM.

UNIT – III

Introduction to Digital Communications: Block diagram of digital communication system, advantages of digital communication systems, digital representation of analog signals.

Baseband Data Transmission: Introduction**,** sampling process, PAM, PWM, PPM, pulse code modulation, differential pulse code modulation, delta modulation, ADM, noise considerations in PCM and DM. Inter symbol Interference, Nyquist criterion for zero ISI, eye diagrams, probability of error, optimum receiver, matched filter receiver.

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UNIT– IV

Passband Data Transmission: Amplitude shift keying, Frequency shift keying, and Phase shift keying, 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.

UNIT– V

Noise, Information Theory and Coding: Types of noise, Gaussian and white noise characteristics, resistive/thermal noise, narrow band noise- In-phase and quadrature representation and its properties. noise in AM and FM systems, SNR and figure of merit calculations.

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 – linear block code and hamming codes, fundamentals of error detection and correction codes.

TEXT BOOKS:

1. Simon Haykin, “Analog and digital communications,” John Wiley, 4th edition 2005.
2. Sudakshina Kundu, “Analog and digital communications,” Pearson India, 1st edition 2010.

REFERENCES:

1. Herbert Taub, Donald L Schiling, Goutam Saha, “Principles of communication systems,” Mcgraw- Hill, 3rd edition, 2008.
2. Dennis Roddy and John Coolean, “Electronic communications,” PEA, 4th Edition, 2004.
3. Wayne Tomasi, “Electronics communication systems,” PHI, 5th edition, 2009.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2240429: LINEAR AND DIGITAL IC APPLICATIONS

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

3 0 0 3

Pre-requisites: Knowledge on Basic Electrical Engineering and Semiconductor Devices

Course Objectives:

- Understand the basic building blocks of linear integrated circuits
- Theoretical aspects and applications of multivibrators and voltage regulators
- Analyze 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:

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

- Understand the fundamental characteristics of operational amplifiers (Op-Amps) and ICs in analog and digital circuit applications.
- Categorize applications of Op-Amps and IC timers in real-world digital and analog systems.
- Analyze functionality, accuracy, and suitability of various A/D and D/A converters for different applications.
- Utilize combinational logic ICs for implementing digital systems.
- Apply sequential logic components and memory technologies for solving practical engineering problems in digital circuit design and systems.

UNIT– I

Integrated Circuits and Operational Amplifier: 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 and Multivibrators.

UNIT – II

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, Butterworth filters – 1st order, 2nd order low pass and high pass filters, 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, Schmitt trigger, PLL, Principles and description of individual blocks of 565.

UNIT – III

A/D and D/A Converters: 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.

UNIT – IV

Digital Integrated Circuits: 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.

UNIT – V

Sequential Logic IC's and Memories: 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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2240503: PYTHON PROGRAMMING
(Common to All Branches)

II Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Course Outcomes:

. The students should be able to

- Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
- Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries.
- Demonstrate proficiency in handling Exceptions, Functions and Modules.
- Develop programs using graphical user interface.
- Learn about Database Programming and Web development.

UNIT - I

Python Basics

Python Objects: Standard Types, Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types.

Python Numbers: Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions.

UNIT - II

Conditionals and Loops-if, else, elif, for, while, break, continue, pass, List comprehensions, Generator expressions.

Sequences: Strings, Lists, and Tuples- Built-in Functions, Special features.

Mapping and Set Types: Dictionaries, Sets- Built-in Functions.

UNIT-III

Files and Input / Output: File Objects, File Built-in Functions, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules.

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Exceptions and the sys Module.

UNIT-IV

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

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UNIT – V

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

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs.

TEXT BOOKS:

1. Core Python Programming, Wesley J. Chun, Second Edition, Prentice Hall PTR.

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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2240480: ANALOG AND DIGITAL COMMUNICATIONS LABORATORY

II Year B.Tech. ECE II – Sem.

L	T	P	C
0	0	2	1

Pre-requisites: Basic concepts of analog and digital communications

Course Objectives:

- Implement various analog & digital modulation techniques in communications
- Study of various spectrums of analog modulation systems using spectrum analyzer
- Understand the importance of automatic gain control and Phase locked loop
- Explore receiver characteristics in analog & digital communications
- Observe the performance of typical telecommunication system in presence of noise

Course Outcomes:

At the end of the laboratory work, the students are able to:

- Analyze different modulation and demodulation techniques used in communication system
- Design pre-emphasis and de-emphasis circuits used in frequency modulation (FM) systems for improving signal quality and mitigate noise.
- Implement PLL circuits, digital phase detectors, and synchronous detectors, evaluating their performance in real-time systems for various applications
- Understand the differences between NBFM and WBFM, including their frequency deviation, bandwidth requirements, and applications in communication systems.
- Apply various digital modulation schemes for effective communication and ensure the performance of each modulation technique.

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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2240481: LINEAR AND DIGITAL IC APPLICATIONS LABORATORY

II Year B.Tech. ECE II – Sem.

L	T	P	C
0	0	2	1

Pre-requisites: Basic concepts of linear and digital IC applications

Course Objectives:

- Know the characteristics of op-amp
- Study the filter characteristics using IC741
- Learn the operation of IC 555
- Design combinational circuits using ICs
- Implement the sequential circuits using ICs

Course Outcomes:

- 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

At the end of the laboratory work, students will be able to

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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2240573: PYTHON PROGRAMMING LABORATORY
(Common to All Branches)

II Year B.Tech. ECE II – Sem.

L	T	P	C
0	0	2	1

Course Outcomes:

. The students should be able to

- Demonstrate proficiency in implementing basic arithmetic operations and decision-making using Python programming.
- Develop skills in solving problems using control flow and iterative structures in Python.
- Employ Python sequences and dictionaries to efficiently manipulate and organize data.
- Design and implement modular programs using functions to handle complex tasks and mathematical computations.
- Handle file operations and implement GUI elements to enhance interaction with programs.

Exercise 1 –Python Numbers

a) Write 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) Write a program to determine the greatest common divisor and least common multiple of a pair of integers.

c) 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.

Exercise –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.

Exercise 3 Control Flow -Continued

a) Write a program to calculate value of the following series 1+x-x2+x3-x4+---------- xn.

b) Write a program to print pascal triangle.

Exercise 4 – 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.

Exercise 5– Python Sequences

a) 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.

b) Write a program to take a string and append a backward copy of that string, making a palindrome.

Exercise 6– 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.

Exercise - 7 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.

Exercise - 8 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.

b) Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

c) If (distance between two balls centers) <= (sum of their radii) then (they are colliding)

d) Find mean, median, mode for the given set of numbers in a list.

e) 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.

Exercise - 9 Functions - Continued

a) Write a function nearlyequal 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.

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

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

Exercise - 10 - Functions - Problem Solving

a) Write a function cumulative_ product to compute cumulative product of a list of numbers.

b) Write a function reverse to reverse a list. Without using the reverse function.

c) Write function to compute GCD, LCM of two numbers. Each function shouldn't exceed one line.

Exercise - 11 GUI, Graphics

a) Write a GUI for an Expression Calculator usingtk

b) Write a program to implement the following figures using turtle

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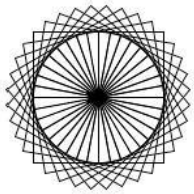
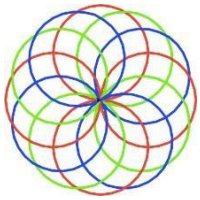

TEXT BOOKS:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2240023: CONSTITUTION OF INDIA

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

3 0 0 0

Course Objectives:

The students will try to learn:

- Understanding the historical context, principles, and philosophies of the Constitution, including framers' intentions and the evolution of Indian democracy.
- Exploring the structure and functioning of the Indian government, including the roles and powers of the Legislature, Executive, and Judiciary in a federal framework.
- Educating about Fundamental Rights and Duties, and how they protect citizens while outlining responsibilities towards the state.
- Elucidating the distribution of powers between central and state governments, the process of constitutional amendments, and the dynamic nature of Indian federalism.
- Investigating the role of the judiciary in interpreting the Constitution, judicial review, and ensuring compliance with constitutional norms and protection of fundamental rights.

Course Outcomes:

- Understand the meaning and importance of Constitution, Fundamental rights and duties, union government, state and local governments, other statutory bodies
- Create awareness about social responsibilities
- To apply the functioning of Union, State and Local Governments in Indian federal system
- To analyze election commission and amendment procedure for various statuary bodies
- Comprehend the judiciary's role in interpreting the Constitution and ensuring fundamental rights through judicial review.

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 have resulted 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 thereforethe 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 of India 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

III YEAR I SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2250202	Control Systems	PC	3	0	0	3	40	60	100
2	2250404	Microprocessors and Microcontrollers	PC	3	1	0	4	40	60	100
3	2250430	Digital CMOS IC Design	PC	3	1	0	4	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
6	2250011	Advanced English Communication Skills Laboratory	HS	0	0	2	1	40	60	100
7	2250473	Microprocessors and Microcontrollers Laboratory	PC	0	0	2	1	40	60	100
8	2250574	Data Base Management Systems Laboratory	PC	0	0	2	1	40	60	100
9	2250024	Intellectual Property Rights	*MC	3	0	0	0	-	-	-
TOTAL				**18**	**1**	**8**	**20**	**320**	**480**	**800**

III YEAR II SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2260431	Antennas and Wave Propagation	PC	2	1	0	3	40	60	100
2	2260432	Digital Signal Processing	PC	2	1	0	3	40	60	100
3	2260433	Analog 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
6	2260482	Digital Signal Processing Laboratory	PC	0	0	3	1.5	40	60	100
7	2260483	Analog & Digital IC Design Laboratory	PC	0	0	3	1.5	40	60	100
8	2260492	Industry Oriented Mini Project/Internship	PS	0	0	4	2	-	100	100
9	2220021	Environmental Science	*MC	3	0	0	0	-	-	-
TOTAL				**13**	**2**	**10**	**20**	**280**	**520**	**800**

***MC- Satisfactory/Unsatisfactory**

Environmental Science in III Yr II Sem Should be Registered by Lateral Entry Students only.

III - I

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2250202: CONTROL SYSTEMS

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

2 1 0 3

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

Course Objectives:

- 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 domain analysis and methods for improving it
- To assess the system performance using frequency domain analysis and techniques for improving the performance
- To design various controllers and compensators to improve system performance

CourseOutcomes:

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

- Develop the ability in modeling linear-time-invariant systems using transfer functions, analyzing system behavior in the Laplace domain.
- Analyze the stability of LTI systems in both the time and frequency domains for reliable and stable operation of control sytems.
- Understand the concept of system stability and it's assessment using Routh's stability Criterion and Root locus.
- Evaluate the stability, transient response, and steady-state behavior of systems, using tools such as transfer functions, Nyquist Plot, Bode plot and compensators.
- Analyze the modeling of linear time invarient systems using state space representation

UNIT - I

Introduction to Control Systems:

Classification of control systems. Feed-Back Characteristics, Effects of feedback - Mathematical modeling of Electrical and Mechanical systems -Transfer function- Transfer function of 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 of first order systems - Transient response of second order system for unit step input, Time domain specifications - Steady state response - Steady state errors and error constants - Effects of P, PD, Pl and PID controllers.

UNIT – III

Stability Analysis in S-Domain:

The concept of stability - Routh's stability Criterion, Absolute stability and relative stability- limitations of Routh's stability.

Root Locus Technique:

The root locus concept - construction of root loci- Effects of adding poles and zeros on the root loci.

UNIT – IV

Frequency Response Analysis:

Introduction to frequency response - Frequency domain specifications - Bode plot - Stability analysis from

Bode plots - Determination of transfer function from the Bode Diagram - Polar Plots, Nyquist Plots, Stability Analysis, Gain margin and phase margin.

Control System Design:

Introduction - Lag, Lead and Lag-Lead Compensator design in frequency Domain.

UNIT - V

State Space Analysis:

Concepts of state, State variables and state model, Derivation of state models of linear time invariant systems - Controllable, Observable and Diagonal state models - State transition matrix - Solution of state equation - Concepts of Controllability and Observability.

TEXT BOOKS:

1. M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education, 1997.
2. B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.

REFERENCE BOOKS:

1. K. Ogata, “Modern Control Engineering”, Prentice Hall, 1991.
2. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2250404: MICROPROCESSORS AND MICROCONTROLLERS

III Year B.Tech. ECE I – Sem.

L	T	P	C
3	1	0	4

Pre-requisites: Knowledge on digital systems and designs.

Course Objectives:

- Understanding the architecture of microprocessors
- Gain knowledge about the programming of microprocessors
- Study the architecture of microcontrollers, interfacing devices and interfacing techniques
- Understand the basic concepts of ARM architecture
- Learn about fundamentals of STM32 architecture

Course Outcomes:

At the end of this course, students will 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

UNIT – I

Introduction of microprocessor, Review and evolution of advanced microprocessors:8085,8086,8088, 80186/286/386/486/Pentium.

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.

UNIT II

Instruction Set and Assembly Language Programming of 8086: 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.

UNIT – III

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes, and Instruction set of 8051.

Interrupts and Interfaces: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Introduction to the various interfacings' chips like 8255, 8251, 8257, Interfacings key boards, LCD, Stepper motor, ADC, DAC, and memory Interfacing.

UNIT - IV

ARM Architecture: 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.

UNIT – V

STM32 microcontroller: STM32 fundamentals, types of STM32 microcontroller, advantages and its features and applications, architecture of STM32 microcontroller, programming, GPIO Registers in STM32, Control Registers in STM32, Peripherals and Middleware configuration.

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.
4. https://www.udemy.com/course/stm32-introduction-to-stm32-stm-electronics/

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2260430: DIGITAL CMOS IC DESIGN

III Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Digital System Design, C Language

Course Objectives:

- Understand the different steps involved in the fabrication of ICs
- Study static and dynamic behavior of CMOS logic circuits
- Design the logic circuits with Verilog HDL with its modelling concepts
- Provide modelling concepts to design CMOS logic circuits
- Understand basic programmable logic devices and testing of CMOS circuits

Course Outcomes:

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

- Acquire knowledge of CMOS fabrication, MOS devices, VLSI design flow, and circuit scaling for efficient digital design.
- Implement CMOS inverter and logic circuits with focus on performance, power, and timing characteristics.
- Use top-down and bottom-up HDL design methodology in designing building blocks of CMOS logic circuits.
- Demonstrate Verilog modeling for designing and simulating digital circuits with timing and control.
- Design digital circuits using PLDs and apply CMOS testing techniques for reliability and manufacturability.

UNIT– I

Introduction to IC Technology: 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.

UNIT – II

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.

UNIT – III

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.

UNIT – IV

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.

UNIT – V

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.

REFERENCES:

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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2250436: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(Professional Elective – I)

III Year B.Tech. ECE I – Sem. **L T P C**
3 0 0 3

Prerequisite: Basics of Electrical and Electronics Engineering

Course Objectives:

- Study the functioning of various measuring systems and performance characteristics
- Know the principle of operation and working of signal generators, signal analyzers,
- Understand and analyze the characteristics of special purpose oscilloscopes and Bridges
- Learn concepts related to various transducers
- Develop virtual instruments for specific applications.

Course Outcomes:

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

- Develop the ability in choosing the appropriate signal generation and analysis equipment based on frequency range, signal integrity, resolution, and system compatibility.
- Analyze various signal parameters, such as amplitude, frequency, phase, rise time, and waveform distortion, using oscilloscopes, and interpret the results for accurate measurements in different contexts.
- Comprehend the working principles, characteristics, and types of transducers and their applications in measurement and control systems.
- Justify the significance of transducers in measuring various forms of energy and understand their critical role in converting physical energy into measurable electrical signals for effective monitoring and control.
- Assess the performance of transducers in terms of accuracy, sensitivity, and response time, for precise and reliable data acquisition.

UNIT - I

Performance Characteristics of Systems: Static Characteristics: Accuracy, Precision, Resolution, Types of Errors, Dynamic Characteristics: Fidelity, Lag, Repeatability, Reproducibility

UNIT - II:

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.

UNIT - III

Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs, mixed signal oscilloscopes.

DC and AC Bridges: DC: Wheat Stone Bridge, DC Kelvin Bridge, AC: Maxwell Bridge, Hay's Bridge, Schering Bridge, Resonance Bridge.

UNIT - IV

Transducers: Classification, Strain Gauges, Resistance Thermometers, Thermistors and Sensistors, Hotwire Anemometers, LVDT, Thermocouples, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers, gyroscopes, accelerometers.

Measurement of Physical Parameters: Hygrometer**:** measurement of Humidity and Moisture, Velocity,

Data Acquisition Systems.

UNIT - V

Virtual Instrumentation: An introduction, Historical perspective, advantages, blocks diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming.

Bio-Medical signals: Basics of biomedical signals and electrodes, ECG, EEG and MRI.

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. D Jovitha Jerome, "Virtual Instrumentation using LabVIEW," 1st Edition, PHI, 2001.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2250437: SPREAD SPECTRUM COMMUNICATIONS
(Professional Elective – I)

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

3 0 0 3

Prerequisite: Basics of communication systems

Course Objectives:

- Acquire the knowledge on Spread Spectrum and study various types of Spread spectrum sequences and their generation
- Understand the principles of Code Division Multiple Access (CDMA) and use of Spread spectrum concept in CDMA
- Know the various Code tracing loops for optimum tracking of wideband signals viz spread spectrum signals
- Develop procedures for synchronization of receiver for receiving the Spread spectrum signal.
- Study the performance of spread spectrum systems in Jamming environment, systems with Forward Error Correction and Multiuser detection in CDMA cellular radio

Course Outcomes:

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

- Generate various types of Spread spectrum sequences and simulate CDMA system (Both Transmitter & Receiver)
- Analyze the performance of Spread spectrum systems in Jamming environment and systems with Forward Error Correction
- Understand the theoretical aspects and basic spread spectrum techniques in mobile wireless systems
- Analyze and solve simple problems in the field of spread spectrum communications
- Analyze detection and cancellation techniques for Multiusers in CDMA cellular radio

UNIT– I

Introduction to Spread Spectrum Systems: Fundamental Concepts of Spread Spectrum Systems, Pseudo Noise Sequences, Direct Sequence Spread Spectrum, Frequency Hop Spread Spectrum, and Code Division Multiple Access.

Binary Shift Register Sequences for Spread Spectrum Systems: Introduction, Definitions, Mathematical Background and Sequence Generator Fundamentals, Maximal Length Sequences.

UNIT – II

Code Tracking Loops: Introduction, Optimum Tracking of Wideband Signals, Base Band Delay-Lock Tracking Loop, Tau-Dither Non- Coherent Tracking Loop, Double Dither Non-Coherent Tracking Loop.

UNIT – IV

Cellular Code Division Multiple Access (CDMA) Principles: Introduction, Wide Band Mobile Channel, Cellular CDMA System, Single User Receiver in a Multi User Channel, CDMA System Capacity.

Multi-User Detection in CDMA Cellular Radio: Optimal Multi-User Detection, Linear Suboptimal Detectors, Interference Combat Detection Schemes.

UNIT – V

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Performance of Spread Spectrum Systems in Jamming Environments: Spread Spectrum Communication System Model, Performance of Spread Spectrum Systems without Coding.

Performance of Spread Spectrum Systems with Forward Error Correction: Elementary Block Coding Concepts, Optimum Decoding Rule, Calculation of Error Probability, Elementary Convolution Coding Concepts.

TEXT BOOKS:

1. J. Rodger, E Ziemer, Roger L. Peterson and David E Borth, “Introduction to Spread Spectrum Communication,” Pearson, 2nd Edition, 2013.
2. Mosa Ali Abu-Rgheff, “Introduction to CDMA Wireless Communications,” Elsevier Publications, 3rd Edition, 2008.

REFERENCES:

1. D. George R. Cooper, Clare D. Mc Gillem, “Modern Communication and Spread Spectrum,” McGraw Hill, 4th Edition,1986.
2. Andrew J. Viterbi, “CDMA: Principles of spread spectrum communication,” Pearson Education, 1st Edition, 1995.
3. Steve Lee, “Spread Spectrum CDMA”, McGraw Hill, 2nd Edition 2002.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2250473: MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

III Year B.Tech. ECE I – Sem.

L	T	P	C
0	0	2	1

Pre-requisites: Basic concepts of microprocessors and microcontrollers

Course Objectives:

- Know the arithmetic and string operations on 16 bit and 32-bit data
- Perform sorting and searching operation an array for 8086
- Study the bit level logical operations, rotate, shift, swap and branch operations
- Know the interfacing of 8051
- Understand the communication between 8051 to interfacing devices

Course Outcomes:

At the end of the laboratory work, students will 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 Assembler

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.

III - II

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2260431: ANTENNAS AND WAVE PROPAGATION

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

2 1 0 3

Pre-requisites: Knowledge on Electromagnetic fields and Maxwell equations

Course Objectives:

- Understand the basic concepts of antennas
- Analyze the characteristics of VHF, UHF and Microwave antennas
- Analyze the characteristics of microstrip antennas and antenna arrays
- Understand the basic concepts of Microwave tubes
- Understand the basic concepts of Microwave solid state devices and measurements

Course Outcomes:

At the end of this course, students will 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

UNIT– I

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).

UNIT - II

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)

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UNIT - III

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.

UNIT - IV

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.

UNIT - V

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.

REFERENCES:

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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2260432: DIGITAL SIGNAL PROCESSING

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

2 1 0 3

Pre-requisite: Signals and Systems

Course Objectives:

- Understand the basic concepts related to the analysis and processing of digital signals
- Understand the fast computation of DFT and appreciate the FFT processing
- Study the designs of IIR digital filters and analyze and synthesize
- Designs of FIR digital filters and analyze and synthesize
- Realize the structures of digital filters and acquaint in multi-rate signal processing techniques

Course Outcomes:

At the end of this course, the student will 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.

UNIT–I

Introduction: Introduction to digital signal processing. 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.

UNIT– II

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.

UNIT –III

IIR Digital Filters- 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.

UNIT –IV

FIR Digital Filters - 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.

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(AUTONOMOUS)

UNIT –V

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.

REFERENCE BOOKS:

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

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2250433: ANALOG CMOS IC DESIGN

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

3 1 0 4

Pre-requisites: Knowledge on circuit design and microelectronics, familiarity with SPICE tool.

Course Objectives:

- Familiarize with MOS devices and its modeling
- Learn and design analog CMOS circuits
- Analyze CMOS based amplifiers frequency response and noise
- Learn and design Operational Amplifiers with CMOS technology
- stability and frequency compensation of analog CMOS circuits

Course Outcomes:

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

- Analyze different MOS device models and circuits.
- Design differential amplifiers and current mirror circuits.
- Evaluate trade-offs in frequency response and noise models.
- Assess CMOS op-amp design and performance trade-offs, including stages, gain boosting, output swing, feedback, and slew rate.
- Apply frequency compensation techniques and determine stability in multipole systems using Nyquist's criterion while considering nonlinearity and mismatch in two-stage op-amps.

UNIT– I

Basic MOS Device Physics: MOS I/V Characteristics, Second-Order Effects, MOS Device Models, Single-Stage Amplifiers, Common-Source Stage, Source Follower, Common-Gate Stage, Cascode Stage,

UNIT – II

Differential Amplifiers and Current Mirrors: 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.

UNIT – III

Frequency Response and Noise: 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.

UNIT – IV

CMOS Operational Amplifiers: 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.

UNIT – V

Stability and Frequency Compensation: 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.

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(AUTONOMOUS)

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

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2260438: DIGITAL IMAGE PROCESSING
(Professional Elective – II)

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

3 0 0 3

Pre-requisites: Knowledge on signals and transforms.

Course Objectives:

- Provide the Fundamentals of digital Image Processing
- Understand the various techniques of image enhancement
- Study special purpose filters for image restoration
- To learn the basic concepts of image morphology
- Design and analysis of different image compression coding techniques

Course Outcomes:

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

- Understand the Basic Concepts of Digital Image Processing
- Analyze the Effectiveness of Different Image Enhancement Methods
- Apply Image Enhancement and Restoration Techniques for Improved Image Quality
- Explain Effective Image Segmentation Techniques for Object Detection
- Analyze the Effectiveness of Different Image Compression Algorithms

UNIT– I

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.

UNIT – II

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.

UNIT – III

Image restoration: Degradation model, Algebraic approach to restoration, Inverse filtering, least mean square filters, Constrained Least squares Restoration, Interactive Restoration.

UNIT – IV

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.

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UNIT – V

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)

2260439: CELLULAR AND MOBILE COMMUNICATIONS
(Professional Elective – II)

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

3 0 0 3

Prerequisite: Basics of communication systems

Course Objectives:

- Understand the cellular concept, frequency Reuse and hand-off strategies
- Analyze wireless and mobile cellular communication systems
- Learn the concepts of coverage for signal and traffic, diversity techniques and mobile antennas
- Study frequency management, channel assignment and types of handoffs

Course Outcomes:

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

- Analyze and design wireless and mobile cellular systems
- Understand the fundamental techniques to overcome the different fading effects and impairments due to multipath fading channel
- Gain the knowledge on co-channel and non-co-channel interferences
- Familiar with cell coverage for signal and traffic, diversity techniques and mobile antennas
- Analyze frequency management, Channel assignment, and types of handoffs

UNIT– I

Introduction to Cellular Mobile Radio Systems: Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems, Uniqueness of Mobile Radio Environment- Fading -Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.

Fundamentals of Cellular Radio System Design: Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I From a Normal Case in a Omni Directional Antenna System, System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems- Cell Splitting, Sectoring, Microcell Zone Concept.

UNIT – II

Co-Channel Interference: Measurement of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and Their Effects, Diversity Techniques-Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity.

Non-Co-Channel Interference: Adjacent Channel Interference, Near-End Far-End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease, Effects of Cell Site Components.

UNIT – III

Cell Coverage for Signal and Traffic: Signal Reflections in Flat and Hilly Terrain, Effect of Human Made Structures, Phase Difference Between Direct and Reflected Paths, Constant Standard Deviation, Straight Line Path Loss Slope, General Formula for Mobile Propagation Over Water and Flat Open Area, Near and Long-Distance Propagation, Path Loss from a Point-to-Point Prediction Model in Different Conditions, Merits of Lee Model.

Cell Site and Mobile Antennas: Space Diversity Antennas, Umbrella Pattern Antennas, Minimum

Separation of Cell Site Antennas, Mobile Antennas.

UNIT – IV

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, Non-Fixed Channel Assignment.

UNIT – V

Handoffs and Dropped Calls: Handoff Initiation, Types of Handoff, Delaying Handoff, Advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem Handoff, Introduction to Dropped Call Rates and their Evaluation.

TEXT BOOKS:

1. W.C.Y. Lee, “Mobile Cellular Telecommunications,” Mc Graw Hill, 2nd Edition, 2017.
2. Theodore. S. Rapport, Wireless Communications,” Pearson Education, 4th Edition, 2010.

REFERENCES:

1. Gordon L. Stuber, “Principles of Mobile Communications,” Springer, 4th Edition, 2017.
2. Simon Haykin, Michael Moher, “Modern Wireless Communications,” Pearson Education, 2nd Edition, 2011.
3. Asrar U. H. Sheikh, “Wireless Communications Theory and Techniques,” Springer, 2nd Edition, 2004.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2260482: DIGITAL SIGNAL PROCESSING LABORATORY

III Year B.Tech. ECE II – Sem.

L	T	P	C
0	0	3	1.5

Pre-requisites: Basic concepts of digital signal processing

Course Objectives:

- Implementation of Linear and Circular Convolution.
- Implementation of FIR and IIR filters
- Predict time and frequency response of discrete-time systems using various techniques like Z Transform, DFT, FFT
- Study the architecture of DSP processor
- Demonstration of Finite word length effects

Course Outcomes:

At the end of the laboratory work, students will be able to

- Understand and Apply Basic Signal Processing Operations
- Design and Simulate Digital Signal Processing Systems Using MATLAB
- Apply Window Functions for Signal Processing optimization in Frequency Domain
- Analyze the filter Performance and enhance Designs for Practical Applications
- Develop Signal Processing Algorithms 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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2260483: ANALOG & DIGITAL COMS IC DESIGN LABORATORY

III Year B.Tech. ECE II – Sem.

L	T	P	C
0	0	3	1.5

Pre-requisites: Basics of VLSI Design.

Course Objectives:

- Understand MOS characteristics
- Design CMOS circuits and analyze AC, DC, OP analysis
- Design Layouts of CMOS circuits and extract DRC, LVS, RC
- Design of digital logic circuits using HDL
- Design of FSM and memories using HDL

Course Outcomes:

At the end of the laboratory work, students will be able to

- Analyze MOSFET characteristics with different operating conditions
- Design and analyze CMOS circuits with DC and AC analysis
- Extract and design layout of CMOS circuits and perform different checks
- Design, simulate and synthesize the CMOS digital circuits using HDL
- Verify the logic by using FPGA/CPLD

PART-A: Analog CMOS IC design-All the following experiments have to be implemented

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.

PART-B: Digital CMOS IC design - Simulate it using any HDL tool and implement by FPGA

1. Design basic logic gates using HDL
2. Design an Adder (Min 8 Bit) using HDL.
3. Design a Multiplier (4 Bit Min) using HDL.
4. Design an ALU using HDL.
5. Design a Universal Shift Register using HDL.
6. Design of Ripple Counters Realization-(Mod -10 & Mod-12) using HDL
7. Design Finite State Machine (Moore/Mealy) using HDL.
8. Design Memories using HDL.

NOTE: Minimum of 12 experiments to be conducted (any **SIX** experiments from each part).

IV YEAR I SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2270434	Embedded System Design	PC	3	0	0	3	40	60	100
2	2270435	Microwave and Optical Communications	PC	3	0	0	3	40	60	100
3	2270017	Fundamentals of Management	HS	3	0	0	3	40	60	100
4		Professional Elective – III	PE	3	0	0	3	40	60	100
5		Open Elective – III	OE	3	0	0	3	40	60	100
6	2270484	Microwave and Optical Communications Laboratory	PC	0	0	4	2	40	60	100
7	2270493	Project Stage - I	PS	0	0	6	3	-	100	100
TOTAL				**15**	**0**	**10**	**20**	**240**	**460**	**700**

IV YEAR II SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1		Professional Elective - IV	PE	3	0	0	3	40	60	100
2		Professional Elective - V	PE	3	0	0	3	40	60	100
3		Professional Elective - VI	PE	3	0	0	3	40	60	100
4	2280494	Technical Seminar	PS	0	0	4	2	100	-	100
5	2280495	Project Stage - II	PS	0	0	18	9	40	60	100
TOTAL				**9**	**0**	**22**	**20**	**260**	**240**	**500**

Professional Elective (PE) Courses

PE I - Professional Elective I

S. No.	Course Code	Course Title
1	2250436	Electronic Measurements and Instrumentation
2	2250521	Artificial Neural Networks
3	2250437	Spread Spectrum Communications
4	2250554	Data Analytics

PE II - Professional Elective II

S. No.	Course Code	Course Title
1	2260438	Digital Image Processing
2	2260439	Cellular Mobile Communications
3	2260509	Operating Systems
4	2260548	IoT Communication Protocols

PE III - Professional Elective III

S. No.	Course Code	Course Title
1	2270440	Wireless Communications and Networks
2	2270441	VLSI Physical Design with Timing Analysis
3	2270442	Fundamentals of Robotics
4	2270519	Cryptography & Network Security

PE IV - Professional Elective IV

S. No.	Course Code	Course Title
1	2280443	Biomedical Instrumentation
2	2280444	Unmanned Aerial Vehicles
3	2280516	Artificial Intelligence
4	2280445	Satellite Communications

PE V - Professional Elective V

S. No.	Course Code	Course Title
1	2280446	Microcontrollers in IOT
2	2280447	Radar Systems
3	2280546	Data Science
4	2280448	Nano Technology

PE VI - Professional Elective VI

S. No.	Course Code	Course Title
1	2280523	Cyber Security
2	2280449	Test and Testability
3	2280450	Global Navigation Satellite System
4	2280451	Computer Vision

Open Elective (OE) Courses

S. No	Open Elective	Course Code	Course Title
1	Open Elective - I	2250406	Electronic Communications & Applications
2	Open Elective – II	2260407	Fundamentals of Embedded Systems
3	Open Elective - III	2270408	Global Navigation Satellite System & Applications

Note: *Open Elective subject's syllabus is provided in a separate document. Student should takeopen electives from the list of offered by other departments/branches only.*

IV - I

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2270434: EMBEDDED SYSTEM DESIGN

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

3 0 0 3

Pre-requisites: Microprocessor & Microcontroller concepts and applications, Operating system concepts.

Course Objectives:

- Understand the basics of an embedded system
- Programing an embedded system
- Designing an Embedded System for different applications
- Understand various operating systems concepts and choosing RTOS
- Design, implement and test an embedded system

Course Outcomes:

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

- Understand the Key Concepts and Components of Embedded Systems
- Design Embedded Systems by Integrating Various Components Effectively
- Apply Software Development Methodologies for Embedded Systems Firmware
- Understand RTOS Concepts in Embedded System Design
- Evaluate and Implement Communication Methods in Embedded Systems

UNIT– I

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.

UNIT – II

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.

UNIT – III

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.

UNIT – IV

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.

UNIT – V

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.

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(AUTONOMOUS)

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
(AUTONOMOUS)

2270435: MICROWAVE AND OPTICAL COMMUNICATIONS

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

3 0 0 3

Prerequisite: Antennas and Propagation

Course Objectives:

- To get familiarized with microwave frequency bands, their applications and to understand the limitations and losses of conventional tubes at these frequencies.
- To distinguish between different types of microwave tubes, their structures and principles of microwave power generation.
- To impart the knowledge of Scattering Matrix, its formulation and utility, and establish the S-Matrix for various types of microwave junctions.
- Understand the utility of Optical Fibers in Communications.

Course Outcomes:

Upon completing this course, the student will be able to

- Analyze the principles, structure, and performance of Klystrons and TWTs with focus on velocity modulation, bunching, efficiency, and gain at microwave frequencies.
- Describe the principles and operating modes of M-type tubes and microwave solid-state devices like Magnetrons, Gunn, IMPATT, and TRAPATT diodes.
- Explain waveguide components and ferrite devices in terms of their structure, operation, and applications in microwave systems.
- Measure microwave parameters using scattering matrix concepts and microwave bench setups, including attenuation, frequency, VSWR, and impedance.
- Apply optical fiber communication concepts in analyzing fiber types, transmission losses, light sources, detectors, WDM, and link budget.

UNIT - I

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.

UNIT - II

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.

UNIT - III

Waveguide Components: 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,

UNIT - IV

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.

UNIT - V

Optical Fiber Transmission Media: 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)

2270017: FUNDAMENTALS OF MANAGEMENT

IV Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Nil

Course Objectives:

- To understand the management concepts, applications of concepts in practical aspects of business and development of managerial Skills.

Course Outcomes:

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

- Understand Management Principles Articulate key management concepts and their historical development.
- Apply Planning Techniques Develop strategic, tactical, and operational plans to achieve organizational goals.
- Analyze Organizational Structures Evaluate different organizational designs and their effectiveness in various contexts
- Implement Control Mechanisms Utilize performance measurement tools to assess and improve organizational effectiveness, leadership skills and
- Enhance Decision-Making Abilities Employ analytical and creative problem-solving techniques in decision-making scenarios and controlling Budgetary and Non Budgetary

UNIT – I

Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT – II

Planning and Decision Making: General Framework for Planning - Planning Process, Types of Plans, Management by Objectives; Development of Business Strategy. Decision making and Problem Solving - Programmed and Non-Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.

UNIT – III

Organization and HRM: Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change. Human Resource Management & Business Strategy: Talent Management, Talent Management Models and Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

UNIT – IV

Leading and Motivation: Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Leadership. Motivation - Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

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(AUTONOMOUS)

UNIT – V

Controlling: Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non-Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency and Methods.

TEXT BOOKS:

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

REFERENCES:

1. Essentials of Management, Koontz Kleihrich, Tata McGraw Hill.
2. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2270440: WIRELESS COMMUNICATIONS AND NETWORKS
(Professional Elective-III)

IV Year B.Tech. ECE I – Sem. **L T P C**
3 0 0 3

Pre-requisites: Knowledge on basics of communication systems

Course Objectives:

- Understand the concept of frequency reuse and design of mobile cellular system
- Design and analysis of the traditional and emerging wireless networks
- Understand the architecture and operation of GSM, IS-95, GPRS and SMS
- Understand wireless LAN architectures and operation
- Understand the emerging technique OFDM and its importance in the wireless communications

Course Outcomes:

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

- Understand the Fundamental Principles of Wireless Communication
- Analyze various multiple access techniques used in wireless communication.
- Apply Performance Optimization Techniques to Wireless Wide Area Networks
- Understand the Architecture and Standards of Wireless Local Area Networks (WLANs)
- Implement OFDM in Practical Communication Systems

UNIT– I

The Cellular Concept-System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies-Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring.

UNIT – II

Mobile Radio Propagation: Large-Scale Path Loss: Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site-Specific Modeling.

UNIT – III

Mobile Radio Propagation: Small –Scale Fading and Multipath: Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel-Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading,

slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT – IV

Equalization and Diversity: Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Nonlinear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT – V

Wireless Networks: Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper Lan, WLL..

TEXT BOOKS:

1. Theodore, S. Rappaport J, "Wireless Communications Principles & Practice," PHI, 5th Edition, 2009.
2. Andrea Goldsmith, "Wireless Communications," Cambridge University Press, 2nd Edition, 2009.

REFERENCES:

1. Kaveh Pah Laven and P. Krishna Murthy, "Principles of Wireless Networks," 2nd Edition, PE, 2002.
2. William Stallings, "Wireless Communication and Networking," PHI, 2nd Edition, 2004.
3. Kamilo Feher, "Wireless Digital Communications," PHI, 3rd Edition, 2015.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2270441: VLSI PHYSICAL DESIGN WITH TIMING ANALYSIS
(Professional Elective-III)

IV Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Prerequisite: Switching Theory and Logic Design, Digital System Design with PLDS

Course Objectives:

- Understand the concepts of Physical Design Process and static timing analysis.
- Discuss the concepts of physical design partitioning and floor planning.
- Understand the concepts of optimized placement and routing
- Understand the concepts of clock routing, design libraries and rules of physical design
- Understand the concepts of CAD simulation and synthesis and machine learning models in physical design

Course Outcomes:

On completion of this course the student will be able to:

- Apply partitioning and chip planning techniques using KL, FM, and floorplanning algorithms for optimizing VLSI design efficiency.
- Use placement and routing techniques with modern algorithms and power planning methods for efficient VLSI layout design.
- Analyze clock routing techniques and input file formats for physical design, focusing on clock skew, latency, and timing constraints in VLSI systems.
- Explore machine learning models and open-source tools for physical design, enabling prediction of timing metrics and implementation of VLSI design flow.

UNIT - I

Introduction to VLSI Physical Design: Introduction, Physical Design flow, Physical Verification, EDA Tools for Physical Design, Data Structures and Algorithms for Physical Design

Static Timing Analysis: Introduction (STA, DTA, Behavior of synchronous circuit), Timing Arcs and Unateness, Definitions – Setup, Hold, Latch, Flipflop, STA (Flipflop), STA (Latch), Time Borrowing and Time Stealing, OCV and CRPR, Multi-Mode Multi corner Analysis, Statistical Static Timing Analysis

UNIT - II

Partitioning: Introduction and Optimization goals, KL – Algorithm, Extensions of KL – Algorithm, FM - Algorithm, Multilevel Partitioning

Chip Planning: Introduction and Optimization goals, Floorplanning Representations, Floorplanning Algorithms, Pin Assignment

UNIT - III

Placement: Introduction and Optimization goals, Min-cut placement, Analytic Placement, Simulated Annealing, Modern Placement Algorithms

Routing – Global and Detailed: Introduction and optimization goals, Single net routing (Rectilinear routing), Global routing in the connectivity graph, finding shortest paths with Dijkstra's Algorithm, Horizontal and vertical constraint graphs, Channel Routing Algorithms, Switch box routing algorithms, Over the cell routing algorithms, Power and Ground routing, Unified Power Format and Special cells used for Power Planning.

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UNIT - IV

Clock Routing: Clocking Schemes and Design Considerations, Clock Routing algorithms (H-tree based, MMM, Geometric matching, Weighted center, Exact zero skew and DME algorithm), Skew, Latency, Uncertainty, and Jitter

Input Files for VLSI Physical Design flow: Physical Library, Technology Library (LEF), Standard Cell Technology Library (LEF), Logical Library of Standard Cells: Operating Conditions, NLDM/ECSM models, Timing Desing Rule Constraints, Timing Desing Rule Constraints, Transition Table, Delay Table, Power Table, Parasitic Extraction, Wire Load Models, and RC table.

UNIT - V

Machine Learning for Physical Design: Machine Learning Models, Predict Path-Based Slack from Graph-Based Timing Analysis, Data collection, Model creation and predicting data

Open-source VLSI Physical Design flow: Yosys - RTL Synthesis, graywolf - Placement, qrouter - Detailed routing, magic - VLSI Layout tool, OpenTimer and OpenSTA - Static timing analysis.

TEXT BOOKS

1. Andrew B. Kahng, Jens Lienig , Igor L. Markov , Jin Hu, "VLSI Physical Design: From Graph Partitioning to Timing Closure", Springer, 2011.
2. Naveed A. Sherwani, "Algorithms for VLSI Physical Design Automation", 3rd edition, Kluwer Academic Publishers, 2007
3. J. Bhasker and Rakesh Chadha, “Static Timing Analysis for Nanometer Designs A Practical Approach” Springer 2009

REFERENCE BOOKS

1. Abhishek Kumar, Suman Lata Tripathi, K. Srinivasa Rao, "Machine Learning Techniques for VLSI Chip Design", Wiley-Scrivener, 2023
2. Veena S. Chakravarthi, Shivananda R. Koteshwar, "SoC Physical Design", Springer 2022
3. R. Jayagowri, Pushpendra S. Yadav, "Static Timing analysis for VLSI Circuits", 1st edition, Medtech, 2018

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2270442: FUNDAMENTALS OF ROBOTICS
(Professional Elective-III)

IV Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To impart knowledge on classification and elements of robot.
- To analyze the components of the Industrial Robotics.
- To analyze principles of robot control.
- To study robot programming.
- To learn system integration and robotic applications.

Course Outcomes:

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

- Understand robot classification, history, and fundamental components, including joints, links, actuators, and sensors
- Develop a comprehensive understanding of industrial robotics by analyzing the position and orientation of rigid bodies.
- Achieve proficiency in planning trajectories, computing link dynamics, and implementing trajectory-following control for precise robotic motion.
- Gain expertise in robot programming by exploring methods, languages, system requirements, and multitasking capabilities, including flow and task control.
- Explore robot system integration and its applications in various industrial and automation domains

UNIT – I

Introduction: Brief history, Classification of robot, Elements of robots joints, links, actuators, and sensors

UNIT – II

Components of the Industrial Robotics: Position and orientation of a rigid body, Homogeneous transformations, Introduction to D-H parameters and its physical significance, Orientation of Gripper, Direct and inverse kinematics serial robots, Examples of kinematics of common serial manipulators.

UNIT – III

Principles of Robot Control: Planning of trajectory, Calculation of a link velocity and acceleration, Calculation of reactions forces, Trajectory-following control.

UNIT – IV

Robot programming: Robot programming methods, Robot programming languages, Requirements of a programming robots' system, The robot as a multitasking system: Flow Control, Task Control.

UNIT – V

System integration and robotic applications: Robot system integration, Robotic applications.

TEXT BOOKS:

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Robot technology fundamentals / James G. Keramas / Cengage Publications

REFERENCE BOOKS:

1. Introduction to Robotics / John J Craig / Pearson Edu.
2. Applied Robotics / Edwin Wise / Cengage Publications.
3. Robotics / Fu K S / McGraw Hill.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2270519: CRYPTOGRAPHY & NETWORK SECURITY
(Professional Elective-III)

IV Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Basic concepts of Computer Networks

Course Objectives:

- To impart knowledge on network security issues, services, goals and mechanisms.
- To analyze the security of communication systems, networks and protocols.
- To apply algorithms used for secure transactions in real world applications.

Course Outcomes:

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

- Demonstrate the knowledge of cryptography and network security concepts and applications.
- Understand and apply the concepts of symmetric encryption.
- Identify and investigate of Cryptographic Hash Functions.
- Understand the concepts of email security and PGP.
- Understand and apply web security mechanisms.

UNIT - I

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT - II

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC4, RC5, Block cipher operation, Stream ciphers, Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT-III

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme. Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

UNIT-IV

Email Privacy: Pretty Good Privacy (PGP) and S/MIME. IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

UNIT – V

Web Security: Requirements, Secure Socket Layer (SSL) and Transport Layer Security(TLS), Secure Electronic Transaction (SET). Intruders, Viruses and related threats, Firewall Design principles, Trusted

Systems, Intrusion Detection Systems.

TEXT BOOKS:

1. Cryptography and Network Security by Atul Kahathe MC Graw Hill, 2nd edition.
2. Cryptography and Network Security by William Stallings 6th Edition, PearsonEducation.

REFERENCES:

1. Cryptography and Network Security by Behrouz A.Forouzan.
2. Applied Cryptography" by Bruce Schneier.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2270484: MICROWAVE AND OPTICAL COMMUNICATIONS LABORATORY

IV Year B.Tech. ECE I – Sem.

L	T	P	C
0	0	4	2

Pre-requisites: Basics of antennas and microwave engineering.

Course Objectives:

- Defining the range of frequencies for operation in microwave engineering.
- Understand the functioning of microwave components.
- Verify the various Characteristics of Active and Passive Microwave Devices Practically.
- Measure the characteristics optical devices.
- Measure the various parameters of the optical sources.

Course Outcomes:

At the end of the laboratory work, students will 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.
- Measure the various characteristics of different optical devices.
- Measure 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.

IV - II

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2280443: BIOMEDICAL INSTRUMENTATION
(Professional Elective-IV)

IV Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- Identify significant biological variables at cellular level and ways to acquire different bio-signals.
- To explore the human body parameters measurements setups.
- Elucidate the methods to monitor the activity of the heart, brain, eyes and muscles.
- Introduce therapeutic equipment for intensive and critical care.
- Outline medical imaging techniques and equipment for certain diagnosis and therapies.

Course Outcomes:

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

- Understand biosystems and medical systems from an engineering perspective.
- Analyze cardiovascular measurement techniques including ECG, blood pressure, and blood flow monitoring.
- Identify techniques for recording and understanding physiological activities such as cell potential, ECG, EEG, BP, blood flow, and EMG.
- Demonstrate knowledge of the operation of various medical instruments and critical care equipment.
- Know the imaging techniques including CT, PET, SPECT and MRI used in diagnosis of various medical conditions.

UNIT–I

Bio-Potential Signals and Electrodes: Bio-signals and their characteristics, Organization of cell, Nernst equation of membrane, Resting and Action potentials. Bio-amplifiers, characteristics of medical instruments, problems encountered with measurements from living systems. Bio-potential electrodes – Body surface recording electrodes, Internal electrodes, micro electrodes. Bio-chemical transducers – reference electrode, the pH electrodes, Blood gas electrodes.

UNIT–II

Cardiovascular Instrumentation: Heart and cardiovascular system Heart electrical activity, blood pressure and heart sounds. Cardiovascular measurements electro cardiography – electrocardiogram, ECG Amplifier, Electrodes and leads, ECG recorder principles. Types of ECG recorders. Principles of blood pressure and blood flow measurement.

UNIT–III

Neurological Instrumentation: Neuronal communication, electro encephalogram (EEG), EEG Measurements EEG electrode-placement system, interpretation of EEG, EEG system Block diagram, preamplifiers and amplifiers. EMG block diagram and Stimulators

UNIT–IV

Equipment for Critical Care: Therapeutic equipment - Pacemaker, Defibrillator, Shortwave diathermy, Hemodialysis machine. Respiratory Instrumentation - Mechanism of respiration, Spirometry, Pneumotachograph, Ventilators.

UNIT–V

Principles of Medical Imaging: Radiography, computed Radiography, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Nuclear Medicine, Single Photon Emission Computed Tomography (SPECT), Positron Emission Tomography (PET), Ultrasonography, Introduction to Telemedicine.

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TEXT BOOKS:

1. Hand-book of Biomedical Instrumentation – by R.S. Khandpur, McGraw-Hill, 2003.
2. Medical Instrumentation, Application and Design – by John G. Webster, John Wiley.

REFERENCES:

1. Biomedical Instrumentation and Measurements – by Leslie Cromwell, F.J. Weibell, E.A. Pfeiffer, PHI.
2. Principles of Applied Biomedical Instrumentation – by L.A. Geoddes and L.E. Baker, John Wiley and Sons.
3. Introduction to Biomedical equipment technology-by Joseph Carr and Brown.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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2280444: UNNAMED AERIAL VEHICLES
(Professional Elective-IV)

IV Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Embedded System Design

Course Objectives:

- To explain and make the students to understand the basic concepts of UAV/DRONE systems and its applications.
- To understand the different hardware configurations for UAV.
- To understand the designing, integration and testing of UAV.
- To understand the GCS Software & applications.
- To demonstrate the flight configurations and Practical implementation.

Course Outcomes:

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

- Identify the evolution, classification, system composition, and applications of unmanned aerial vehicles.
- Prepare preliminary design requirements for an unmanned aerial vehicle.
- Analyze the components, types, assembly process of drones, and the integration of artificial intelligence in drone mapping.
- Integrate flight dynamics and aerodynamics for drone movement and control.
- Evaluate navigation techniques, ground control systems, and testing processes for UAVs

UNIT – I

Introduction to Unmanned Aerial Vehicle Systems -- evolution of UAV – classification – models and prototypes – System Composition-applications.

UNIT – II

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.

UNIT – III

Basic Components of Drone - Different Types of Drones- Assembling of Drone, Artificial Intelligence in Drone -Drone Mapping.

UNIT - IV

Theory of Flight-Three Axes of Fight-Take –Off - Landing – Hover- Turning- Forwards and Sideway-Aerodynamic of Drone.

UNIT – V

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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2280516: ARTIFICIAL INTELLIGENCE
(Professional Elective-IV)

IV Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Pre-requisites:

A course on “Computer Programming and Data Structures”

Some background in linear algebra, and probability will be helpful

Course Objectives:

- To learn the distinction between optimal reasoning Vs. human like reasoning
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

Course Outcomes:

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

- Formulate an efficient problem space for a problem expressed in natural language.
- Select a search algorithm for a problem and estimate its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique for a given problem.
- Apply AI techniques to solve problems of game playing, and machine learning.

UNIT I

Artificial Intelligence: What is AI, Foundations and History of AI.

Intelligent Agents: Introduction, how Agents Should Act, Structure of Intelligent Agents, Agent programs, Simple reflex agents, Goal based agents, Utility based agents, Environments and Environment programs.

Problem Solving by Search: Problem-Solving Agents, Formulating Problems, Example Problems, Searching for Solutions, Search Strategies (Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search).

UNIT II

Informed Search Methods: Best-First Search, Heuristic Functions, Memory Bounded Search, Iterative Improvement Algorithms.

Game Playing: Introduction, Games as Search Problems, Perfect Decisions in Two-Person Games, Imperfect Decisions, Alpha-Beta Pruning, Games That Include an Element of Chance, State-of-the-Art Game Programs.

UNIT III

Knowledge and reasoning: A Knowledge-Based Agent, The Wumpus World Environment, Representation, Reasoning, and Logic, Propositional Logic, An Agent for the Wumpus World.

First-Order Logic: Syntax and Semantics, Extensions and Notational Variations, Using First- Order Logic, Logical Agents for the Wumpus World, A Simple Reflex Agent, RepresentingChange in the World
Building a Knowledge Base: Properties of Good and Bad Knowledge Bases, Knowledge Engineering, The Electronic Circuits Domain, General Ontology, Application: The Grocery Shopping World.

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UNIT-IV

Inference in First-Order Logic: Inference Rules Involving Quantifiers, An Example Proof, Generalized Modus Ponens, Forward and Backward Chaining, Resolution: A Complete Inference Procedure, Completeness of resolution.

Logical Reasoning Systems: Introduction, Indexing, Retrieval, and Unification, Logic Programming Systems, Theorem Provers, Forward-Chaining Production Systems, Frame Systems and Semantic Networks, Description Logics, Managing Retractions, Assumptions, and Explanations.

UNIT-V

Planning: A Simple Planning Agent, From Problem Solving to Planning, Planning in Situation Calculus, Basic Representations for Planning, A Partial-Order Planning Example, A Partial-Order Planning Algorithm, Knowledge Engineering for Planning.

Practical Planning: Practical Planners, Hierarchical Decomposition, Analysis of Hierarchical Decomposition, Resource Constraints.

TEXT BOOKS:

1. Artificial Intelligence A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition,Pearson Education.

REFERENCES:

1. Artificial Intelligence, E.Rich and K.Knight, , 3rd Edition, TMH
2. Artificial Intelligence, Patrick Henny Winston, 3rd Edition, Pearson Education.
3. Artificial Intelligence, ShivaniGoel, Pearson Education
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2280445: SATELLITE COMMUNICATIONS
(Professional Elective-IV)

IV Year B.Tech. ECE II – Sem. **L T P C**
3 0 0 3

Pre-requisites: Knowledge on analog and digital communication systems.

Course Objectives:

- Acquire the basic knowledge of satellite communication principles
- Overview of types of orbits and satellites for the satellite communication
- Basic knowledge of link design of a satellite and multiple access systems
- Understand the basic concepts of earth station technology and their various types
- Gain knowledge on various missions like MOM, Chandrayaan, other missions

Course Outcomes:

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

- Illustrate the basic concepts of satellite communication and orbital dynamics, along with satellite types and launch mechanisms.
- Analyze the design and functionality of satellite subsystems, including attitude control, telemetry, power, communication, and antenna systems.
- Design satellite communication links and evaluate multiple access techniques such as FDMA, TDMA, and CDMA for efficient bandwidth utilization and signal quality.
- Visualize various earth station technology and their various types
- Understand the fundamentals of deep space missions, GPS navigation systems, and recent developments in satellite communication technologies.

UNIT– I

Introduction: 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.

UNIT – II

Satellite Subsystems: Attitude and Orbit Control System, Telemetry, Tracking, Command and Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification.

UNIT – III

Satellite Link Design: Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design o 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.

UNIT – IV

Earth Station Technology: 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.

UNIT – V

Deep Space Communications: 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
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2280446: MICROCONTROLLERS IN IOT
(Professional Elective – V)

IV Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Microprocessors and Microcontrollers

Course Objectives:

- Introduce low power microcontrollers and to develop the skill set of programming low power sensing applications.
- Understand PIC controllers' registers, instruction pipeline, interrupts and architecture.
- Impart the knowledge of various peripheral related to sensing and communication using wired or wireless means and Raspberry Pi.
- Develop the skill set of students to build IoT systems and sensor interfacing.
- Learn about instructions, addressing modes, conditional instructions and programming of advanced embedded processors and microcontrollers and its cloud interfacing.

Course Outcomes:

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

- Understand the architecture, programming, and low-power features of MSP430 microcontrollers, including memory organization, interrupts, and mixed-language development.
- Apply the architecture and programming of PIC microcontrollers for interfacing sensors, controlling motors, and using communication protocols like SPI.
- Interface display modules, communication peripherals, and sensors using Raspberry Pi and Python programming.
- Implement sensor interfacing techniques using port programming, ADCs, PWM, and serial communication protocols.
- Develop IoT applications using microcontrollers like ESP8266 and NodeMCU with cloud platforms for data transmission, reception, and logging.

UNIT– I

Microcontrollers: Architecture of the MSP430, Memory, Addressing modes, Reflections on the CPU instruction set. Clock system, Exceptions: Interrupts and resets. Functions and subroutines, Mixing C and assembly language, Interrupts, Interrupt service routines, Issues associated with interrupts Low power modes of operation.

UNIT – II

PIC Microcontrollers: Introduction to PIC microcontrollers, architecture and memory organization, registers, I/O ports, interrupts, timer, instruction sets, PIC programming in assembly and C, Sensor interfacing, motor control, SPI bus protocols.

UNIT – III

Display and Communication modules: GPIO, LCD display, graphical display, relays, Peripheral programming of SPI, I2C, UART, Zigbee controller.

Raspberry Pi: Raspberry Pi board and its processor, Programming the Raspberry Pi using Python,

Communication facilities on Raspberry Pi (I2C,SPI, UART), Interfacing of sensors and actuators.

UNIT – IV

Sensors interfacing: Sensors interfacing techniques- Port Programming, ADC, SPI thermometer, I2C thermometer, PWM generation and demodulation, DTH11, single wire thermometer, Frequency counters.

UNIT – V

Microcontrollers for IoT: ESP8266, NodeMCU, TICC3200, Access point and station point mode, HTTP, MQTT, transmission and receiving, Intel-Gallileo boards.

Cloud interfacing: Interfacing and data logging with cloud: Thing speak, Things board, Blync platform.

TEXT BOOKS:

1. John H. Davies, “MSP430 Microcontroller Basics”, 2nd edition, Newnes publishing, New York, 2011.
2. Jacob Fraden, “Hand Book of Modern Sensors: physics, Designs and Applications”, 4th edition, Springer, New York, 2014.
3. Muhammod Ali Mazidi, Rolin D. Mckinlay & Danny Sansey, “PIC Microcontroller and Embeded System SPI, UART using Assembly & C for PICI8,” Pearson International Edition, 2008.

REFERENCES:

1. John. B. Peatman, “Design with PIC Microcontroller”, Prentice Hall, 1997.
2. S. Monk, “Programming the Raspberry Pi” McGraw-Hill Education, 2013.
3. Sergey Y. Yurish, “Digital Sensors and Sensor Systems: Practical Design”, 1st edition, IFSA publishing, New York, 2011.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2280447: RADAR SYSTEMS
(Professional Elective-V)

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

3 0 0 3

Pre-requisites: Knowledge on Antennas and communication systems.

Course Objectives:

- Understand the working principle of a radar, formulating radar equation
- Identify the need for modulation and Doppler effect for working of CW and FM-CW radar
- Impart the knowledge of functioning of MTI radar, variants and its limitations
- Understand the principles of operation of Tracking Radar
- Concepts of a Matched Filter in radar receiver and its characteristics

Course Outcomes:

At the end of this course, students will be able

- Explain the working principle of a pulse radar and implement the radar range equation
- Understand the need and functioning of CW, FM-CW and MTI radars
- Illustrate DLC characteristics, range gated Doppler filter bank, and MTI radar performance
- Distinguish between Sequential Lobing, Conical Scan, Monopulse type of Tracking Radars
- Derive the matched filter response characteristics for radar applications

UNIT– I

Basics of Radar: Introduction, 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, Illustrative Problems.

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 (qualitative treatment), Illustrative Problems.

UNIT – II

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. Illustrative Problems.

FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM- CW altimeter.

UNIT – III

MTI and Pulse Doppler radar: Introduction, Principle, MTI Radar with - 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.

UNIT – IV

Tracking Radar: 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, introduction to SAR, phased array radar.

UNIT – V

Detection of Radar Signals in Noise: Introduction, 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. Merrill I. Skolnik, “Introduction to Radar Systems,” Mc Graw Hill, 3rd Edition, 2017.
2. Byron Edde, “Radar: Principles, Technology, Applications,” Pearson Education, 1st Edition, 2004.

REFERENCES:

1. Peebles, Jr., P.Z, “Radar Principles,” Wiley, New York, 1st Edition, 2007.
2. Nicolaos S Tzannes, “Communication and Radar Systems,” iUniverse, 1st Edition, 2000.
3. G. Sasi Bhushana Rao, “Microwave & Radar Engineering,” Pearson, 1st Edition, 2014.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2280448: NANO TECHNOLOGY
(Professional Elective-V)

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

3 0 0 3

Pre-requisites: Knowledge on Basic Semiconductor Physics.

Course Objectives:

- Study the basic concepts of Nanotechnology
- Learn Nanoparticles and Nanostructured Materials
- Analyze nano devices operation and their issues
- Understand the concepts of Nano systems
- Study the Bio-nanotechnology and Impact of nanotechnology

Course Outcomes:

At the end of this course, students will be able

- Describe core concepts, history, and basic principles of nanotechnology and material characterization.
- Analyze the types, properties, and synthesis methods of nanoparticles and nanostructured materials.
- Examine the principles, challenges, and emerging trends in nanodevices including electronic, photonic, spintronic, and mechanical systems.
- Gain knowledge of nanosystem design, material selection, defect control, and applications of carbon-based nanomaterials.
- Assess bio-nanotechnology principles and the diverse impacts of nanotechnology on science, society, and the environment.

UNIT– I

Introduction: Definitions and Concepts, An Ostensive Definition of Nanotechnology, A Brief History of Nanotechnology, Biology as Paradigm, Why Nanotechnology? Solid State Structure, Energy Bands, Localized Particles, Microscopy, Spectroscopy.

UNIT – II

Nanoparticles and Nanostructured Materials: Metal Nanoclusters, Semiconducting Nanoparticles, Rare Gas and Molecular Clusters, Methods of Synthesis, Solid Disordered Nanostructures, Nanostructured Crystals.

UNIT – III

Nanodevices: Issues of Miniaturization, Digital Information Processing, Quantum Computing, Electronic Devices, Trends in the Miniaturization of Electronics, Spintronics (Magnetic Devices), Photonic Devices, Mechanical Devices, Fluidic Devices, Micro-Electro-Mechanical Systems (MEMSs), Nano-Electro-Mechanical Systems (NEMSs),

UNIT – IV

Nano systems and their Design: Systems, Materials selection, Defects in Nanograins, Spacial Distribution of Defects, Strategies to Overcome Component Failure, Computational Modeling, “Evolutionary” Design, Performance Criteria, Scale out, Standardization, Creative Design, Producibility, Graphene, Carbon Nanotubes, Carbon Nanoparticles (Fullerenes), Materials Applications, Device Components and Devices.

UNIT – V

Bio-Nanotechnology and Impact of Nanotechnology: The Structural Nature of Biomolecules, Some

General Characteristics of Biological Molecules, The Mechanism of Biological Machines, DNA as Construction Material, Biosensors, Bio photonic Devices, Technical Revolutions, Scientific Impacts, Technical Impacts, Commercial and Economic Impacts, Environmental Impacts, Social Implications, Impacts on Individual Psychology, Some Ethical Issues.

TEXT BOOKS:

1. Jeremy Ramsden, “Nanotechnology: An Introduction,” Elsevier, 2nd Edition, 2016.
2. Charles P. Poole, Jr. and Frank J. Owens, “Introduction to Nanotechnology,” John Wiley & Sons, 2nd Edition, 2003.

REFERENCES:

1. Mark Ratner and Daniel Ratner, “Nanotechnology: A Gentle Introduction to the Next Big Idea,” Pearson, 2nd Edition, 2003.
2. Risal Singh and Shipra Mital Gupta, “Introduction to Nanotechnology,” Oxford University Press, 1st Edition, 2016.
3. William Illsey Atkinson, “Nanotechnology,” Jaico Publishing House, 1st Edition, 2006.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2280523: CYBER SECURITY
(Professional Elective-VI)

IV Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Nil

Course Objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

Course Outcomes:

At the end of this course, students will be able

- Understand cyber-attacks, types of cybercrimes, cyber laws
- Know how to protect them self and the entire Internet community from Cyber Attacks

UNIT – 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, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - 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, Special Techniques for Forensics Auditing.

UNIT - 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, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- 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. Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - 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. Mini-Cases: 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.

REFERENCES:

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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2280449: TEST AND TESTABILITY
(Professional Elective-VI)

IV Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Prerequisite: Switching Theory and Logic Design, Digital System Design with PLDS

Course Objectives:
- To provide or broad understanding of fault diagnosis
- To generate patterns using LFSR and CA
- To illustrate the framework of test pattern generation
- To design for Testability for combinational circuits
- To understand design for testability in Digital Design

Course Outcomes:

On completion of this course the student will be able to:
- Analyze testing challenges in digital, analog, and mixed-signal circuits, along with fault models and design-for-test strategies for reliable circuit performance.
- Examine test pattern generation techniques used in combinational logic circuits for improved fault detection.
- Design pseudorandom test pattern generators using Linear Feedback Shift Registers (LFSRs) and Cellular Automata (CAs) for efficient circuit testing.
- Apply design-for-testability techniques, including controllability, observability, and Reed Muller's expansion, for enhancing testability in combinational circuits.
- Design testable sequential circuits using full scan, partial scan, and multiple scan techniques improving fault detection and circuit reliability.

UNIT - I

Need for testing, the problems in digital Design testing, the problems in Analog Design testing, the problems in mixed analog/digital design testing, design for test, printed-circuit board (PCB) testing, software testing.

Fault in Digital Circuits: General Introduction, Controllability and Observability, Fault Models, stuck at faults, bridging faults, CMOS technology considerations, intermittent faults.

UNIT - II

General Introduction, to test pattern generation, Test Pattern generation for combinational logic circuits, Manual test pattern generation, automatic test pattern generation, Boolen difference method, Roth's D- Algorithm, Developments following Roth's D-algorithm, Pseudorandom test pattern generation.

UNIT - III

Pseudorandorn test pattern generators, Design of test pattern generator using Linear feedback shift registers (LFSRs) and cellular automata (CAs).

UNIT - IV

Design for Testability for combinational circuits: Basic Concepts of testability, controllability and observability, the Reed Muller's expansion techniques, use of control logic and syndrome testable

designs.

UNIT - V

Making sequential circuits testable, testability insertion, full scan DFT technique-Full scan insertion, flip-flop structures, Full scan design and test, scan architectures-full scan design, shadow register DFT, partial scan methods, multiple scan design, other scan designs.

TEXT BOOKS

1. Fault Tolerant and Fault Testable Hardware Design-Parag K. Lala, 1984, PHI.
2. VLSI Testing digital and Mixed analogue/digital techniques-Stanley L. Hurst, IEE Circuits, Devices and Systems series 9, 1998.

REFERENCE BOOKS

1. Digital Systems Testing and Testable Design-Miron Abramovici, Melvin A. Breuer and Arthur D. Friedman, Jaico Books
2. Essentials of Electronic Testing-Bushnell and Vishwani D.Agarwal, Springers
3. Design for test for Digital IC's and Embedded Core Systems-Alfred L. Crouch, 2008, Pearson Education.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2280450: GLOBAL NAVIGATION SATELLITE SYSTEM
(Professional Elective-VI)

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

3 0 0 3

Pre-requisites: Knowledge on the communication systems.

Course Objectives:

- Familiarize with Satellite based navigation
- Understand the GPS signals and GPS datums
- Understand the different types of GPS errors
- Understand the DGPS and GPS coordinate system
- Discuss the Augmentation systems

Course Outcomes:

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

- Learn the fundamentals of GPS, including its principles, architecture, navigation methods, and time reference systems.
- Interpret GPS and GNSS signal structures, receiver components, and global datums used in satellite navigation systems.
- Evaluate GPS error models and apply techniques for error mitigation and signal integrity.
- Understand DGPS systems, spoofing countermeasures, and global satellite constellations.
- Identify key characteristics and operational concepts of satellite and ground-based augmentation systems like WAAS, GAGAN, and LAAS.

UNIT– I

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.

UNIT – II

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.

UNIT – III

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.

UNIT – IV

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

UNIT – V

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.

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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)

2280451: COMPUTER VISION
(Professional Elective-VI)

IV Year B.Tech. ECE II – Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Knowledge on the digital image processing.

Course Objectives:

- Explore the difference between human vision and computer vision
- Understanding the various features extraction methods
- Knowledge on shape representation and segmentation
- Familiarize the concepts of motion detection and estimation
- Understand various algorithms used for object recognition

Course Outcomes:

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

- Understand image formation models, stereo vision principles, and camera calibration techniques for 3D scene reconstruction.
- Analyze feature extraction techniques for interpreting shape, texture, motion, and reflectance in images.
- Apply shape representation and segmentation techniques including deformable models, region-based and edge-based methods for image analysis.
- Evaluate motion detection and estimation techniques for dynamic scene analysis.
- Utilize object recognition techniques including Hough transform, shape matching, and principal component analysis.

UNIT-I

Image Formation Models: Monocular imaging system, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration. Apparel, Stereo vision.

UNIT-II

Feature Extraction: Image representations (continuous and discrete), Edge detection, Edge linking, corner detection, texture, binary shape analysis, boundary pattern analysis, circle and ellipse detection, Light at Surfaces; Phong Model; Reflectance Map; Albedo estimation; Photometric Stereo; Use of Surface Smoothness Constraint; Shape from Texture, color, motion and edges.

UNIT-III

Shape Representation and Segmentation: Deformable: Curves and surfaces, Snakes and active contours Level set representations, Fourier and wavelet descriptors, Medial representations, multi-resolution analysis, Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean- Shift, MRFs, Texture Segmentation.

UNIT-IV

Motion Detection and Estimation: Regularization theory, Optical computation, Stereo Vision Motion estimation, Background Subtraction and Modelling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation, Structure from motion, Motion Tracking in Video.

UNIT-V

Object recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal component analysis, Shape priors for recognition.

TEXT BOOKS:

1. D. Forsyth and J. Ponce, “Computer Vision - A modern approach,” Pearson Prentice Hall, 2nd Edition, 2012.
2. Szeliski Richard, “Computer Vision: Algorithms and Applications,” Springer- Verlag London Limited, 1st Edition, 2011.

REFERENCES:

1. Richard Hartley and Andrew Zisserman, “Multiple View Geometry in Computer Vision,” Cambridge University Press, 2nd Edition, 2004.
2. K. Fukunaga, “Introduction to Statistical Pattern Recognition,” Morgan Kaufmann, 2nd Edition, 1990.
3. Rafael C. Gonzalez and Richard E. Woods,” Digital Image Processing,” PHI, 4th Edition. 2018.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2250406: ELECTRONIC COMMUNICATIONS & APPLICATIONS
(Open Elective – I)

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

3 0 0 3

Pre-requisites: Knowledge on the basics of communication systems

Course Objectives:

- Study the system requirements of analog communication systems
- Gain knowledge on the various digital modulation techniques
- Realize the significance of optical fiber communications
- Explore the concepts of radar and its frequency bands
- Acquire the basic knowledge of satellite communication principles

Course Outcomes:

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

- Understand the basic knowledge of analog communication systems
- Analyze the performance of digital modulation techniques
- Understand and analyze the constructional parameters of optical fibers
- Derive the complete radar range equation
- Understand the basic concepts, and frequency allocations for satellite communication

UNIT– I

Basics of Analog Communication: Need for modulation, Amplitude and Frequency, Phase Modulations - Time and frequency domain description, power relations in AM and FM waves, Applications of AM and FM.

UNIT – II

Introduction to Digital Communications: *Model of digital communication system, advantages of digital communication systems, digital representation of analog signals.*

Basics of Baseband Data Transmission: Introduction**,** sampling process, PAM, PWM, PPM, pulse code modulation, differential pulse code modulation, delta modulation, ADM, basics of ASK, FSK and PSK, Applications of Digital Communications.

UNIT – III

Basics pf Optical Fiber Communication: - Historical development, The general system, Advantages of Optical Fiber Communications, Optical Fiber Wave Guides- Total Internal Reflection, Acceptance Angle, Numerical Aperture, Step Index Fibers, Graded Index Fibers. Basics of Single Mode Fibers.

UNIT – IV

Basics of Radar: Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies. Applications: defence weapons systems and in safety and navigation applications etc.

UNIT – V

Basics of of Satellite Communications: Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Orbital Mechanics, Indian Scenario in satellite communications, Applications of Satellite Communications.

TEXT BOOKS:

3.Simon Haykin, “Analog and digital communications,” John Wiley, 5th Edition 2009.

4.Gerd Keiser, “Optical Fiber Communications,” MC GRAW HILL publication, 5th Edition, 2017.

REFERENCES:

1. Sudakshina Kundu, “Analog and digital communications,” Pearson India, 2nd Edition 2020.
2. Merrill I. Skolnik, “Introduction to Radar Systems,” TMH Special Indian Edition, 3rd Edition, 2017.
3. Timothy Pratt, Charles Bostian and Jeremy Allnutt, “Satellite Communications,” WSE, Wiley Publications, 3rd Edition, 2019.

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(AUTONOMOUS)

2260407: FUNDAMENTALS OF EMBEDDED SYSTEMS
(Open Elective - II)

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

3 0 0 3

Pre-requisites: Knowledge on basic semiconductor devices, micro processors and controllers.

Course Objectives:

- Understand the basics of an embedded system
- Learn embedded system for different applications
- Learn different embedded processors and their architectures
- Analyze embedded architectures quantitively and their security concerns
- Design, implement and test an embedded system

Course Outcomes:

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

- Understand the process involved in the designing of embedded systems
- Draw and analyze system clocks with design considerations and Test Generation Methods
- Understand types of memory
- Understand embedded firmware design approaches
- Gain the knowledge on task communications

UNIT– I

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.

UNIT – II

The Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs.

Memory: ROM, RAM, Memory according to the type of Interface, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface basics

UNIT – III

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware, Difference between C and Embedded C, why C for Embedded.

UNIT – IV

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.

UNIT – V

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Communication/ Synchronization Issues, Device Drivers, Linux basic and utilities UNIX/lINUX/Window, advantages of Linux, Linux Device drivers, Role of Drivers.

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TEXT BOOKS:

3. Shibu K.V, “Introduction to Embedded Systems,” Mc Graw Hill, 3rd Edition, 2017.
4. Morgan Kaufmann, “Computers as Components,” Wayne Wolf, 4th Edition, 2019.

REFERENCES:

4. Raj Kamal, “Embedded Systems-Architecture, programming and Design,” TMH, 2nd Edition, 2007.
5. Frank Vahid, Tony Givargis, “Embedded System Design- Unified Hardware / Software Introduction,” John Wiley, 1st Edition, 2006.
6. Lyla B. Das, “Embedded Systems- An integrated approach,” Pearson, 1st Edition, 2013.

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2270408: GLOBAL NAVIGATION SATELLITE SYSTEM & APPLICATIONS
(Open Elective-III)

B.Tech. ECE I – Sem. **L T P C**

3 0 0 3

Pre-requisites: Basic knowledge of GIS and Remote Sensing.

Course Objectives:

- Get familiarize with Satellite based navigation.
- Understand the concept of Position fixing GPS.
- Introduce state of the art technique for comparing the positional accuracy.
- Demonstrate a clear understanding of the GPS signal, codes and biases
- Discuss the practical applications of GPS and the implications of its modernization

Course Outcomes:

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

- Introduction to global positioning
- Learn types of signals used in the GPS systems and accuracy limits
- Know latest versions of GPS and its application
- Understand satellite positioning and navigation
- Know how satellites positions objects on and above surface of the Earth, as well as in space

UNIT– I

Introduction to SC: Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Orbital Mechanics, Indian Scenario in satellite communications, Applications of Satellite Communications.

UNIT – II

GPS Fundamentals: Accessing the quality of DEM, Integration of DEMs with satellite data, Common derivatives and crashing network.

UNIT – III

GPS receivers & data errors: DEMs derivatives - 1, DEMs derivatives - 2, DEMs derivatives - 3, DEMs derivatives -4, DEM based Surface Hydrologic Modeling -1.

UNIT – IV

Other GNSS: DEMs based Surface Hydrologic Modeling DEMs and dam simulation and its application in groundwater hydrology Applications of DEMs in solar.

UNIT – V

GPS APPLICATIONS: wind energy potential estimations, Applications of DEMs in Viewshed and Flood Hazard Mapping DEMs Sources Limitations and future of Digital Elevation Models. Civilian and non-civilian applications.

TEXT BOOKS:

1. Hofmann-Wellenhof, B., Lichtenegger, H., Wasle, E., “GNSS – Global Navigation Satellite Systems,” 5th Edition, Springer, Verlag Wien, 2012.
2. Pratap Misra, “Global Positioning System: Signals, Measurements and Performance,” 1st Edition, Ganga-Jamuna, 2001.

REFERENCES:

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1. Elliott D. Kaplan and Christopher Hegarty, “Understanding GPS/GNSS: Principles and Applications,” 3rd Edition, Artech House, 2017.
2. Bhatta, B., “Global Navigation Satellite Systems: Insights Into GPS, Glonass, Galileo, Compass, and Others,” 2nd Edition, BS Publications, 2010.
3. Grewal, M. S., Weill, L. R., Andrews, A. P., “Global Positioning Systems, Inertial Navigation, and Integration,” 1st Edition, John Wiley & Sons, New York, 2010.