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

B.Tech – Electrical & Electronics Engineering
Course Structure (R20)
Applicable From 2020-21 Admitted Batch
Structure Breakup

S. No	Category	Breakup of credits (Total 160 credits)
1	Humanities and social sciences including management courses (HSMC)	10
2	Basic Sciences Courses (BS)	26
3	Engineering sciences courses including workshop, drawing basics of electrical/mechanical/computer etc. (ES)	21
4	Professional core courses (PC)	62
5	Professional Electives courses relevant to chosen specialization/branch (PE)	18
6	Open subjects- Electives from other technical and/or emerging subjects (OE)	9
7	Project work, seminar and internship in industry or elsewhere (PS)	14
8	Mandatory Courses	-
	TOTAL	**160**

I YEAR I SEMESTER

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2010001	Engineering Mathematics - I	BSC	3	1	0	4	30	70	100
2	2010008	Engineering Chemistry	BSC	3	1	0	4	30	70	100
3	2010009	Communicative English	HSMC	2	0	0	2	30	70	100
4	2010501	Programming For Problem Solving	ESC	3	1	0	4	30	70	100
5	2010073	Engineering Chemistry Lab	BSC	0	0	3	1.5	30	70	100
6	2010074	Communicative English Lab	HSMC	0	0	2	1	30	70	100
7	2010571	Programming For Problem Solving Lab	ESC	0	0	3	1.5	30	70	100
8	---	Induction Program		0	0	0	0	-	-	-
Total Credits				**11**	**3**	**8**	**18**	**210**	**490**	**700**

I YEAR II SEMESTER

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2020002	Engineering Mathematics - II	BSC	3	1	0	4	30	70	100
2	2020006	Applied Physics	BSC	3	1	0	4	30	70	100
3	2020201	Basic Electrical Engineering	PCC	3	0	0	3	30	70	100
4	2020372	Engineering Workshop	ESC	1	0	3	2.5	30	70	100
5	2020371	Engineering Drawing Practice	ESC	1	0	4	3	30	70	100
6	2020071	Applied Physics Lab	BSC	0	0	3	1.5	30	70	100
7	2020273	Basic Electrical Engineering Workshop Lab	PCC	0	0	2	1	30	70	100
Total Credits				**11**	**2**	**12**	**19**	**210**	**490**	**700**

II YEAR I SEMESTER

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2030003	Laplace Transforms Series Solutions And Complex Variables	BSC	3	1	0	4	30	70	100
2	2030204	Network Analysis	PCC	3	0	0	3	30	70	100
3	2030205	Electrical Machines-I	PCC	3	1	0	4	30	70	100
4	2030402	Analog Electronics	PCC	3	0	0	3	30	70	100
5	2030502	Data Structures	BSC	2	0	0	2	30	70	100
6	2030274	Network Analysis Lab	PCC	0	0	2	1	30	70	100
7	2030484	Analog Electronics Lab	PCC	0	0	2	1	30	70	100
8	2030572	Data Structures Lab	BSC	0	0	2	1	30	70	100
9	2030321	Environmental Science	*MC	2	0	0	0	-	-	-
Total Credits				**16**	**2**	**6**	**19**	**240**	**560**	**800**

II YEAR II SEMESTER

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2040206	Electro Magnetic Fields	PCC	3	1	0	4	30	70	100
2	2040207	Electrical Machines-II	PCC	3	0	0	3	30	70	100
3	2040407	Digital Electronics & IC Applications	PCC	3	0	0	3	30	70	100
4	2040412	Signals & Systems	PCC	3	0	0	3	30	70	100
5	2040509	Java Programming	ESC	2	0	0	2	30	70	100
6	2040275	Electrical Machines-I Lab	PCC	0	0	2	1	30	70	100
7	2040485	Digital Electronics & IC Applications Lab	PCC	0	0	2	1	30	70	100
8	2040484	Signals & Systems Lab	PCC	0	0	2	1	30	70	100
9	2040570	Java Programming Lab	ESC	0	0	2	1	30	70	100
Total Credits				**14**	**1**	**8**	**19**	**270**	**630**	**900**

III YEAR I SEMESTER

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2050208	Power Systems-I	PCC	3	0	0	3	30	70	100
2	2050209	Control Systems	PCC	3	0	0	3	30	70	100
3	2050403	Microprocessors and Microcontrollers	ESC	3	0	0	3	30	70	100
4	2050010	Business Economics and Financial Analysis	HSMC	3	0	0	3	30	70	100
5	2050505	Python Programming	ESC	2	0	0	2	30	70	100
6		Open Elective-I	OEC	3	0	0	3	30	70	100
7	2050276	Electrical Machines-II Lab	PCC	0	0	2	1	30	70	100
8	2050472	Microprocessors and Microcontrollers Lab	ESC	0	0	2	1	30	70	100
9	2050575	Python Programming Lab	ESC	0	0	2	1	30	70	100
10	-------	Internship*	PS	0	0	2	1	30	70	100
Total Credits				**17**	**0**	**8**	**21**	**300**	**700**	**1000**

III YEAR II SEMESTER

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2060210	Power Systems-II	PCC	3	0	0	3	30	70	100
2	2060211	Electrical Measurements & Instrumentation	PCC	3	0	0	3	30	70	100
3	2060212	Power Electronics	PCC	3	0	0	3	30	70	100
4	2060011	Fundamentals Of Management	HSMC	3	0	0	3	30	70	100
5		Open Elective-II	OEC	3	0	0	3	30	70	100
6		Professional Elective-I	PEC	3	0	0	3	30	70	100
7	2060277	Control Systems Lab	PCC	0	0	2	1	30	70	100
8	2060278	Electrical Systems Simulation Lab	PCC	0	0	2	1	30	70	100
9	2060075	Advanced English Language and Communication Skills Lab	HSMC	0	0	2	1	30	70	100
10		Applications of AI	*MC	0	2	0	0	-	-	-
Total Credits				**18**	**2**	**6**	**21**	**270**	**630**	**900**

***Students have to complete internship in II Year- II Semester Summer break, Evaluation is carried in III-I semester.**

IV YEAR I SEMESTER

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2070213	Switchgear & Protection	PCC	3	0	0	3	30	70	100
2	2070214	Power System Operation & Control	PCC	3	0	0	3	30	70	100
3	2070215	Power Semiconductor Drives	PCC	3	0	0	3	30	70	100
4		Professional Elective-II	PEC	3	0	0	3	30	70	100
5		Professional Elective-III	PEC	3	0	0	3	30	70	100
6		Open Elective-III	OEC	3	0	0	3	30	70	100
7	2070279	Power Systems Lab	PCC	0	0	2	1	30	70	100
8	2070280	Electrical Measurements & Instrumentation Lab	PCC	0	0	2	1	30	70	100
9	2070281	Power Electronics Lab	PCC	0	0	2	1	30	70	100
10		Industry Oriented Mini Project**	PS	0	0	4	2	30	70	100
Total Credits				**18**	**0**	**10**	**23**	**300**	**700**	**1000**

IV YEAR II SEMESTER

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1		Professional Elective-IV	PEC	3	0	0	3	30	70	100
2		Professional Elective-V	PEC	3	0	0	3	30	70	100
3		Professional Elective-VI	PEC	3	0	0	3	30	70	100
4		Technical Seminar	PS	0	0	2	1	30	70	100
5		Major Project	PS	0	0	14	7	30	70	100
Total Credits				**9**	**0**	**16**	**17**	**150**	**350**	**500**

****Students have to complete industry oriented mini project in III Year- II Semester Summer break, Evaluation is carried in IV-I semester.**

PE I - Professional Elective I

S. No	Course Code	Course Title
1	2060216	Renewable Energy Sources
2	2060217	High Voltage Engineering
3	2060218	Advanced Control Systems
4	2060219	Special Machines

PE II - Professional Elective II

S. No	Course Code	Course Title
1	2070220	Electrical Distribution Systems
2	2070221	Digital Control Systems
3	2070419	VLSI Design
4	2070222	Modern Power Electronics

PE III – Professional Elective III

S. No	Course Code	Course Title
1	2070418	Digital Signal Processing
2	2070223	Control System Design
3	2070224	Flexible AC Transmission System
4	2070225	Utilization of Electrical Energy

PE IV - Professional Elective IV

S. No	Course Code	Course Title
1	2080226	Power Quality
2	2080227	Industrial Electrical Systems
3	2080228	Electrical Machine Design
4	2080229	Electrical & Hybrid Vehicles

PE V - Professional Elective V

S. No	Course Code	Course Title
1	2080230	IOT With Electrical Applications
2	2080231	Smart Grid Technologies
3	2080232	AI Techniques in Electrical Engineering
4	2080233	HVDC Transmission System

PE VI - Professional Elective VI

S. No	Course Code	Course Title
1	2080234	Advanced Control of Electric Drives
2	2080235	Estimation & Costing of Electrical Systems
3	2080236	ML Techniques to Power System Security
4	2080238	Programmable Logic Controllers

I–I

2010001: ENGINEERING MATHEMATICS - I

B.Tech. I Year I Semester **L T P C**
3 1 0 4

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 eigenvectors and to reduce the quadratic form to canonical form. Geometrical approach to the mean value theorems and their application to the mathematical problems.
- Partial differentiation, concept of total derivative, finding maxima and minima of function of two and three variables.
- The evaluation of Multiple integration and its applications

Course Outcomes:

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

CO.1: Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations

CO.2: Find the Eigen values, Eigen vectors and reduce the quadratic form to canonical form using orthogonal transformations.

CO.3: Solve the applications on the mean value theorems.

CO.4: Find the extreme values of functions of two variables with/ without constraints.

CO.5: Evaluate the multiple integrals and apply the concept to find areas, volumes for cubes, sphere and rectangular parallelepiped

UNIT-I: Matrices

Matrices: Types of Matrices, Symmetric; Skew-symmetric; orthogonal matrices; rank of a matrix by Echelon form, Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method, Gauss seidel iteration method.

UNIT-II: Eigen values and Eigen vectors

Eigen values and Eigenvectors 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 up to three variables. Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III: Calculus of single variable.

Mean value theorems: Rolle's Theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's and Maclaurin theorems with remainders (without proof). Beta and Gamma functions and their applications.

UNIT-IV: Multivariable Calculus.

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

UNIT-V: Multiple integrals& applications:
Evaluation of Double integrals (Cartesian and polar coordinates); Change of order of integration (Cartesian form); Evaluation of Triple integrals; Change of variables (Cartesian to polar) for double and (cartesian to spherical and cylindrical polar coordinates) for triple integrals.
Applications: finding the area of a region using double integration and volume of a region using double and triple integration.

TEXTBOOKS:
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.

REFERENCES:
1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.

2010008: ENGINEERING CHEMISTRY

B.Tech. I Year I Semester

L	T	P	C
3	1	0	4

Course Objectives:

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
- Toacquiretheknowledgeofelectrochemistry,corrosionandwatertreatmentwhichare essential for the Engineers and in industry
- To acquiretheskillspertainingtospectroscopyandtoapplythemformedicalandother fields.
- To impart the knowledge of stereochemistry and synthetic aspects useful for understanding reaction pathways

Course Outcomes: The basic concepts included in this course will help the student to gain:

- The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
- The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments.
- The required skills to get clear concepts on basic spectroscopy and application to medical and other fields.
- The knowledge of configurational and conformational analysis of molecules andr eaction mechanisms.

Unit - I:

Molecularstructure and Theoriesof Bonding: Atomicand Molecularorbitals / Introduction of VBT. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbitalenergyleveldiagrams of N_2, O_2 and COmolecules.πmolecularorbitalsof1,3-butadiene.

Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d-orbitalsin tetrahedral, octahedral and square planargeometries. Applications of CFT. Band structure ofsolids and effect of doping on conductance.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand the Schrodinger wave equation to hydrogen and particle in a box.
- Explain the molecular orbital energy level diagram of different molecular species.
- Apply the band theory of solids for conductors, semiconductors and insulators.
- Analyze discuss the magnetic behavior and colour of complexes.
- Evaluate the Crystal Field theory and Splitting of d- orbital‟s

Unit - II:

Water and its treatment: Introduction – hardness of water – Causes of hardness - Types of hardness: temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method, Numerical Problems on hardness of water. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization.Boiler troubels-scale andsludge,

causticembrittlement, primingandfoaming. Boilerfeedwateranditstreatment–Calgonconditioning, Phosphate conditioning and colloidal conditioning. External treatment of water – Ion exchange process. Desalination of water – Reverse osmosis.

Learning outcomes: The student will be able to

- Understand the differences between temporary and permanent hardness of water.
- Explain the principles of reverse osmosis and Ion-Exchange processes.
- Apply the drinking water with BIS and WHO standards.
- Analyze problems associated with hard water - scale and sludge.
- Evaluate the Internal and external treatment of water.

Unit - III:

Electrochemistry and corrosion: Electro chemical cells – electrode potential, standard electrode potential, types of electrodes – calomel, Quinhydrone and glass electrode. Nernst equation Determination of pH of a solution by using glass electrode. Electrochemical series and its applications. Numerical problems. Potentiometric titrations. Batteries – primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).

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 affectingrateofcorrosion, Corrosioncontrolmethods-Proper Design, Cathodicprotection– Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – methods of application. Electroplating and electroless plating of Nickel.

Learning outcomes: The student will be able to

- Understand the Nernst equation for calculating electrode and cell potentials.
- Explain the corrosion prevention methods and factors affecting corrosion.
- Apply the Pilling Bedworth rule for corrosion and corrosion prevention.
- Analyze the Dry and Wet corrosion and its Mechanism.
- Evaluate the Corrosion controlmethods

Unit - IV:

Stereochemistry, Reaction Mechanism and synthesis of drug molecules: Introduction to representation of 3-dimensional structures, Structural and stereoisomers, symmetry and chirality. Enantiomers, diastereomers, optical activity and configurational nomenclatures (D,L and R,S configurations) Conformational analysis of n- butane.
Substitution reactions: Nucleophilic substitution reactions: Mechanism of S_N1, S_N2 reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti Markownikoff‟s additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using $KMnO_4$.Reduction reactions: reduction ofcarbonyl compoundsusing $LiAlH_4$.Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand the 3 dimension structures of organic chemistry
- Explain the symmetry , chirality of the organic molecule
- Apply the Markownikoff and anti Markownikoff‟s additions; Grignard additions conformations of n-butane
- Analyze the reaction mechanism of different compounds.
- Evaluate the synthesis of aspirin, paracetamol

Unit - V:

Spectroscopictechniques and applications: Principles of spectroscopy, selection rules and applications of electronic spectroscopy and IR Spectroscopy. Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift, spin-spin splitting Introduction to Magneticresonanceimaging.

Learning Outcomes: At the end of this unit, the students will be able to

- Understand the. Principles of .spectroscopy and its selection rules
- Explain the concepts of nuclear magnetic resonance spectroscopy
- Apply the chemical shift values for the different compounds
- Analyze the different structures of organiccompound
- Evaluate the vibrational and rotational spectroscopy

Text Books:

1. Engineering Chemistry by P.C.Jain & M.Jain; Dhanpat Rai Publishing Company (P)Ltd., New Delhi.
2. Text Book of Engineering chemistry by Jaya Shree Anireddy: Wiley Publications.
3. Text Book of Engineering Chemistry by Prasanth Rath,B.Rama Devi and Ch.VenkataRamana Reddy : Cengage Publication 2019.

Reference Books:

1. Organic reaction Mechanism by Morrison and Boyd.
2. Fundamentals of Molecular Spectroscopy by C.N.Banwell
3. Inorganic Chemistry by J.D.Lee

2010009:COMMUNICATIVE ENGLISH

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

2 0 0 2

Learning Objectives:

- Improve language proficiency with emphasis on Vocabulary, Grammar, Reading and Writing skills.
- Apply the theoretical and practical components of English syllabus to study academic subjects more effectively and critically.
- Analyze a variety of texts and interpret them to demonstrate in writing or speech.
- Write clearly and creatively, and adjust writing style appropriately to the content, the context, and nature of the subject.
- Develop language components to communicate effectively in formal and informal situations.

Course Outcomes:

- Use English Language effectively in spoken and written forms.
- Comprehend the given texts and respond appropriately.
- Communicate confidently in various contexts in their profession.
- Acquire basic proficiency in English including LSRW skills.
- Use prewriting techniques to develop ideas and produce multiple drafts of different types of paragraphs.
- Recognize and incorporate basic grammar, mechanics, and sentence variety in writing.

SYLLABUS

UNIT –I: 'The Raman Effect' from the prescribed textbook 'English for Engineers' published by Cambridge University Press

Vocabulary Building: The Concept of Word Formation --The Use of Prefixes and Suffixes.

Grammar: Common Errors: Articles and Prepositions.

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

Basic Writing Skills: 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.

Learning Outcomes

At the end of the module, the learners will be able to

- Understand the concept of word formation, root words and their usage in English.
- know the types of sentences and analyze the sentence structure
- use articles and prepositions appropriately
- use punctuation marks correctly in writing
- understand the techniques of effective reading
- write paragraphs effectively

UNIT –II: Writing Skills.
Vocabulary: Synonyms and Antonyms.
Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
Reading: Improving Comprehension Skills – Techniques for Good Comprehension
Writing: Format of a Formal Letter-**Writing Formal Letters** E.g.., Letter of Complaint, Letter of Requisition, and Job Application with Resume.
Learning Outcomes
At the end of the module, the learners will be able to

- enrich their vocabulary using synonyms and antonyms
- noun, pronoun and subject verb agreement accurately
- understand the techniques of reading comprehension
- write formal letters in various context.

UNIT –III: 'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press
Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-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- Skimming and Scanning
Writing: Nature and Style of Sensible Writing- **Defining- Describing** Objects, Places and Events – **Classifying**- Providing Examples or Evidence
Learning Outcomes
At the end of the module, the learners will be able to

- use Prefixes and Suffixes from Foreign Languages in English
- understand the use misplaced modifiers and uses of tenses
- skim and scan the given text appropriately
- write definitions, descriptions and classifications

UNIT –IV: 'What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.
Vocabulary: Standard Abbreviations in English
Grammar: Redundancies and Clichés in Oral and Written Communication.
Reading: Comprehension**-** Intensive Reading and Extensive Reading
Writing: Writing Practices--Writing Introduction and Conclusion - Essay Writing-Précis Writing.

Learning Outcomes
At the end of the module, the learners will be able to

- understand the importance of food pyramid in your daily life.
- explain the Active and passive Voice Subject Verb Agreement (Concord)
- apply the One word Substitutes in your everyday vocabulary.
- analyze the Intensive and Extensive reading skills.
- evaluate the importance of Technical Report Writing, and E-mail writing.

UNIT –V 'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Technical Vocabulary and their usage

Grammar: Common Errors in English

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.

Learning Outcomes

At the end of the module, the learners will be able to

- understand the Technical Vocabulary and their Usage.
- avoid common errors in English
- read any text using the sub skills of reading
- write technical reports using manual script format.

Prescribed Textbooks:

1. Sudarshan, N. P. and Savitha, C. (2018). English for Engineers, Cambridge University Press

2. Wren & Martin. (2017). High School English Grammar and Composition Book, S Chand Publishing

References:

1. Murphy, R. (2015). Essential Grammar in Use. Cambridge University Press.
2. Current English Grammar and Usage with Composition by R. P Sinha
3. Wood, F.T. (2007).Remedial English Grammar. Macmillan.
4. Swan, M. (2016). Practical English Usage. Oxford University Press.
5. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

2020501:PROGRAMMING FOR PROBLEM SOLVING

B.Tech. I Year II Sem. **L T P C**
3 1 0 4

Course Objectives:

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

Course Outcomes: The student will learn

- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in C programming language.
- To decompose a problem into functions and to develop modular reusable code.
- Searching and sorting problems.

Unit - 1: Introduction to Programming

Introduction to computers: disks, primary and secondary memory, processor, operating system, compilers, creating and running of program, Number systems, Pseudo code, algorithm, flowchart.

Introduction to C Programming Language: Basic structure of C program, Syntax and Logical Errors in compilation, 'C' tokens: Identifiers, variables, Data types, Operators (Arithmetic, Relational, Logical, Bit-wise, Increment and Decrement, size of, Conditional operator, Assignment, Special operator), expressions and precedence, Expression evaluation, Precedence and Associativity, type conversion, Command line arguments.

Unit - II: Control statements, Arrays

Conditional statements: Writing and evaluation of conditionals and consequent branching with if, if-else, nested if-else and switch statements.

Iterative Statements: while, do-while, for, Nested loops

Jumping Statements: break, continue and goto

I/O: Simple input and output with scanf and printf, formatted I/O, stdin, stdout,stderr.

Arrays: Types of arrays, creating, accessing and manipulating elements of arrays.

Unit - III: Strings, Structures and Unions, Pointers

Strings: Introduction to strings, handling strings as array of characters, string I/O functions, string handling functions, arrays of strings

Structures and unions: Defining structures, Initializing structures, Array of structures, nested structures, Bit Fields, unions.

Pointers: Defining pointers, Address and Indirection operators, pointers to arrays and structures, use of pointers in self-referential structures, Enumeration Data types

Unit - IV: Functions 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, call by reference, void function, Structure to functions, Some C standard functions and libraries, Storage classes (auto, extern, static and register)

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: Preprocessor and File handling in C:

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

Files: Text and Binary files, File structure, Creating, Reading and Writing text and binary files, appending data to existing files, Writing and Reading structures using binary files,File Status functions, File Positioning functions.

TEXT BOOKS:

1. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)
2. Let us C by YashavantKanetkarBPB publications (16th Edition)

REFERENCE BOOKS:

1. programming in ANSI C by Balaguruswamy,(7th Edition)
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
3. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)
4. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education HerbertSchildt, C: The Complete Reference, McGrawHill, 4th Edition

2010073: ENGINEERING CHEMISTRY LAB

B.Tech - I Year I Semester

L	T	P	C
0	0	3	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 and chloride content in water to check its suitability for drinking purpose.

• To determine the rate constant of reactions from concentrations as a function of time.

• The measurement of physical properties like adsorption and viscosity.

• To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.

Course Outcomes: The experiments will make the student to:

- Understand various procedures for performing the experiments.
- Explain the different measuring devices and meters to record the data
- Apply the mathematical concepts and equations to obtain quality results.
- Analyze the analytical techniques and graphical analysis to the experimental data.
- Evaluate the various parameters for different experiments accurately.

List of Experiments:

1. Determination of total hardness of water by complexometric method using EDTA
2. Determination of chloride content of water by Argentometry

Conductometric titrations

3.Strong acid $_{vs}$ strong base

4.Weak acid $_{vs}$ strong base

Potentiometric titrations

5.Strong acid $_{vs}$ strong base

6. Redox titration: -Fe^{2+} using KMnO4
7. Determination of rate constant of acid catalysed hydrolysis of methyl acetate
8. Synthesis of Aspirin and Paracetamol
9. Thin layer chromatography- calculation of Rf values. eg: ortho and para nitro phenols
10.. Determination of acid value of coconut oil
11. Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer.
12. Determination of surface tension of a give liquid using stalagnometer

References

1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi)
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi)
3. Vogel's text book of practical organic chemistry 5th edition
4. Text book on Experiments and calculations in Engineering chemistry – S.S. Dara

2010074: COMMUNICATIVE ENGLISH LAB

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

The Communicative English Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives:

- Facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.
- Enhance English language skills, communication skills and to practice soft skills.
- Improve fluency and pronunciation intelligibility by providing an opportunity for practice in speaking.
- Train students in different interview and public speaking skills such as JAM, debate, role
- play, group discussion etc.
- Instill confidence and make them competent enough to express fluently and neutralize their mother tongue influence.

Learning Outcomes:

By the end of the course students will be able to-

- Better perception of nuances of English language through audio- visual experience.
- Neutralization of accent for intelligibility.
- Participate in group activities.
- Speaking skills with clarity and confidence which in turn enhances their employability.
- Apply effective communication skills in a variety of public and interpersonal settings

Communicative English Language Lab (CELL) shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

Listening Skills

Objectives

a. Enable students develop their listening skills to appreciate its role in the LSRW skills approach to language and improve their pronunciation.
b. 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

a. Involve students in speaking activities in various contexts.

b. Enable students express themselves fluently and appropriately in social and professional contexts.

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

Exercise – I

CALL Lab: *Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening. *Practice*: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

ICS Lab: *Understand:* Communication at Work Place- Spoken vs. Written language. *Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II

CALL Lab: *Understand:* Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context. *Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

ICS Lab: *Understand:* Features of Good Conversation – Non-verbal Communication. *Practice:* Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise - III

CALL Lab: *Understand:* Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).

Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

ICS Lab: *Understand:* How to make Formal Presentations. *Practice:* Formal Presentations.

Exercise – IV

CALL Lab: *Understand:* Listening for General Details. *Practice:* Listening Comprehension Tests.

ICS Lab: *Understand:* Public Speaking – Exposure to Structured Talks. *Practice:* Making a Short Speech – Extempore.

Exercise – V

CALL Lab: *Understand:* Listening for Specific Details. *Practice:* Listening Comprehension Tests.

ICS Lab: *Understand:* Interview Skills. *Practice:* Mock Interviews.

Reference Books:

1. Kumar, S. & Lata, P. (2011). Communication Skills. Oxford University Press.
2. Balasubramanian, T. (2008). A Text book of English Phonetics for Indian Students, Macmillan.
3. Thorpe, E. (2006). Winning at Interviews, Pearson Education.
4. Sethi, J. et al. (2005). A Practical Course in English Pronunciation (with CD), Prentice Hall of
5. Effective Technical Communication by M Ashraf Rizvi

2010571: PROGRAMMING FOR PROBLEM SOLVING

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

3 1 0 4

Course Objectives:

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

Course Outcomes: The student will learn

- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in C programming language.
- To decompose a problem into functions and to develop modular reusable code..
- Searching and sorting problems.

Unit - 1: Introduction to Programming

Introduction to computers: disks, primary and secondary memory, processor, operating system, compilers, creating and running of program, Number systems, Pseudo code, algorithm, flowchart.

Introduction to C Programming Language: Basic structure of C program, Syntax and Logical Errors in compilation, 'C' tokens: Identifiers, variables, Data types, Operators(Arithmetic, Relational, Logical, Bit-wise, Increment and Decrement, size of, Conditional operator, Assignment, Special operator), expressions and precedence, Expression evaluation, Precedence and Associativity, type conversion, Command line arguments.

Unit - II: Control statements, Arrays

Conditional statements: Writing and evaluation of conditionals and consequent branching with if, if-else, nested if-else and switch statements.

Iterative Statements: while, do-while, for, Nested loops

Jumping Statements: break, continue and goto

I/O: Simple input and output with scanf and printf, formatted I/O, stdin, stdout,stderr.

Arrays: Types of arrays, creating, accessing and manipulating elements of arrays.

Unit - III: Strings, Structures and Unions, Pointers

Strings: Introduction to strings, handling strings as array of characters, string I/O functions, string handling functions, arrays of strings

Structures and unions: Defining structures, Initializing structures, Array of structures, nested structures, Bit Fields, unions.

Pointers: Defining pointers, Address and Indirection operators, pointers to arrays and structures, use of pointers in self-referential structures, Enumeration Data types

Unit - IV: Functions 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, call by reference, void function, Structure to functions, Some C standard functions and libraries, Storage classes (auto, extern, static and register)
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: Preprocessor and File handling in C:
Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef.
Files: Text and Binary files, File structure, Creating, Reading and Writing text and binary files, Appending data to existing files, Writing and Reading structures using binary files,File Status functions, File Positioning functions.

TEXT BOOKS:

3. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)
4. Let us C by YashavantKanetkar BPB publications (16th Edition)

REFERENCE BOOKS:

5. programming in ANSI C by Balaguruswamy,(7th Edition)
6. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
7. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)
8. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education HerbertSchildt, C: The Complete Reference, McGrawHill, 4th Edition

I — II

2020002: ENGINEERING MATHEMATICS-II

L	T	P	C
3	1	0	4

B.Tech. I Year II Semester

Course Objectives: To learn

- Methods of solving the differential equations of 1st and higher order.
- The applications of the differential equations to Newton's law of cooling, Natural growth and decay, etc.
- Concept of Sequence and nature of the series.
- 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

Co 1: Identify whether the given differential equation of first order is exact or not

Co 2: Solve higher differential equation and apply the concept of differential equation to real world problems.

Co3: Analyse the nature of sequence and series.

Co 4: Apply the del operator to vector and scalar valued functions.

Co5: Evaluate the line, surface and volume integrals and converting them from one to Another.

UNIT-I: First Order and First-Degree ODE and its applications

Exact, linear and Bernoulli's equations; Applications: Newton's law of cooling, Law of natural growth and decay. Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Learning outcomes:

- Identify whether the given differential equation of first order is exact or not.
- Apply the concept of differential equation to real world problems.
- Understand the conepts of linear and Non linear differential equations.
- Analyze Exact and Non Exact differential equations.
- Explain formation of differential equations, Homogeneous equations.

UNIT-II: Higher Order Linear Differential equations

Linear differential equations of second and higher order with constant coefficients, RHS term of the type e^{ax} , Sin ax, Cos ax, and x^n , e^{ax} V(x), x^n V(x), method of variation of parameters; Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

Learning outcomes:

- Identify essential characteristics of linear differential equations with constant coefficients.
- Apply higher order DE's for solving some real world problems.
- Understand the differential equations with constant coefficients by appropriate method.
- Analyse Legendre's equation and Cauchy-Euler equation.
- Explain Method of variation of parameters.

UNIT-III: Sequences & Series

Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences. Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test,

p-test, D-Alembert's ratio test; Raabe's test,logarithmic test; Cauchy's Integral test; Cauchy's root test; Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

Learning outcomes:

- Identify the Sequence, types of sequences.
- Apply the concept of sequence and series to real world problems.
- Understand the logical knowledge of forming the series.
- Analyzethe nature of sequence and series.
- Explain Alternating series.

UNIT-IV: Vector Differential Calculus

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

Learning outcomes:

- Identify scalar and vector point functions.
- Apply Del to scalar and vector point functions.
- Understand the concepts of Solenoidal and irrotational vectors.
- Analyze the physical interpretation of Gradient, Divergence and curl.
- Explain vector identies.

UNIT-V: Vector Integral Calculus

Line integral-Work done, Surface Integrals-Flux of a vector valued function and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

Learning outcomes:

- Identify the work done in moving a particle along the path over a force field.
- Apply Greens, Stokes and Divergence theorems in evaluation of double and triple integrals.
- Understand the concepts of Line Integral.
- Analyze the Flux of a vector valued function.
- Explain Vector valued theorems to real world problems.

TEXT BOOKS:

1 B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010

2 Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006

3 G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.

REFERENCES:

1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

2020006: APPLIED PHYSICS

B.Tech. I Year II Semester

L	T	P	C
3	1	0	4

Course Objectives:

- Students will demonstrate skills in scientific inquiry, problem solving and laboratory techniques.
- Students will be able to demonstrate competency and understanding of the concepts found in Quantum Mechanics, Fiber optics and lasers, Semiconductor physics, optoelectronics and dielectric and magnetic properties and a broad base of knowledge in physics.
- The graduates will be able to solve non-traditional problems that potentially draw on knowledge in multiple areas of physics.
- To study applications in engineering like memory devices, transformer core and electromagnetic machinery.

Course Outcomes: Upon graduation:

- The student would be able to learn the fundamental concepts on Quantum behavior of matter in its micro state.
- The knowledge of fundamentals of Semiconductor devices and their applications.
- Design, characterization and study of properties of optoelectronic devices help the students to prepare new materials for various engineering applications.
- Study about Lasers and fiber optics which enable the students to apply to various systems involved with communications.
- The course also helps the students to be exposed to the phenomena of dielectric and magnetic properties.

UNIT-I: Quantum Mechanics

Introduction to quantum physics, Black body radiation, Photoelectric effect, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

Learning Outcomes:

Understand the fundamental concepts of quantum mechanics.
Explain the physical significance of wave function.
Apply Schrödinger's wave equation for a free particle.
Analyze the particle behavior in different potential regions.
Evaluate the significance of energy values in one dimensional box.

UNIT-II: Semiconductor Physics

Intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier transport: diffusion and drift, p-n junction diode, Zener diode and their V-I Characteristics, Bipolar Junction Transistor (BJT): Construction, Principle of operation, Hall effect.

Learning Outcomes:

Understand the energy band formation of semiconductors.
Explain the properties of n-type and p-type semiconductors.
Apply the Hall effect for various types of semiconductors.
Analyze the various types of diodes.
Evaluate the hall coefficient of semiconductors.

UNIT-III: Optoelectronics

Radiative and non-radiative recombination mechanisms in semiconductors, LED : Device structure, Materials, Characteristics and figures of merit, Semiconductor photodetectors: Solar cell, PIN and Avalanche photodiode and their structure, working principle and Characteristics.

Learning Outcomes:

Understand the basic principle involved in LED.
Explain about various types of photodiodes.
Apply the knowledge on various diodes.
Analyze the working of PIN and Avalanche diodes.
Evaluate the characteristics of diodes.

UNIT-IV: Lasers and Fibre Optics

Lasers: Introduction to Lasers, Coherence, Population inversion, Pumping, Lasing action, Types of Lasers: Ruby laser, Carbon dioxide (CO_2) laser, He-Ne laser, Semiconductor laser; Applications of laser.

Fibre Optics: Introduction, Block diagram of fiber optic communication system, Total internal reflection, Acceptance angle and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres.

Learning Outcomes:

Understand about Laser and fiber optics.
Explain the working principle of laser and optical fibers.
Apply optical fibers in communication system.
Analyze the applications of optical fibers in medical, communication and other fields.
Evaluate the laser and fiber optic concepts in various fields.

UNIT-V: Dielctric and Magnetic Properties

Dielectric properties: Introduction to dielectrics, Polarisation, Permittivity and Dielectric constant, Types of polarisation (Qualitative), Internal fields in a solid, Clausius-Mossotti equation, Ferroelectrics and Piezoelectrics.

Magnetic properties: Introduction to magnetism, Magnetisation, permeability and susceptibility, Classification of magnetic materials, Domain theory of ferro magnetism, Hysteresis, Applications of magnetic materials.

Learning Outcomes:

Understand the concept of polarization in dielectric materials.
Explain various types of polarization of dielectrics and classification of magnetic materials.
Apply Lorentz field and Claussius- Mosotti relation in dielectrics.
Analyze the ferromagenetism on the basis of domain theory.
Evaluate the applications of dielectric and magnetic materials.

TEXT BOOKS:

1. Engineering Physics, B.K. Pandey, S. Chaturvedi - Cengage Learing.
2. Halliday and Resnick, Physics - Wiley.
3. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand

REFERENCES:

1. Richard Robinett, Quantum Mechanics
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, Mc Graw-Hill inc. (1995).
3. Online Course: “Optoelectronic Materials and Devices” by Monica Katiyar and Deepak Guptha on NPTEL.

2010201: BASIC ELECTRICAL ENGINEERING

B.Tech. I Year II Semester

L	T	P	C
3	0	0	3

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.

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, Thevenins and Norton's Theorems.

Learning Outcomes:

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

- Explain the need of circuit elements. (L2)
- Analyse the resistive circuits with independent sources. (L4)
- Solve D.C. circuits by using KVL and KCL. (L3)
- Apply network theorems for solving D.C. circuit problems. (L3)

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.

Learning Outcomes:

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

- Develop an understanding of the fundamental laws and elements of A.C circuits. (L3)
- Learn the energy properties of electric elements and the techniques to measure voltage and current. (L2)
- Explain the concept of steady state. (L2)

UNIT-III

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

Learning Outcomes:

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

- Demonstrate knowledge of construction and operating principles of single-phase transformers. (L3)
- Determine losses, efficiency, and voltage regulation of a transformer under specific operating conditions. (L5)

- Identify the connections of a three phase transformer. (L3)
- Illustrate the performance characteristics of different induction motors. (L3)

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.

Learning Outcomes:

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

- Explain construction & working of induction motor - DC motor. (L2)
- Perform speed control of DC Motor. (L3)
- Explain principle and operation of DC Generator & Motor. (L2)

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.

Learning Outcomes:

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

- Understand working principles of LT Switchgear components. (L2)
- Perform elementary calculations for energy consumption, power factor improvement and battery backup. (L3)

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.

Course Outcomes

After completion of this course the student is able to

- Analyse Electrical circuits to compute and measure the parameters of Electrical Energy.
- Comprehend the working principles of Electrical DC Machines.
- Identify and test various electrical switchgear, single phase transformers and assess the ratings needed in given application.
- Comprehend the working principles of electrical AC machines.

2020372: ENGINEERING WORKSHOP

B.Tech. I Year II Semester **L T P C**
1 0 3 2.5

COURSE OBJECT :

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

UNIT – 1 CARPENTRY & FITTING HOURS :4

Carpentry – Introduction, Carpentry tools, sequence of operations, Trade importance, advantages, disadvantages and applications

Fitting – Introduction, fitting tools, sequence of operations, Trade importance, advantages, disadvantages and applications

LEARNING OUTCOME :

Student should be able to

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

UNIT – 2 TIN SMITHY AND BLACKSMITHY HOURS :

Tin-Smithy – Introduction, Tin smithy tools, sequence of operations, Trade importance, advantages, disadvantages and applications

Black smithy- Introduction, Black smithy tools, sequence of operations, Trade importance, advantages, disadvantages and applications

LEARNING OUTCOME :

Student should be able to

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

UNIT – 3 HOUSE WIRING AND WELDING HOURS :4

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 & Gas Welding)

LEARNING OUTCOME :

Student should be able to

1. Discuss the topic of Heat engines.(L3)
2. Identify types of Heat engines cycles.(L5)
3. Evaluate the Factors affecting routing procedure, Route Sheet.(L4)

LIST OF EXPERIMENTS:

1. Carpentry
2. Fitting
3. House Wiring
4. Tin smithy
5. Black smithy
6. welding
7. Foundry

TRADES FOR DEMONSTRATION & EXPOSURE:

1. Plumbing
2. Metal Cutting (Water Plasma), Power Tools In Construction And
3. Wood Working

TEXT BOOK :

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

REFERENCE BOOK :

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

COURSE OUTCOMES :

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

2020371:Engineering Drawing Practice

B.Tech. I Year II Semester **L T P C**
1 0 4 3

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

Course Objective:

- The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation.
- To prepare the student to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- To get exposure to a CAD package.

Course Outcomes:

1. Familiarize with BIS standards and conventions used in engineering graphics.
2. Draw various engineering curves e.g., ellipse, parabola, cycloids and involutes etc and construct various reduced scales e.g., plain and diagonal scale.
3. Develop the lateral surfaces of simple solids
4. Ability to draw orthographic projections and isometric projections of given engineering components.
5. Visualize different views like elevation and plan for a given line, plane figures or solid objects.
6. Apply drafting techniques and use 2D software e.g., AutoCAD to sketch 2D plane figures.

UNIT – 1 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, Diagonal and Vernier Scale.

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

Engineering Curves: Cycloid, Epicycloid, Hypocycloid

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

Learning Outcome:

1. To understand the basic standards, conventions of engineering drawing and how to use the instruments in drawing.
2. Learn and draw the various types of curves used in engineering application.

UNIT – 2 ORTHOGRAPHIC PROJECTIONS

Principles- Assumptions- Different Angles of Projection.

Projections of Points- orientation in all the quadrants

Projections of Lines- Parallel, Perpendicular, Inclined to one plane and Inclined to both planes.

Projections of Planes: Surface Parallel, Perpendicular, Inclined to one plane and Inclined to both planes.

Learning Outcome:

1. Knowledge in various planes of projections
2. To draw the front view, top view and side views of the given geometrical elements

UNIT – 3 PROJECTIONS OF SOLIDS

Classification of solids- Axis- Parallel, Perpendicular, Inclined to one plane and Inclined to both planes- Prisms, Pyramids, Cylinder and Cone

Learning Outcome:

1. To understand the various solid types
2. To draw all the views of the given solid in all possible orientations.

UNIT – 4 SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES

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

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

Learning Outcome:

1. To identify the cut surfaces and represent the sectional views graphically when the solid is sectioned.
2. To develop the surfaces of solid using various methods.

UNIT – 5 ISOMETRIC PROJECTIONS AND PERSPECTIVE 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.

Learning Outcome:

1. Knowledge in principles of isometric projection
2. Conversion of isometric to orthographic and vice-versa.

Text Books:

1. N.D.Bhatt, Elementary Engineering Drawing, Charotar Publishers,2012.
2. Basanth Agrawal and C M Agrawal –Engineering Drawing 2e –,McGraw-Hill Education(India) Pvt.Ltd.

References:

1. Engineering graphics with Auto CAD- R.B. Choudary/Anuradha Publishers
2. Engineering Drawing- Johle/Tata Macgraw Hill.
3. K.Veenugopal, –Engineering Drawing and Graphics + Autocad New Age International Pvt.Ltd, 2011.

2020071: APPLIED PHYSICS LAB

B.Tech. I Year II Semester

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To gain practical knowledge by applying the experimental methods to correlate with the theoretical knowledge of physics concepts.
- To learn the usage of electrical and optical systems for measurements.
- Apply the analytical techniques and graphical analysis to the experimental data.
- To develop intellectual communication skills through discussion on basic principles of scientific concepts in a group.

COURSE OUTCOMES:

- Understand the concepts of the error and analysis.
- Explain the different measuring devices and meters to record the data with precision.
- Apply the experimental skills to design new experiments in engineering.
- Analyze the theoretical knowledge and correlate with the experiment.
- Evaluate the various parameters accurately.

List of Experiments:

1.Energy gap of P-N junction diode: To determine the energy gap of a semiconductor diode.
2. Solar Cell: To study the V-I Characteristics of solar cell.
3. Photoelectric effect: To determine work function of a given material.
4. Light emitting diode: Plot V-I and P-I characteristics of light emitting diode.
5. LASER: To study the V-I characteristics of LASER sources.
6. Optical fibre: To determine the Numerical aperture and bending losses of Optical Fibres
7. Stewart – Gee's experiment:
   Determination of magnetic field induction along the axis of a current carrying coil.
8. Hall effect: To determine Hall co-efficient of a given semiconductor.
9. LCR Circuit: To determine the resonance frequency and Quality factor of LCR Circuit.
10. R-C Circuit: To determine the time constant of R-C circuit.

Note: Any 8 experiments are to be performed

(2020273) BASIC ELECTRICAL ENGINEERING WORKSHOP LAB

I Year B.Tech EEE – II Sem.

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

Prerequisite: Basics of Electrical Engineering

Course Objectives:

- To enhance practical knowledge related to different subjects
- To develop hardware skills such as soldering, winding etc.
- To develop debugging skills.
- To increase ability for analysis and testing of circuits.
- To give an exposure to market survey for available components
- To develop an ability for proper documentation of experimentation.
- To enhance employability of a student.
- To prepare students for working on different hardware projects**.**

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

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

List of Experiments

Group-A

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Verification of Thevenin's Theorem
4. Verification of Norton's Theorem
5. Verification of Superposition Theorem
6. Wiring of lamps in Series- and Parallel
7. Electrical switch board connections for various configurations
8. Design and fabrication of reactor/electromagnet for different inductance values
9. Design and Fabrication of Single phase induction/3Phase Motor Stator
10. Star Delta starter wiring for automatic and manual operation

Group-B:

This group consists of electric circuits which must be assembled and tested on general purpose PCB or bread boards.

1. Wiring of distribution box with MCB, ELCB, RCCB and MCCB
2. Wiring of 40 Watts Tube, T-5, LED Metal Halide lamps and available latest luminaries.
3. Assembly of DOL and 3-point starter with NVC connection and over load operation.

II - I

2030003: LAPLACE TRANSFORMS, SERIES SOLUTIONS AND COMPLEX VARIABLES

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

3 1 0 4

Course Objectives:

- To understand the basic theory of complex functions to express the power series
- To evaluate the contour integration using Cauchy residue theorem
- Solving ordinary differential equations using Laplace transforms techniques

Course Outcomes:

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

- Use the Laplace transforms techniques for solving ODE's
- Evaluate Fourier series for discontinuous functions
- Apply the series solution for Ordinary Differential Equations
- Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems
- Understand Taylor's and Laurent's series expansions of complex function

UNIT– I

Laplace Transforms: Laplace Transform of standard functions; first shifting theorem; 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 transforms of Special functions; Laplace transform of periodic functions. Inverse Laplace transform by different methods, convolution theorem (without Proof), solving ODEs by Laplace Transform method.

Learning Outcomes: At the end of this unit, the student will be able to

- Understand the concept of transformations.
- Analyze the Laplace transforms of various functions
- Explain the Laplace Transform of periodic functions.
- Evaluate the integrals by Laplace Transforms.
- Apply Laplace Transforms to solve the ordinary differential Equations.

UNIT – II

FOURIER SERIES: Introduction, Periodic functions, Fourier series of Periodic functions, Dirichlet's conditions, Even and Odd Functions, Change of interval, Half range Fourier sine and cosine series.

Learning Outcomes: At the end of this unit, the student will be able to

- Understand the concept of algebraic function into trigonometric series.
- Explain the concepts of Periodic functions.
- Apply Fourier series for change of interval.
- Analyse an Even and Odd functions.
- Evaluate the Discontinuity functions in a given period.

UNIT – III

SERIES SOLUTIONS OF ODE: Introduction, Ordinary and singular point of an Equation.Bessel's Differential equation: Bessel function, properties of Bessel function, Recurrence relations of Bessel function, Generating function and Orthogonality of Bessel function, Trigonometric expansions involving Bessel function.

Learning Outcomes: At the end of this unit, the student will be able to

- Understand Bessel's function
- Explain Properties of Bessel's function
- Apply Bessel's function in circuit analysis.
- Analyse the Orthogonality of Bessel function
- Evaluation Recurrence relations of Bessel function.

UNIT – IV

Complex Variables (Differentiation): Limit, Continuity and Differentiation of Complex functions, Analyticity, Cauchy-Riemann equations (without proof), finding harmonic conjugate; Milne-Thomson method for constructing analytic functions.

Learning Outcomes: At the end of this unit, the student will be able to

- Understand the basic theory of complex functions
- Explain the concepts of limit, continuity, differentiability, analyticity.
- Apply C-R equations to different complex functions
- Analyse the harmonic functions
- Evaluate the Bilinear Transformation.

UNIT – V

ComplexVariables(Integration): Line integral, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions, Singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem, Conformal mappings, Mobius transformations and their properties.(All theorems are without proof)

Learning Outcomes: At the end of this unit, the student will be able to

- Understand the concept of complex integration.
- Explain the Cauchy's integral theorem
- Apply Complex integration over the stream flow functions
- Analyse the contour Integration.
- Evaluation of a line integral along a path.

TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 10th Edition, 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition, 2012.

REFERENCE BOOKS:

1. Churchill, R.V. and Brown, J.W, "Complex Variables and Applications", Tata Mc Graw-Hill, 8th Edition, 2012.
2. A. K. Kapoor, "Complex Variables Principles and Problem Sessions", World Scientific Publishers, 1st Edition, 2011.
3. Murray Spiegel, John Schiller, "Probability and Statistics", Schaum‟s Outline Series, 3rd Edition,2010.

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

3 0 0 3

(2030204) NETWORK ANALYSIS

Course Prerequisite: Mathematics - II (Ordinary Differential Equations and Multivariable Calculus) & Basic Electrical Engineering

Course Objectives:

- To understand Magnetic Circuits, Network Topology and Three phase circuits.
- To analyze transients in Electrical systems.
- To evaluate Network parameters of given Electrical network
- To design basic filter configurations

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

- Apply network theorems for the analysis of electrical circuits.
- Obtain the transient and steady-state response of electrical circuits.
- Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
- Analyze two port circuit behaviour.

UNIT - I

Network Theorems: Node and Mesh Analysis, Maximum power transfer theorem, Reciprocity theorem, Milliman's theorem,Tellegen's theorem,Compensation theorem. Analysis with dependent current and voltage sources. Concept of duality and dual networks.

Learning Outcomes:

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

- Determine the currents and voltages in a circuit using the mesh current and node voltage method.
- Apply network theorems to find the response of a network.
- Analyze the concept of dependent sources in networks theorems.

UNIT - II

Solution of First and Second order Networks: Solution of first and second order differential equations for Series and parallel R-L, R-C, RL-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response for DC Excitation.

Learning Outcomes:

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

- Evaluate the response of first and second order circuit.
- Illustrate the transient and steady state response of electrical circuits.

UNIT - III

Steady State Analysis: Series, Parallel RLC circuit analysis, series and parallel Resonance, Locus Diagrams, Three-phase circuits balanced and unbalanced circuits. Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer.

Learning Outcomes:

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

- Analyze AC circuits using phasor concept, Resonance.
- Illustrate average and complex power.
- Understand magnetic circuit.

UNIT - IV

Network Analysis Using Laplace Transforms: Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, inverse Laplacetransform,and transformed network with initial conditions. Transfer function representation. Poles andZeros.Frequency response (magnitude and phase plots).

Learning Outcomes:

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

- Find the response using Laplace transform method.
- Analyze poles and zeros concept of network functions.
- Evaluate time domain response from pole-zero plot.

UNIT - V

Two Port Network and Network Functions: Two Port Networks, terminal pairs, relationship of twoport variables, impedance parameters, admittance parameters, transmission parameters and hybridparameters, interconnections of two port networks.

Learning Outcomes:

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

- Analyze two port network behaviours.
- Evaluate the different parameters of the circuit.

TEXT BOOKS:

1. M. E. Van Valkenburg, “Network Analysis”, Prentice Hall, 2006.
2. D. Roy Choudhury, “Networks and Systems”, New Age International Publications, 1998.
3. Chakrabarthy, Circuit theory, 4th Edition, DhanpatRai& Sons Publications.
4. Network analysis by Sudhakarshyammohan S Palli.

REFERENCE BOOKS:

1. W. H. Hayt and J. E. Kemmerly, “Engineering Circuit Analysis”, McGraw Hill Education, 2013.
2. C. K. Alexander and M. N. O. Sadiku, “Electric Circuits”, McGraw Hill Education, 2004.

(2030205) ELECTRICAL MACHINES - I

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

3 1 0 4

Prerequisite: Basic Electrical Engineering

Course Objectives:

- To study and understand different types of DC generators, Motors and Transformers, their construction, operation andapplications.
- To analyze performance aspects of various testingmethods.

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

- Identify different parts of a DC machine & understand itsoperation
- Carry out different testing methods to predetermine the efficiency of DCmachines
- Understand different excitation and starting methods of DCmachines
- Control the voltage and speed of a DCmachines
- Analyze single phase and three phase transformers circuits.

UNIT - I

D.C. Generators: Principle of operation – Action of commutator – constructional features – armature windings – lap and wave windings -E.M. F Equation. Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensating winding – commutation – reactance voltage – methods of improving commutation. Methods of Excitation – separately excited and self-excited generators – build-up of E.M.F - critical field resistance and critical speed - causes for failure to self-excite and remedial measures. Load characteristics of shunt, series and compoundgenerators.

Learning Outcomes:

At the end of this unit, student will able to

- Analyze the concepts of D.C. Generator.
- Select the different types of armature winding depending on the requirement and need.
- Recognize the importance of Commutator, Compensation winding and building Emf.

UNIT – II

DC Motors: Principle of operation – Back E.M.F. - Torque equation – characteristics and application of shunt, series and compound motors – Armature reaction and commutation. Speed control of D.C. Motors - Armature voltage and field flux control methods. Motor starters (3-point and 4-point starters), numerical problems,Testing of D.C. machines - Losses – Types of losses – calculation of efficiency – condition for maximumefficiency.

Learning Outcomes:

At the end of this unit, student will able to

- Illustrate the effect of Armature Reaction on Dc-Machine.
- Demonstrate different Speed Control Methods of Dc-Machine.
- Identify different types of losses occurring in a Dc-machine.

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UNIT - III

Testing of DC Machines: Methods of testing – direct, indirect, and regenerative testing – Brake test - Swinburne's test – Hopkinson's test – Field's test - separation of stray losses in a d.c. motortest.

Learning Outcomes:

At the end of this unit, student will able to

- Understand different types of tests that are conducted on a Dc-machine.
- Analyze the types of Motor necessary for a specific application by knowing its characteristics.
- Distinguish the difference between Direct and In-Direct test.

UNIT - IV

Single Phase Transformers: Types - constructional details-minimization of hysteresis and eddy current losses- EMF equation - operation on no load and on load - phasor diagrams

Equivalent circuit - losses and efficiency – regulation - All day efficiency - effect of variations of frequency & supply voltage on iron losses- Effect of nonlinear B-H curve of magnetic core material.

Learning Outcomes:

At the end of this unit, student will able to

- Understand the concept of transformer construction and principle.
- Analyze the different types of losses in a transformer.
- Distinguish the importance of Equivalent circuit with its phasor diagrams.

UNIT - V

Testing of Transformers and Poly-Phase Transformers: OC and SC tests - Sumpner's test - predetermination of efficiency and regulation-separation of losses test-parallel operation with equal and unequal voltage ratios - auto transformers-equivalent circuit - comparison with two winding transformers. Poly-phase transformers –cooling of transformers- Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and openΔ

Learning Outcomes:

At the end of this unit, student will able to

- Pre determine the performance of transformer by conducting suitable tests.
- Outline the necessary & satisfactory conditions for parallel operation.
- Identify the Importance of Poly Phase Connections of3-phase transformers and Auto Transformers.

TEXT BOOKS:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.
3. Principles of Electric Machines and Power Electronics P C SEN Second Edition.
4. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.

REFERENCE BOOKS:

1. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
2. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

2030402: ANALOG ELECTRONICS

(For EEE)

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

3 0 0 3

Course Objectives:

- To introduce components such as diodes, BJTs and FETs their switching characteristics, applications
- Learn the concepts of high frequency analysis of transistors
- To give understanding of various types of basic and feedback amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers
- To design the basic linear integrated circuits
- To understand the concepts of waveform generation and introduce some special function ICs

Course Outcomes:

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

- Know the characteristics, utilization of various components.
- Understand the biasing techniques
- Design and analyze various rectifiers, small signal amplifier circuits.
- Design sinusoidal and non-sinusoidal oscillators.
- Understand the functioning of OP-AMP, designs OP-AMP based circuits with linear integrated circuits.

UNIT - I

Diode Circuits: P-N junction diode, I-V characteristics of a diode; Half-wave and Full-wave rectifiers, Cclamping and Clipping circuits. Input output characteristics of BJT in CB, CE, CC configurations, biasing circuits, Load line analysis, Common-emitter, Common-base and Common collector amplifiers; Small signal equivalent circuits.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand construction of P-N junction diode
- Under the lamping and clipping circuits
- Draw the Input output characteristics of BJT in CB, CE, CC configurations

UNIT - II

MOSFET Circuits: MOSFET structure and V-I characteristics. MOSFET as a switch. small signal equivalent circuits - gain, input and output impedances, small-signal model and common-source, common-gate and common-drain amplifiers, trans conductance, high frequency equivalent circuit.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand structure and Plot the I-V characteristics MOSFET
- Know the common-source, common-gate and common-drain amplifiers
- Draw the high frequency equivalent circuit

UNIT - III

Multi-Stage and Power Amplifiers: Direct coupled and RC Coupled multi-stage amplifiers; Differential Amplifiers, Power amplifiers - Class A, Class B, Class C.

Learning Outcomes: At the end of the unit, the student will be able to

- Know the Different types of Amplifiers
- Draw the Characteristics of different types of amplifiers
- Understand the Class A, Class B, Class C amplifiers

UNIT - IV

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 – Simple problems.

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 - Applications.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the Concepts and Classification of feedback amplifiers
- Draw the Characteristics of different types of feedback amplifiers
- Know the Different types Oscillators and their Characteristics

UNIT - V

Operational Amplifiers: Ideal op-amp, output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product, Inverting and non-inverting amplifier, Differentiator, integrator, Square-wave and triangular-wave generators.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of op-amps
- Classify the different types of op-amps
- Know the Square-wave and triangular-wave generators.

TEXT BOOKS:

1. Jacob Millman, Christos C Halkias, "Integrated Electronics," McGraw Hill Education, 2nd Edition 2010.
2. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs," 3rdEdition,PHI, 2003.

REFERENCE BOOKS:

1. Thomas L. Floyd, "Electronic Devices," 1stEdition, 2015, Pearson.
2. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 4thEdition, 1988.
3. P. Horowitz and W. Hill, "The Art of Electronics," Cambridge University Press, 3rdEdition, 1989.

2030502: DATA STRUCTURES

B.TECH II YearISem. **L T P C**
3 0 0 3

Prerequisites

A course on "Programming for Problem Solving "

Objectives

- Exploring basic data structures such as linked list, stacks and queues.
- Describes searching and sorting techniques.
- Introduces trees and graphs.

Outcomes

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to assess efficiency trade-offs among different data structure implementations or combinations.
- Implement and know the application of algorithms for searching and sorting.
- Design programs using a variety of data structures- lists, stacks, queues, trees and graphs.

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

UNIT-II

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

UNIT - III

Searching: Linear Search and Binary Search and its applications.
Sorting: Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort and its applications.

UNIT-IV

Trees - Introduction, Types of trees, Binary tree, recursive and non- recursive Traversals of Binary Tree, Binary search tree- Operations and its applications.

UNIT - V

Graphs: Introduction, Types of graphs, Representation of graphs, Graph Traversal Methods, comparison between trees and graphs and its applications.

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.

II Year B.Tech. EEE I-Sem **L TP C**
0 021

(2030274) NETWORK ANALYSIS LAB

Prerequisite: Basic Electrical Engineering, Network Analysis

Course Objectives:

- To design electrical systems
- To analyze a given network by applying various Network Theorems
- To measure three phase Active and Reactive power.
- To understand the locus diagrams

Course Outcomes: After Completion of this lab the student is able to

- Analyze complex DC and AC linear circuits
- Apply concepts of electrical circuits across engineering
- Evaluate response in a given network by using theorems

The following experiments are required to be conducted as compulsory experiments

1. Verification of Reciprocity and Maximum Power Transfer theorems
2. Verification of compensation, Tellegen's&Milliman's theorems
3. Locus Diagrams of RL and RC Series Circuits
4. Series and Parallel Resonance
5. Time response of first order RC / RL network for periodic non – sinusoidal inputs – Timeconstant.
6. Two port network parameters – Z – Y parameters, Analytical verification.
7. Two port network parameters – A, B, C, D & Hybrid parameters, Analytical verification
8. Determination of Self and Mutual inductance in a Coupled Circuit, Co-efficient of Coupling.
9. Determination of form factor for non-sinusoidal waveform
10. Measurement of Active Power for Star and Delta connected balanced loads
11. Measurement of Reactive Power for Star and Delta connected balanced loads

TEXT BOOKS:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
2. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.

REFERENCES:

1. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.
2. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.
3. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.

2030484: ANALOG ELECTRONICSLABORATORY

(For EEE)

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

0 0 2 1

Pre-requisite: Analog Electronics

Course Objectives:

- To introduce components such as diodes, BJTs and FETs their switching characteristics, applications
- Learn the concepts of high frequency analysis of transistors
- To give understanding of various types of basic and feedback amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers
- To introduce the basic building blocks of linear integrated circuits
- To introduce the concepts of waveform generation and introduce some special function ICs

Course Outcomes:

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

- Know the characteristics, utilization of various components.
- Understand the biasing techniques
- Design and analyze various rectifiers, small signal amplifier circuits.
- Design sinusoidal and non-sinusoidal oscillators.
- Understanding the functioning of OP-AMP, designs OP-AMP based circuits with linear integrated circuits.

List of Experiments:

Experiments have to be designed, simulated and verify in hardware laboratory.

1. PN Junction diode characteristics: Forward and Reverse bias.
2. Full Wave Rectifier with & without filters.
3. Common Emitter amplifier characteristics.
4. Common Base amplifier characteristics.
5. Common Source amplifier characteristics.
6. Measurement of h-parameters of transistor in CB, CE, CC configurations.
7. Inverting and Non-inverting Amplifiers using Op-Amp.
8. Adder and Subtractor using Op-Amp.
9. Integrator Circuit using IC 741.
10. Differentiator circuit using Op-Amp.
11. Current Shunt Feedback amplifier.
12. RC Phase shift Oscillator.
13. Hartley and Colpitt's Oscillators.
14. Class A power amplifier.

NOTE: Minimum of 12 experiments to be conducted.

2030572: DATA STRUCTURES LAB

B.Tech. I YearIISem. **L T/P/D C**
0 0/2/0 1

Prerequisites:
A Course on "Programming for problem solving"

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.

Outcomes

- Ability to develop C programs for computing and real life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists.
- Ability to Implement searching and sorting algorithms

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 using both recursive and non-recursive.
12. Write a program to implement the graph traversal methods.

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.

2020021 - ENVIRONMENTAL SCIENCE

B.Tech. I Year II 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: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT-V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act-1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. 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 lifestyle.

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.

II - II

(2030204) ELECTROMAGNETIC FIELDS

II Year B.Tech EEE – IISem.	L	T	P	C
	3	1	0	4

Course Prerequisites: Mathematics-II (Differentiation and Integration)& Applied Physics.

Course Objectives:

- Inculcate the knowledge of different basic laws in static electric field for various applications.
- Impart the applications of static electric field such as boundary conditions across different media.
- Understand the laws in magnetic field at static conditions and its application.
- Concept of various Maxwell's equations in different forms and different media.
- Understand the concept of Electromagnetic waves and its application in Power transmission lines.

UNIT-I

Static Electric Field: Review of conversion of a vector from one coordinate system to another coordinate system, Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential, potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density

Learning Outcomes:

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

- Illustrate the application of vector analysis.(L4)
- Recognise the importance of electric field intensity in electrostatics. (L5)
- Demonstrate the use of Gauss Law and its application. (L4)

UNIT-II

Conductors, Dielectrics and Capacitance: Current and current density, Ohms Law in Point form, Continuity equation, Boundary conditions of conductors and dielectric materials. Capacitance, Capacitance of a two-wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation.

Learning Outcomes:

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

- Outline the necessary and essential boundary conditions in electrostatic field for dielectrics and conductors. (L6)

- Judge the importance of capacitance in electrostatics. (L1)
- Demonstrate the use of Laplace and Poisson's Equation. (L5)

UNIT-III

Static Magnetic Fields and Magnetic Forces: Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors. Force on a moving charge, Force on a differential current element, Force between differential current elements, Magnetic boundary conditions, Magnetic circuits, Self- inductances and mutual inductances.

Learning Outcomes:

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

- Compute magnetic field intensity by using Bio-Savart's law and Amperes law. (L4)
- Evaluate the force in magneto statics and current configurations. (L1)
- Interpret the equations for self and mutual inductance due to magneto statics. (L4)

UNIT-IV

Time Varying Fields and Maxwell's Equations: Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces.

Learning Outcomes:

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

- Classify the Maxwell's equations for time varying fields. (L5)
- Select the Maxwell's equations for different applications. (L6)
- Judge the importance of displacement current in time varying fields. (L1)

UNIT-V

Electromagnetic Waves: Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane wave in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors. Poyntingtheorem.

Learning Outcomes:

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

- Evaluate the Wave equations in different forms. (L1)
- Compute the Maxwell's equation in phasor form. (L4)
- Illustrate the plane waves in lossy dielectrics and pointing theorem. (L4)

TEXT BOOKS:

1. M. N. O. Sadiku, “Elements of Electromagnetics”, Oxford University Publication, 2014.
2. W. Hayt, “Engineering Electromagnetics”, McGraw Hill Education, 2012.

REFERENCE BOOKS:

1. A. Pramanik, “Electromagnetism-Problems with solution”, Prentice Hall India, 2012.
2. G. W. Carter, “The electromagnetic field in its engineering aspects”, Longmans, 1954.
3. W. J. Duffin, “Electricity and Magnetism”, McGraw Hill Publication, 1980.
4. W. J. Duffin, “Advanced Electricity and Magnetism”, McGraw Hill, 1968.
5. E. G. Cullwick, “The Fundamentals of Electromagnetism”, Cambridge University Press, 1966.
6. B. D. Popovic, “Introductory Engineering Electromagnetics”, Addison-Wesley Educational Publishers, International Edition, 1971.
7. A. Pramanik, “Electromagnetism - Theory and applications”, PHI Learning Pvt. Ltd, New Delhi, 2009.

Course Outcomes:

After completion of this course the student is able to

- Demonstrate the concept of electrostatic field intensity and electric potential.
- Illustrate polarization of dielectrics and the behavior of conductors and dielectrics in an electric field.
- Understand the concept of field intensity and flux density in magnetic fields.
- Discuss forces in magnetic fields and laws of electromagnetic induction.
- Evaluate the Maxwell’s equation in different forms and different media.

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

3 0 0 3

(2040207) ELECTRICAL MACHINES – II

Prerequisite: Basic Electrical Engineering**,** Electrical Machines-I

Course Objectives:

- To deal with the detailed analysis of poly-phase induction motors & Alternators
- To understand operation, construction and types of single phase motors and their applicationsin house hold appliances and control systems.
- To introduce the concept of parallel operation of alternators
- To introduce the concept of regulation and its calculations.

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

- Understand the concepts of rotating magnetic fields.
- Understand the operation of ac machines.
- Analyze performance characteristics of ac machines.

UNIT - I

Poly-Phase Induction Machines: Constructional details of cage and wound rotor machinesproductionof a rotating magnetic field - principle of operation - rotor EMF and rotor frequency – rotorreactance, rotor current and Power factor at standstill and during operation.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand the construction and operation of different types of Induction motors. (L4)
- Calculate emf value along with the calculations of losses. (L3)
- Obtain the performance characteristics of different induction motors. (L2)
- Identify the effects of loading of induction motors. (L1)

UNIT - II

Characteristics of Induction Machines: Rotor power input, rotor copper loss and mechanical powerdeveloped and their inter relation-torque equation-deduction from torque equation - expressions formaximum torque and starting torque - torque slip characteristic - equivalent circuit - phasor diagram -crawling and cogging -No-load Test and Blocked rotor test –Predetermination of performance-Methods of starting and starting current and Torque calculations.

Speed Control Methods: Change of voltage, change of frequency, voltage/frequency, injection of anEMF into rotor circuit (qualitative treatment only)-induction generator-principle of operation.

Learning Outcomes:

At the end of the unit, the student will be able to

- Predetermine the performance of Polyphase Induction Motor Understandability of starting and stopping techniques of Induction motor. (L5)
- Control the speed of Induction Motor Understandability of working of an induction generator. (L3)

UNIT - III

Synchronous Generator: Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings– distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated e.m.f. – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance andimpedance – experimental determination - phasor diagram – load characteristics. Regulation bysynchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salient polealternators – two reaction analysis – experimental determination of Xd and Xq (Slip test) Phasordiagrams – Regulation of salient pole alternators.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand the construction and operation ofSynchronous motor. (L4)
- Understand the effect of harmonics in Synchronous machines. (L3)
- Analysis of Regulation methods of Synchronous machines. (L2)

UNIT - IV

Parallel Operation of Synchronous Generator: Synchronizing alternators with infinite bus bars – synchronizing power torque – parallel operation and load sharing - Effect of change of excitation andmechanical power input. Analysis of short circuit current wave form – determination of sub-transient,transient and steady state reactance's.

Synchronous Motors: Theory of operation – phasor diagram – Variation of current and power factorwith excitation – synchronous condenser – Mathematical analysis for power developed- hunting andits suppression – Methods of starting – synchronous induction motor.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand the excitation of mechanical power input in alternators. (L4)
- Determination of sub-transient,transient and steady state reactance's. (L3)

- Obtain the methods for prevent hunting Synchronous motors. (L2)

UNIT – V:

Single Phase &Special Machines: Single phase induction motor – Capacitor start Induction motor- Capacitor and capacitor run induction motor - Constructional features-Doublerevolving field theory – split-phase motors – shaded pole motor- Reluctance motor- stepper motor- universal motor.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand the construction and operation single phase motors. (L4)
- Obtain the performance of shaded pole motor.(L2)
- Analysis of different special machines. (L3)

TEXT BOOKS:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.

REFERENCE BOOKS:

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
3. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
4. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.

2040407: DIGITAL ELECTRONICS & IC APPLICATIONS
(For EEE)

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

3 0 0 3

Pre-requisite: Analog Electronics

Course Objectives:

- To learn about Number System and Boolean Algebra and Switching Functions
- To Learn the concepts of Design of Combinational Circuits
- To understand the various types of Registers and Counters
- To know the concepts of ADC and DAC converters
- To introduce the concepts Filters & IC-555 and its applications

Course Outcomes:

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

- Understand of Number System and Boolean algebra
- Design of Combinational Circuits
- Acquire the knowledge about the Data converters
- Design theSequential Logic Circuits
- Know theFilters & IC-555 Applications

UNIT – I

Number System and Boolean Algebra and Switching Functions: Review of number systems, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Distance Codes, Error Detecting and Correcting Codes.

Boolean Algebra: Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of Number System and Boolean algebra
- Understand the properties of Binary Codes, Binary Coded Decimal Code
- Know the different types of Logic Gates

UNIT - II

Minimization and Design of Combinational Circuits: Introduction, The Minimization of switching function using theorem, The Karnaugh Map Method-Up to Five Variable Maps, Don't Care Map Entries, Tabular Method, Design of Combinational Logic: Adders, Subtractors, comparators, Multiplexers, De-multiplexers.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concepts related to Combinational Circuits.
- Develop the Karnaugh Map Method-Up to Five Variable Maps
- Know the Design of Combinational Logic circuits.

UNIT - III

Sequential Logic Circuits: Introduction: Basic Architectural Distinctions between Combinational and Sequential circuits, Latches, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

Registers and Counters: Shift Registers, Operation of Shift Registers, Shift Register Configuration, Bidirectional Shift Registers, Applications of Shift Registers, Design and Operation of Ring and Twisted Ring Counter, Operation Of Asynchronous And Synchronous Counters.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of Sequential Logic Circuits.
- Know the Classification of Flip Flops.
- Understand the Registers and Counters.

UNIT - IV

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

Learning Outcomes: At the end of the unit, the student will be able to

- Acquire the knowledge on Data converters
- Understand the Different Types of Analog to Digital converters
- Know the DAC and ADC Specifications

UNIT – V

Filters & IC-555 Applications: Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer – Functional Diagram, Monostable, and Astable Multivibrators – Operations and its Applications.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept and classification of Filters
- Know the Waveform Generators – Triangular, Sawtooth, Square Wave
- Understand the concept IC555 Timer and its Functional Diagram

TEXT BOOKS:

1. William Gothmann H, "Digital Electronics: An Introduction to Theory and Practice," PHI,1982.
2. John Morris, "Digital Electronics," Pearson Education Limited, 2013

REFERENCE BOOKS:

1. D. Roy Chowdhury, "Linear Integrated Circuits," New Age International (p) Ltd, 2nd Ed., 2003.
2. RP Jain, Modern Digital Electronics," 4th Edition TMH, 2010.
3. Floyd and Jain, "Digital Fundamentals," Pearson Education, 8th Edition, 2005.

2040412: SIGNALS& SYSTEMS
(For EEE)

II Year B.Tech. EEEII -Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Basics of Mathematics, and Electrical Engineering.

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

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

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.

Learning Outcomes: At the end of this unit, the students will be able to

- Discuss the similarity between vectors and signals
- Describe different types of signals
- Perform different operations on signals

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.

Learning Outcomes: At the end of this unit, the students will be able to

- Illustrate Fourier series and properties of Fourier series
- Demonstrate dirichlet's conditions of Fourier series and Fourier Transform
- Compute Fourier Transform from Fourier series and Transform of different signals.

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 characteristicsof 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 ofconvolution

Learning Outcomes: At the end of this unit, the students will be able to

- Analyze the response of a linear system
- Compute transfer function of a LTI system
- Discuss filter characteristics of linear systems

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 betweenLaplace, 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.

Learning Outcomes: At the end of this unit, the students will be able to

- Describe Laplace Transform andinverse Laplace Transform with the concept ofregion of convergence (ROC)
- Examine the constraints on ROC for various classes of signals
- Describe the properties of L.T's, Z.T's and relation between F.T, L.T, and Z.T of a signal

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, Parsevalstheorem, 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 byfiltering.

Learning Outcomes: At the end of this unit, the students will be able to

- Illustrate sampling theorem and types of sampling
- Reconstruct the signal from its samples and effect of under sampling
- Demonstrate auto correlation and cross correlation of functions and its properties

TEXT BOOKS:

1. B.P. Lathi, "Signals, Systems & Communications," BSP, 2nd Edition 2001.
2. A.V. Oppenheim, A.S. Willskyand 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.

2040509: JAVA PROGRAMMING

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

Prerequisites: A course on programming for problem solving

Course Objectives:

- To introduce the object-oriented programming concepts.
- To understand object-oriented programming concepts, and apply them in solving problems.
- To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes.
- To introduce the implementation of packages and interfaces.
- To introduce the concepts of exception handling and multithreading.
- To introduce the design of Graphical User Interface using applets and swing controls.

Course Outcomes:

- Able to solve real world problems using OOP techniques.
- Able to understand the use of abstract classes.
- Able to solve problems using java collection framework and I/o classes.
- Able to develop multithreaded applications with synchronization.
- Able to develop applets for web applications.
- Able to design GUI based applications

UNIT-I:

Object oriented thinking and Java Basics- Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program,

Functions, Recursion, Enumeration. concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

UNIT II:

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

UNIT III:
Exception handling and Multithreading—Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. String handling, Exploringjava.util. Differences between multi threading and multitasking, thread life cycle,creating threads, thread priorities, synchronizing threads, interthread communication, thread groups,daemon threads.

UNIT IV:
Event Handling : Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

UNIT V :
Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- Japplet, Jframe and Jcomponent, Icons and Labels, text fields, buttons – The Jbutton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables

TEXT BOOKS:
1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

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

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

(2040275) ELECTRICAL MACHINES LAB – I

LAB EXPERIMENTS

The following experiments are required to be conducted compulsory experiments:

1. Magnetization characteristics of DC shunt generator (Determination of critical field resistance and critical speed)
2. Load test on DC shunt generator (Determination of characteristics)
3. Load test on DC series generator (Determination of characteristics)
4. Load test on DC compound generator (Determination of characteristics.
5. Hopkinson's test on DC shunt machines (Predetermination of efficiency)
6. Fields test on DC series machines (Determination of efficiency)
7. Swinburne's test and speed control of DC shunt motor (Predetermination of efficiencies)
8. Brake test on DC compound motor (Determination of performance curves).
9. Speed control of DC Shunt Motor.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted:

1. Brake test on DC shunt motor (Determination of performance curves)
2. Retardation test on DC shunt motor (Determination of losses at rated speed)
3. Separation of losses in DC shunt motor.

2040485: DIGITAL ELECTRONICS & IC APPLICATIONS LABORATORY
(For EEE)

II Year B.Tech. EEEII -Sem.

L	T	P	C
0	0	2	1

Pre-requisite: Digital Electronics, Analog Electronics

Course Objectives:

- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
- To implement simple logical operations using combinational logic circuits
- To design combinational logic circuits, sequential logic circuits.
- To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.

Course Outcomes:

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

- Understand working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.
- Understand the process of Analog to Digital conversion and Digital to Analog conversion.
- Be able to use PLDs to implement the given logical problem.
- Understand working of truth table and excitation table.

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 a 4 – bit gray to Binary and Binary to Gray Converter
6. Design and realization of a 4 bit pseudo random sequence generator using logic gates.
7. Design and realization of an 8 bit parallel load and serial out shift register using flip-flops.
8. Design and realization a Synchronous and Asynchronous counter using flip-flops
9. Design and realization of Asynchronous counters using flip-flops
10. Design and realization 8x1 using 2x1 mux
11. Design and realization 2 bit comparator
12. Verification of truth tables and excitation tables
13. Realization of logic gates using DTL, TTL, ECL, etc.,
14. Design Finite state machines.

NOTE: Minimum of 12 experiments to be conducted.

2040484: SIGNALS & SYSTEMS LABORATORY

(For EEE)

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

0 0 2 1

Pre-requisites: Nil

Course Objectives:

- To develop ability to analyze linear systems and signals
- To develop critical understanding of mathematical methods to analyze linear systems and signals
- To know the various transform techniques
- To analyze sampling principles
- To analyze Fourier series, transformation techniques.

Course Outcomes:

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

- Understand the concepts of continuous time and discrete time systems.
- Analyze systems in complex frequency domain.
- Understand sampling theorem and its implications.
- Understand Fourier transformation techniques.
- Analyze magnitude and phase plots.

List of Experiments:

All the signals & systems Lab experiments are to be simulated using MATLAB/SCI LAB or equivalentsoftware.

1. Frequency spectrum of continuous signal
2. Frequency spectrum of impulse signals (time bounded signals)
3. Frequency response analysis using any software
4. Frequency response analysis for any transfer function (Preferably transformer)
5. Write a program to generate the discrete sequences: Unit step, Unit impulse, Ramp and Periodic sinusoidal sequences. (Plot all the sequences).
6. Find the Fourier transform of a square pulse. (Plot its amplitude and phase spectrum).
7. Write a program to convolve two discrete time sequences. (Plot all the sequences). Verify the result by analytical calculation.
8. WriteaprogramtofindthetrigonometricFourierseriescoefficientsofarectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings.
9. Write a program to find the trigonometric and exponential Fourier series coefficients of a periodic rectangular signal. Plot the discrete spectrum of the signal.
10. Generateadiscretetimesequencebysamplingacontinuoustimesignal.Showthat with sampling rates less than nyquist rate, aliasing occurs while reconstructing the signal.
11. Write a program to find the magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
12. Write a program to find the response of a low pass filter and high pass filter, when a speech signal is passed through these filters.

2030570: JAVA PROGRAMMING LABORATORY

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

0 0 2 1

Course Objectives:

- To write programs using abstract classes.
- To write programs for solving real world problems using java collection frame work.
- To write multithreaded programs.
- To write GUI programs using swing controls in Java.
- To introduce java compiler and eclipse platform.
- To impart hands on experience with java programming.

Course Outcomes:

- Able to write programs for solving real world problems using java collection frame work.
- Able to write programs using abstract classes.
- Able to write multithreaded programs.
- Able to write GUI programs using swing controls in Java.

1. a) Use Eclipse or Net bean platform and acquaint with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
   b) Write a java program that prints all real solutions to the quadratic equation ax2 +bx+c=0. Read in a, b, c and use the quadratic formula.
   c) Write a java program to implement Fibonacci series.

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

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

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

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

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

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

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

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

7. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.
8. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).
9. a)Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).

b) Write a java program to demonstrate the key event handlers.

10. a) Develop an applet in Java that displays a simple message.

b) Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named “Compute” is clicked.

11. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
12. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “Stop” or “Ready” or “Go” should appear above the buttons in selected color. Initially, there is no message shown.
13. Develop Swing application which uses JList, JTree, JTable, JTabbedPane and JScrollPane.
14. Write a Java program that implements Quick sort algorithm for sorting a list of names in ascending order

15. Write a Java program that implements Bubble sort algorithm for sorting in descending order and also shows the number of interchanges occurred for the given set of integers.

III-I

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2050208: POWER SYSTEMS-I

III Year B. Tech EEE – I Sem.

L	T	P	C
3	0	0	3

Course Prerequisites: Environmental Studies, Physics

Course Objectives:

- To understand the different types of power generating stations.
- To examine A.C. and D.C. distribution systems.
- To understand and compare overhead line insulators and Insulated cables
- To illustrate the economic aspects of power generation and tariff methods.
- To evaluate the transmission line parameters calculations
- To understand the concept of corona

Course Outcomes

After completion of this course the student is able to

- Understand the concepts of power systems
- Understand the operation of conventional generating stations and renewable sources of electrical power
- Evaluate the power tariff methods.
- Determine the electrical circuit parameters of transmission lines
- Understand the layout of substation and underground cables and corona.

UNIT-I: Generation of Electric Power:

Conventional Sources (Qualitative): Hydro station, steam power plant, Nuclear Power Plant and gas turbine Plant. Non-Conventional sources (Qualitative): ocean Energy, tidal Energy, Wave Energy, wind Energy, fuel cells, and solar energy, cogeneration and energy conservation and storage.

Learning Outcomes: At the end of this unit, the student will be able to

- Acquire the Knowledge of generating stations
- Analyze the different types of energies
- Find the response energy storage

UNIT-II: Economics of Generation:

Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load duration curve, number and size of generator units. Base load and peak load plants. Cost of electrical energy-fixed cost, running cost, tariff on charge to customer.

Learning Outcomes: At the end of this unit, the student will be able to

- Evaluate the different factors
- Analyze the different types of curves
- Utilization of tariff,

UNIT-III: Transmission Line Conductors:

Line conductors, inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, Composite conductors-transposition, bundled conductors, and effect of earth on capacitance.

Corona: Introduction, disruptive critical voltage, corona loss, factors affecting corona loss and methods of reducing corona loss, disadvantages of corona, interference between power and communication lines.

Learning Outcomes: At the end of this unit, the student will be able to

- Analyze interference between power and communication lines
- Evaluate inductance and capacitance single phase and three phase transmission lines

- Learn about composite conductors -transposition.

UNIT-IV: Overhead Line Insulators & Cables:

Introduction, types of insulators, Potential distribution over a string of suspension insulators, methods of equalizing the potential, testing of insulators. Introduction, insulation, insulating materials, extra high voltage cables, grading of cables, insulation resistance of a cable, capacitance of a single core and three core cables, overhead lines versus underground cables, types of cables.

Learning Outcomes: At the end of this unit, the student will be able to

- Analyze function of different types of insulators.
- Obtain functions insulating materials
- Learn the description of different types of cables.

UNIT-V A.C. Distribution:

Introduction, ac distribution, single phase, 3-phase, 3 phase 4 wire system, bus bar arrangement, selection of site for substation. Voltage Drop calculations (Numerical Problems) in ac distributors for the following cases: Power factors referred to receiving end voltage and with respect to respective load voltages.

DC Distribution:

Classification of distribution Systems. - Comparison of DC vs AC and Under- ground vs over- head distribution systems. -Requirements and design features of Distribution Systems.

Learning Outcomes: At the end of this unit, the student will be able to

- Analyze distribution of 3-phase 4 wire system
- Evaluate the different types distribution (ac& dc distribution)
- Learn about selection of site for substation.

TEXT BOOKS:

1. Generation and utilization of Electrical Energy – C.L.Wadhawa, New age International (P) Limited, Publishers1997.
2. Electrical Power Systems by C.L.Wadhawa New age International (P) Limited, Publishers 1997.
3. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, Dhanpat Rai and Co. Pvt. Ltd, 1999.

REFERENCES:

1. Elements of Power Station design and practice by M.V. Deshpande, Wheeler Publishing.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
3. Principles of Power Systems by V.K Mehta and Rohit Mehta, S.Chand& Company Ltd, New Delhi, 2004.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050209: CONTROL SYSTEMS

III Year B. Tech EEE – I Sem.

L	T	P	C
3	0	0	3

Prerequisite: 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

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

- Understand the modelling of linear-time-invariant systems using transfer function and state space representations.
- Understand the concept of stability and its assessment for linear-time invariant systems.
- Design simple feedback controllers.

UNIT - I Introduction to Control Systems:

Classification of control systems. Feedback characteristics, Effect of Feedback - Mathematical modelling 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.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of Mathematical models of physical systems. (L2)
- Able to calculate Transfer function of linear time-invariant systems. (L3)
- Able to calculate Transfer function using Signal flow graph (L3).
- Analyze the comparison between Open-Loop and Closed-loop systems L4)

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 sate errors and error constants – Effect of P, PD, PI and PID controllers.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of time response. (L2)
- Able to calculate the time response of first and second order systems for standard test inputs (L3)
- Able to Design specifications for second-order systems based on the time-response (L3).
- Understand the concept of classical controllers (L3).

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 – Effect of adding poles and zeros on the root loci.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of Stability (L3).
- Understand the concept of R-H Criterion (L3).
- Able to know the Construction of Root-loci. (L2)

UNIT - IV Frequency-Response Analysis:

Introduction to frequency response - frequency domain specifications - Bode plot – Stability analysis from Bode plots – Determination of transfer function from 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.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of Frequency-Response Analysis. (L2)
- Able to know the Relationship between time and frequency response (L3)
- Able to construct the, Polar plots, Bode plots (L3).
- Understand the concept of compensators (L2)

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 - Concept of Controllability and Observability.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the Concepts of State Variables (L2)
- Analysis of State transition matrix. (L3)
- Able to know controllability and observability of control systems (L3)

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. I. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2050403: MICROPROCESSORS AND MICROCONTROLLERS

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

3 0 0 3

Pre-requisites: Knowledge on digital systems and designs.

Course Objectives:

- Introduce the architecture of microprocessors
- Knowledge the programming of microprocessors
- Learn about interfacing devices and interfacing techniques
- Study the architecture of microcontrollers and programming for various applications
- Understand the basic concepts of ARM architecture

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

- Acquire an overview of what a processor and controller and differentiate between them.
- Program using assembly language instructions for any application of processors.
- Analyze and design real world applications and interface peripheral devices to the microprocessor.
- Understand the architecture of a A and enable to design program
- Apply theoretical learning to practical real time problems for automation applications using them

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.

Learning Outcomes: At the end of this unit, the student will be able to

- Learn the basic of microprocessors
- Understand the architecture of 8086 microprocessor
- Analyze the operation modes of 8086

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.

Learning Outcomes: At the end of this unit, the student will be able to

- Understand the instructions of 8086 microprocessor
- Learn the interrupt of microprocessor
- Knowledge of programming of 8086 microprocessor

UNIT – III Introduction to Microcontrollers:

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

8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters.

Learning Outcomes: At the end of this unit, the student will be able to

- Understand the architecture and pin out of 8051
- Knowledge of instruction and addressing modes of 8051
- Design the program for real time applications

UNIT - IV

Introduction to the various interfacings' chips like 8255, 8253, 8251, 8257, Interfacings key boards, LCD, Stepper motor, ADC, DAC and memory Interfacing.

Learning Outcomes: At the end of this unit, the student will be able to

- Understand the peripheral ICs of microprocessor
- learn the functional diagram of various interfacing chips
- Analyze the interfacing techniques

UNIT – V 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.

Learning Outcomes: At the end of this unit, the student will be able to

- Describe the Architecture of ARM processor
- Summarize the operational modes of ARM processor
- Analyze the applications of ARM

TEXT BOOKS:

1. A. K. Ray and K.M. Bhurchandani, "Advanced Microprocessors and Peripherals," MHE, 2nd Edition 2006.
2. Kenneth. J. Ayala, "The 8051 Microcontroller," Delmar Cengage Learning, 3rd Edition, 2004.
3. Andrew Sloss, Dominic Symes, Chris Wright, "ARM System Developers guide," Elsevier, 2nd Edition, 2012.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

(2050010) BUSINESS ECONOMICS & FINANCIAL ANALYSIS

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

Pre-requisite: Nil

Course Objectives:

- To learn the basic Business types, impact of the economy on business and firms specifically.
- To analyze the business from the financial perspective.

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

- Understand the various forms of business and the impact of economic variables on the business.
- Understand the demand, supply, production, cost, market structure, pricing aspects
- Study the firm's financial position by analyzing the financial statements of a company.

UNIT – I Introduction to Business and Economics:

Business: Structure of Business Firm, Types of Business Entities, Limited Liability Companies, Economics: Significance of Economics, Micro and Macro Economic Concepts, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist.

UNIT – II Demand Analysis and Elasticity of Demand:

Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Demand Forecasting: Steps in Demand Forecasting, Methods of Demand Forecasting.

UNIT – III Production, Cost, Market Structures & Pricing:

Production, Cost, Market Structures & Pricing: Production Analysis: Factors of Production, Production Function, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and long run Cost Functions. Market Structures: Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

UNIT – IV Capital Budgeting:

Importance of Capital Budgeting, methods of Capital Budgeting: Traditional Methods: Pay Back Period, Accounting Rate of Return, and Discounting Methods: Net Present Value, Profitability Index, Internal Rate of Return; Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

UNIT – V 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, and Preparation of Final Accounts.

TEXT BOOKS:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2nd Edition, Tata McGraw Hill Education Pvt. Ltd. 2012.
4. I.M. Pandey, Financial Management, 11th Edition, Kindle Edition, 2015.

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, 5th Edition, Vikas Publications, 2013.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2050505: PYTHON PROGRAMMING

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

Prerequisites: Nil

Course Objectives:

- Handle Strings and Files in Python.
- Understand Lists, Dictionaries and Regular expressions in Python.
- Understand FILES, Multithread programming in Python.
- Understand GUI in Python.

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.
- Demonstrate proficiency in handling Strings and File Systems.
- Create, run and manipulate Python Programs using core data structures like Lists,
- Dictionaries.
- Develop programs using graphical user interface.

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.

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, 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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050276: ELECTRICAL MACHINES LAB – II

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

0 0 2 1

LAB EXPERIMENTS

The following experiments are required to be conducted as compulsory experiments

1. O.C. & S.C. Tests on Single phase Transformer
2. Sumpner's test on a pair of single-phase transformers
3. No-load & Blocked rotor tests on three phase Induction motor
4. Regulation of a three -phase alternator by synchronous impedance & m.m.f. methods
5. V and Inverted V curves of a three–phase synchronous motor.
6. Equivalent Circuit of a single-phase induction motor
7. Determination of X_d and X_q of a salient pole synchronous machine
8. Load test on three phase Induction Motor

In addition to the above experiments, at least any two of the following experiments are required to be conducted from the following list

1. Separation of core losses of a single-phase transformer
2. Efficiency of a three-phase alternator
3. Parallel operation of Single-phase Transformers
4. Regulation of three-phase alternator by Z.P.F. and A.S.A methods
5. Heat run test on a bank of 3 Nos. of single-phase Delta connected transformers
6. Measurement of sequence impedance of a three-phase alternator.
7. Vector grouping of Three Transformer
8. Scott Connection of transformer

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2050472: MICROPROCESSORS AND MICROCONTROLLERS LAB

III Year B. Tech EEE – I Sem.

L	T	P	C
0	0	2	1

Course Objectives:

- Know the arithmetic, 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

- Perfume arithmetic and logical operation in assemble language to 8086.
- Understand interfacing and how interfacing is done in 8051
- Write the program in assemble language to generate Triangular wave through DAC to 8051
- Analyses the delay generation and serial communication in 8051
- Create sequence generation using serial interface 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.

The following experiments are performed using 8051 Processor Kits and interfacing Kits

6. Write a program using arithmetic, logical and bit manipulation instructions of 8051.
7. Perform interfacing ADC to 8051.
8. Generate Triangular wave through DAC interfacing with 8051.
9. Program and verify interrupt handling in 8051.
10. Perform Time delay Generation Using Timers of 8051.
11. Perform serial Communication from / to 8051 to / from I/O devices.
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.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2050575: PYTHON PROGRAMMING LAB

III Year B. Tech EEE – I Sem.

L	T	P	C
0	0	2	1

Prerequisites: Nil

Course Objectives:

- Handle Strings and Files in Python.
- Understand Lists, Dictionaries and Regular expressions in Python.
- Understand FILES, Multithread programming in Python.
- Understand GUI in python.

Course Outcomes: The students should be able to

- Examine Python syntax and semantics and be fluent in the use of Python flow controland functions.
- Demonstrate proficiency in handling Strings and File Systems.
- Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries.
- Develop programs using Graphical user interface.

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. Forexample, 1992, 1996, and 2000 are leap years, but 1967 and 1900 are not. The next leap year falling ona century is 2400.

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

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 itscase 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 keysand 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 thefiles 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 arenearly 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.

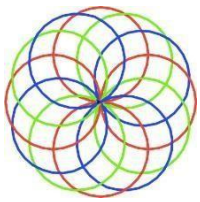
c) Write function to compute GCD, LCM of two numbers. Each function shouldn‟t exceed one

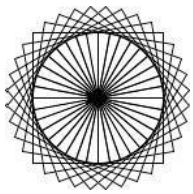
line.

Exercise - 11 GUI, Graphics

a) Write a GUI for an Expression Calculator usingtk

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





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.

III–II

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2060210: POWER SYSTEM – II

III Year B. Tech EEE – II Sem. **L T P C**
3 0 0 3

Prerequisite: Power System –I and Electro Magnetic Fields

Course Objectives:

- To analyze the performance of transmission lines.
- To understand the voltage control and compensation methods.
- To understand the per unit representation of power systems.
- To examine the performance of travelling waves.
- To know the methods of overvoltage protection and Insulation coordination of transmission lines
- To know the symmetrical components and fault calculation analysis

Course Outcomes:

- Analyze transmission line performance.
- Apply load compensation techniques to control reactive power
- Understand the application of per unit quantities.
- Design over voltage protection and insulation coordination
- Determine the fault currents for symmetrical and unbalanced faults

UNIT- I: PERFORMANCE OF TRANSMISSION LINES:

Representation of lines, short transmission lines, medium length lines, nominal T and PI representations, long transmission lines, equivalent circuit representation of a long Line, A, B, C, D constants, Ferranti Effect, Power flow through a transmission line, receiving end power circle diagram. Sag in over head lines, calculation of sag, equal heights and unequal heights.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the types of different types of transmission lines and its representation. (L2)
- Analyze the Equivalent circuit representation of long transmission lines. (L4)
- Determine the ABCD Constants of transmission lines. (L3)
- Understand the concept of Ferranti effect (L2)

UNIT- II: VOLTAGE CONTROL:

Introduction of voltage control – methods of voltage control, shunt and series capacitors / Inductors, tap changing transformers, synchronous phase modifiers. Compensation in Power Systems Introduction - Concepts of Load compensation – Load ability characteristics of overhead lines – Uncompensated transmission line – Symmetrical line – Radial line with asynchronous load – Compensation of lines.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the different methods of voltage control. (L2)
- Apply the Concepts of Load compensation techniques to control reactive power. (L4)
- Determine the A BCD Constants of a transmission lines. (L3)

UNIT- III: **PER UNIT REPRESENTATION OF POWER SYSTEMS:**

Per Unit Representation of Power Systems, one-line diagram, impedance and reactance diagrams, per unit quantities, change the base of per unit quantities, advantages of per unit system. Travelling Waves on Transmission Lines Production of travelling waves, open circuited line, short circuited line, line terminated through a resistance, line connected to a cable, reflection and

refraction at T-junction line terminated through a capacitance, capacitor connection at a T-junction, Attenuation of travelling waves.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of per unit representation of a transmission lines. (L2)
- Understand the concept of Travelling Waves on Transmission Lines and Production of travelling waves. (L2)

UNIT- IV: OVERVOLTAGE PROTECTION AND INSULATION COORDINATION:

Over voltage due to arcing ground and Peterson coil, lightning, horn gaps, surge diverters, rod gaps, expulsion type lightning arrester, valve type lightning arrester, ground wires, ground rods, counter poise, surge absorbers, insulation coordination, volt-time curves.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the methods of overvoltage protection and Insulation coordination of transmission lines (L2)
- To know the different types of Lightening arresters used in power systems(L4)
- To know the insulation coordination of transmission lines. (L4)

UNIT - V: SYMMETRICAL COMPONENTS AND FAULT CALCULATIONS:

Significance of positive, negative and zero sequence components, Average 3-phase power in terms of symmetrical components, sequence impedances and sequence networks, : Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems fault calculations, sequence network equations, single line to ground fault, line to line fault, double line to ground fault, three phase fault, faults on power systems, faults with fault impedance, reactors and their location, short circuit capacity of a bus.

Learning Outcomes: At the end of the unit, the student will be able to

- Determine the fault currents for symmetrical and unbalanced faults (L3)
- Understand the representation of sequence impedances and sequence networks(L2)
- Determine the short circuit capacity of a bus. (L3)

TEXT BOOKS

1. C. L. Wadhwa, Electrical Power Systems, 3rd Edn, New Age International Publishing Co., 2001.
2. D. P. Kothari and I. J. Nagrath, Modern Power System Analysis, 4th Edn, Tata McGraw Hill Education Private Limited 2011.

REFERENCES:

1. D. P. Kothari: Modern Power System Analysis-Tata Mc Graw Hill Pub. Co. 2003.
2. Hadi Sadat: Power System Analysis –Tata Mc Graw Hill Pub. Co. 2002.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2060211: ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

III Year B. Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Pre-requisite: Basic Electrical Engineering, Analog Electronics, Network Analysis & Electro Magnetic fields.

Course objectives:

- To introduce the basic principles of all measuring instruments
- To deal with the measurement of voltage, current, Power factor, power, energy and magnetic measurements.
- To understand the basic concepts of smart and digital metering.

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

- Understand different types of measuring instruments, their construction, operation and characteristics
- Identify the instruments suitable for typical measurements
- Apply the knowledge about transducers and instrument transformers to use them effectively.
- Apply the knowledge of smart and digital metering for industrial applications

UNIT- I: Introduction to Measuring Instruments

Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters-electrometer type and attracted disc type – extension of range of E.S. Voltmeters.

Learning Outcomes:

- Determine the construction and operation of various measuring instruments.
- Apply the characteristics of measuring instruments in finding response.
- Analyze the concept of extension range of meters.

UNIT- II: Potentiometers & Instrument Transformers

Principle and operation of D.C. Crompton's potentiometer – standardization-Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate type's standardization – applications. CT and PT – Ratio and phase angle errors

Learning Outcomes:

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

- Identify appropriate instruments to measure given sets of parameters
- Illustrate different types of errors that may occur in instruments during measurements.

UNIT- III: Measurement of Power & Energy

Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeters, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems. Single phase induction type energy meter – driving and braking torques – errors and compensations. Three phase energy meter, maximum demand meters.

Learning Outcomes:

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

- Illustrate the different types of watt meters.

- Analyze and measure active and reactive power using wattmeter.
- Determine driving and breaking torques using induction type energy meter.

UNIT- IV: DC & AC Bridges

Method of measuring low, medium and high resistance – sensitivity of Wheat-stone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance loss of charge method. Measurement of inductance- Maxwell's bridge, Hay's bridge, Anderson's bridge - Owen's bridge. Measurement of capacitance and loss angle -Desaunty's Bridge - Wien's bridge – Schering Bridge.

Learning Outcomes:

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

- Compare the bridge circuits to select appropriate bridge for the measurement of electrical quantities.
- Apply the knowledge of measuring inductance and capacitance using various bridge circuits.

UNIT-V:

Transducers

Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, gauge factor, Thermistors, Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, and photo diodes.

Introduction to Smart and Digital Metering: Digital Multi-meter, True RMS meters, Clamp-on meters, Digital Storage Oscilloscope.

Learning Outcomes:

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

- Apply the knowledge of transducers in energy conversions.
- Identify the transducer for different applications.
- Analyze digital meters usage.

TEXT BOOKS:

1. G. K. Banerjee, "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition, 2016
2. S. C. Bhargava, "Electrical Measuring Instruments and Measurements", BS Publications, 2012.

REFERENCES:

1. A. K. Sawhney, "Electrical & Electronic Measurement & Instruments", Dhanat Rai & Co. Publications, 2005.
2. R. K. Rajput, "Electrical & Electronic Measurement & Instrumentation", S. Chand and Company Ltd., 2007.
3. Buckingham and Price, "Electrical Measurements", Prentice – Hall, 1988.
4. Reissland, M. U, "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1st Edition2010.
5. E.W. Golding and F. C. Widdis, "Electrical Measurements and measuring Instruments", fifth Edition, Wheeler Publishing, 2011.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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2060212: POWER ELECTRONICS

III Year B. Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Analog Electronics

Course Objectives:

- To Design/develop suitable power converter for efficient control or conversion of power in drive applications
- To Design / develop suitable power converter for efficient transmission and utilization of power in power system applications.

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

- Choose the appropriate converter for various applications
- Design the power converters suitable for particular applications
- Develop the novel control methodologies for better performance.

UNIT – I POWER DEVICES:

Thyristors – Silicon Controlled Rectifiers (SCR's) - BJT - Power MOSFET - Power IGBT and their characteristics and other thyristors - Basic theory of operation of SCR - Static characteristics – Turn-on methods of SCR - Dynamic characteristics of SCR - Turn on and Turn off times - Line Commutation and Forced Commutation circuits. Two transistor analogy of SCR - R, RC, UJT firing circuits - Series and parallel connections of SCRs - Snubber circuit details -Numerical problems –

Learning Outcomes: At the end of this unit student will be able to learn

- Analysis of different power semiconductor devices and their operations of SCR, MOSFET, IGBT. (L2)
- Evaluate Two transistor analogy of SCRs. (L3)
- To understand the forced commutation circuits. (L3)

UNIT – II AC-DC CONVERTERS:

Phase control technique - Single phase Line commutated converters - Single phase Half controlled converters – Single Phase Full Controlled Midpoint and Bridge connections with R, RL loads and RLE load - Derivation of average load voltage and current Expressions of load voltage and current - Numerical problems. Three phase converters - Three pulse and six pulse converters and bridge connections with R, RL load voltage and current with R and RL loads - Effect of Source inductance-Dual converters Waveforms - Effect of source inductance -Numerical Problems

Learning Outcomes: At the end of this unit student will be able to learn

- Evaluate voltage derivation of Single Phase, Three Phase Line Commutated Converters with R, RL and RLE Loads (L2)
- Analyze the operation of converters (L2)
- To understand the forced commutation circuits. (L4)

UNIT – III AC-AC CONVERTERS:

AC voltage controllers – Single phase two SCR's in anti-parallel with R and RL loads, modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage, current and power factor- wave forms, Numerical problems- Single phase and three phase cycloconverters (principle of operation only).

Learning Outcomes: At the end of this unit student will be able to learn

- Evaluate various current, voltage waveforms of AC voltage controllers with R and RL Loads (L4)
- Analyze the operation difference of Thyristors and Triac (L2)
- To understand the ac voltage controller operation (L3)

UNIT – IV DC-DC CONVERTERS:

Choppers – Time ratio control and Current limit control strategies – Step down choppers- Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage expression. Morgan's chopper – Jones chopper - Oscillation choppers (Principle of operation only) -waveforms – AC Chopper - Problems

Learning Outcomes: At the end of this unit student will be able to learn

- Analyze Choppers types and their controlling methods (L3)
- Evaluate voltage and current equations of different choppers (L2)
- To understand Morgan's, Jones and Oscillation choppers (L4)

UNIT – V DC-AC CONVERTERS:

Inverters - Single phase inverter – Basic series inverter, parallel Capacitor inverter, bridge inverter – Waveforms. Simple bridge inverters, Voltage control techniques for inverters- Pulse width modulation techniques – Numerical problems.

Learning Outcomes: At the end of this unit student will be able to learn

- Analyze inverter operation with different loads R and RL (L3)
- Evaluate different inverters with control techniques (L3)
- To understand pulse width modulation techniques (L2)

TEXT BOOKS:

1. M. D. Singh & K. B. Kanchandhani, "Power Electronics", Tata Mc Graw – HillPublishing Company, 1998.
2. "M. H. Rashid", "Power Electronics: Circuits, Devices and Applications", PrenticeHall of India, 2nd edition, 1998
3. "V. R. Murthy", "Power Electronics", Oxford University Press, 1st Edition 2005.

REFERENCE BOOKS:

1. Vedam Subramanyam, "Power Electronics", New Age International (P) Limited,Publishers, 2nd Edition 2008.
2. Philip T. Krein, "Elements of Power Electronics", Oxford University Press, 1997.
3. M. S. Jamil Asghar, "Power Electronics", PHI Private Limited, 2004.
4. P. C. Sen, "Power Electronics", Tata Mc Graw-Hill Publishing, 2001.
5. John G. Kassakian, Martin, F. Schlect, Geroge C. Verghese, "Principles of PowerElectronics", Pearson Education, 1st Edition 2010.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2060011: FUNDAMENTALS OF MANAGEMENT

III Year B. Tech EEE – II 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 the significance of management in their profession
- Understand the various forms of organization and HRM, leadership and motivation theories,controlling procedure.
- The students can explore the management practices in their domain area.

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.

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 frequencyand 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)

2060216: RENEWABLE ENERGY SOURCES
(Professional Elective-I)

III Year B. Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Power System-I, Power System-II

Course Objectives:

- To recognize the awareness of energy conservation in students
- To identify the use of renewable energy sources for electrical power generation
- To collect different energy storage methods
- To detect about environmental effects of energy conversion

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

- Understand the principles of wind power and solar photovoltaic power generation, fuel cells.
- Assess the cost of generation for conventional and renewable energy plants
- Design suitable power controller for wind and solar applications
- Analyze the issues involved in the integration of renewable energy sources to the grid

UNIT-I: INTRODUCTION

Renewable Sources of Energy-Grid-Supplied Electricity-Distributed Generation-Renewable Energy Economics Calculation of Electricity Generation Costs -Demand side Management Options – Supply side Management Options-Modern Electronic Controls of Power Systems. WIND POWER PLANTS: Appropriate Location -Evaluation of Wind Intensity -Topography -Purpose of the Energy Generated -General Classification of Wind Turbines-Rotor Turbines-Multiple-Blade Turbines Drag Turbines -Lifting Turbines Generators and Speed Control used in Wind Power Energy Analysis of Small Generating Systems.

UNIT-II: PHOTOVOLTAIC POWER PLANTS

Solar Energy-Generation of Electricity by Photovoltaic Effect -Dependence of a PV Cell Characteristic on Temperature-Solar cell Output Characteristics-Equivalent Models and Parameters for Photovoltaic Panels Photovoltaic Systems-Applications of Photovoltaic Solar Energy-Economical Analysis of Solar Energy.

FUEL CELLS:

The Fuel Cell-Low and High Temperature Fuel Cells-Commercial and Manufacturing Issues Constructional Features of Proton Exchange-Membrane Fuel Cells -Reformers-Electro-lyzer Systems and Related Precautions-Advantages and Disadvantages of Fuel Cells-Fuel Cell Equivalent Circuit-Practical Determination of the Equivalent Model Parameters -Aspects of Hydrogen as Fuel.

UNIT-III: INDUCTION GENERATORS

Principles of Operation-Representation of Steady-State Operation-Power and Losses Generated-Self-Excited Induction Generator-Magnetizing Curves and Self-Excitation Mathematical Description of the Self-Excitation Process-Interconnected and Stand-alone operation -Speed and Voltage Control -Economical Aspects.

UNIT-IV: STORAGE SYSTEMS

Energy Storage Parameters-Lead-Acid Batteries-Ultra Capacitors-Flywheels -Superconducting

Magnetic Storage System-Pumped Hydroelectric Energy Storage - Compressed Air Energy Storage -Storage Heat -Energy Storage as an Economic Resource.

UNIT-V: INTEGRATION OF ALTERNATIVE SOURCES OF ENERGY

Principles of Power Injection-Instantaneous Active and Reactive Power Control Approach Integration of Multiple Renewable Energy Sources-Islanding and Interconnection Control-DG Control and Power Injection.

INTERCONNECTION OF ALTERNATIVE ENERGY SOURCES WITH THE GRID:

Interconnection Technologies -Standards and Codes for Interconnection-Interconnection Considerations - Interconnection Examples for Alternative Energy Sources.

TEXT BOOKS:

1. Felix A. Farret, M. Godoy Simoes, “Integration of Alternative Sources of Energy”, John Wiley& Sons, 2006.
2. Solanki: Renewable Energy Technologies: Practical Guide for Beginneers, PHI Learning Pvt. Ltd., 2008.

REFERENCES:

1. D.Mukherjee: Fundamentals of Renewable Energy Systems, New Age International publishers, 2007.
2. Remus Teodorescu, Marco Liserre, Pedro Rodríguez: Grid Converters for Photovoltaic and Wind Power Systems, John Wiley & Sons, 2011.
3. Gilbert M. Masters: Renewable and Efficient Electric Power Systems, John Wiley & Sons, 2004.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2060217: HIGH VOLTAGE ENGINEERING
(Professional Elective-I)

III Year B. Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Power Systems – I, Electro Magnetic Fields

Course Objectives:

- To deal with the detailed analysis of Breakdown occurring in gaseous, liquids and solid dielectrics
- To inform about generation and measurement of High voltage and current
- To introduce High voltage testing methods

Course outcomes: At the end of the course, the student will demonstrate

- Understand the basic physics related to various breakdown processes in solid, liquid and gaseous insulating materials.
- Knowledge of generation and measurement of D. C., A.C., & Impulse voltages.
- Knowledge of tests on H. V. equipment and on insulating materials, as per the standards.
- Knowledge of how over-voltages arise in a power system, and protection against these over voltages.

UNIT - I Breakdown in Gases

Ionization processes and de-ionization processes, Types of Discharge, Gases as insulating materials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Streamer mechanism, Corona discharge.

Breakdown in Liquid and Solid Insulating Materials

Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand the types of different types of insulating mediums (L_2)
- Understand the breakdown process of Gasses dielectric media (L_4)
- Able to know the Breakdown Phenomenon of Solids dielectric media(L_3)
- Able to know the Breakdown Process of Liquid Dielectric media(L_2)

UNIT - II Generation of High Voltages

Generation of high voltages, generation of high D. C. and A.C. voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

Learning Outcomes:

At the end of the unit, the student will be able to

- Know the Different Methods for the generation of High Voltage DC(L_2)
- Understand the methods to generate High AC Voltages(L_3)
- Able to know the construction and operation of Impulse Generators(L_2).

UNIT- III Measurements of High Voltages and Currents

Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant

and loss factor, partial discharge measurements.

Learning Outcomes:

At the end of the unit, the student will be able to

- Able to know the methods for the Measurement of High DC Voltages (L_2)
- Understand the methods for the Measurement of High AC Voltages (L_3)
- Know the Construction of cathode ray oscillographs for impulse voltage (L_2)

UNIT - IV LIGHTNING AND SWITCHING OVER-VOLTAGES

Charge formation in clouds, stepped leader, Dart leader, Lightning Surges. Switching over voltages, Protection against over-voltages, Surge diverters, Surge modifiers.

Learning Outcomes:

At the end of the unit, the student will be able to

- Able to understand the Formation of clouds(L_2)
- Know the Phenomenon of Lightning surges(L_3)
- Understand the Surge Diverters(L_3)

UNIT - V High Voltage Testing of Electrical Apparatus and High Voltage Laboratories

Various standards for HV Testing of electrical apparatus, IS, IEC standards, testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, power transformers and some high voltage equipment, High voltage laboratory layout, indoor and outdoor laboratories, testing facility requirements, safety precautions in H. V. Labs.

Learning Outcomes:

At the end of the unit, the student will be able to

- Illustrate Various standards for HV Testing(L_3)
- Know the IS, IEC standards(L_2)
- Understand the Different Methods for Testing Isolators(L_2)
- Understand the Safety precautions in H. V. Labs. (L_3)

TEXT BOOKS:

1. M. S. Naidu and V. Kamaraju, “High Voltage Engineering”, McGraw Hill Education, 2013.
2. C. L. Wadhwa, “High Voltage Engineering”, New Age International Publishers, 2007.

REFERENCES:

1. D. V. Razevig (Translated by Dr. M. P. Chourasia), “High Voltage Engineering Fundamentals”, Khanna Publishers, 1993.
2. E. Kuffel, W. S. Zaengl and J. Kuffel, “High Voltage Engineering Fundamentals”, Newnes Publication, 2000.
3. R. Arora and W. Mosch “High Voltage and Electrical Insulation Engineering”, John Wiley & Sons, 2011.
4. Various IS standards for HV Laboratory Techniques and Testing.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2060218: ADVANCED CONTROL SYSTEMS
(Professional Elective-I)

III Year B. Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Control Systems

Course Objectives:

- To provide fundamentals required to model a control system in state space and check its controllability and observability.
- To educate the students about non-linear systems behaviour and the methods to determine their stability.
- To make the students thorough with Liapunov stability analysis.
- To familiarise the students with the concept of optimal control and how to determine optimum for functional using calculus of variations.
- To introduce the concept of Adaptive control and explain how to design a Model reference Adaptive system.

Course outcomes:

- Able to model any control system in state space.
- Able to understand the behaviour of nonlinear system and methods of determining stability.
- Able to determine the stability of nonlinear system using Liapunov method.
- Able to formulate optimal control problem and determine optimum of functional.
- Able to understand and design adaptive control problem.

UNIT – I: Review of State Variable representation of system:

Controllability and Observability -Model control of single input – single output systems (SISO), Controllable and Observable companion forms – Effect of state feedback on Controllability and Observability, Pole placement by state feedback.

Polar Plots-Nyquist Plots-Stability Analysis. Lag, Lead, Lead-Lag Controllers design in frequency Domain to improve steady state and transient response. Feedback and Feed forward compensator design using bode diagram.

UNIT –II: Classification of Non-Linearities:

Phenomenon exhibited by the nonlinearities – Limit cycles – Jump resonance, Sub hormonic oscillations - Phase plane analysis - Singular points - Construction of phase plane trajectories - Isocline method – Delta method – Measurement of time on phase plane trajectories.

Describing Function Analysis:

Introduction to nonlinear systems, Types of nonlinearities, describing functions, describing function analysis of nonlinear control systems.

UNIT –III: Concept of Stability:

Definitions of Stability, Lyapunov stability - Lyapunov's first and second methods – Stability of linear time invariant systems by Lyapunov's second method – Generation of Lyapunov functions-Variable gradient method – Krasooviski method.

UNIT – IV: Formulation of Optimal Control problems:

Calculus variations - Fundamental concepts -Functionals - Variation of functionals - Fundamental

theorem of calculus of variations - Boundary conditions - Constrained minimization - Dynamic programming _ Hamilton Principle of optimality, Jacobi Bellman equation - Potryagins minimum principle.

UNIT – V: Introduction to Adaptive Control:

Types of adaptive control systems. Design of model reference adaptive control systems using M/T rule and Lyapunov stability theorem.

TEXT BOOKS:

1. Advanced Control Systems, B. N. Sarkar, PHI Learning Private Limited.
2. Advanced Control Theory, Somanath Majhi, Cengage Learning.

REFERENCE BOOKS:

1. Control Systems theory and applications, S.K Bhattacharya, Pearson.
2. Control Systems, N.C.Jagan, BS Publications.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2060219: SPECIAL MACHINES
(Professional Elective-I)

III Year B. Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Electrical Machines - I & Electrical Machines - II

Course objectives:

- To understand the working and construction of special machines
- To know the use of special machines in different feed-back systems
- To understand the use of micro-processors for controlling different machines

Course Outcomes: Upon the completion of this subject, the student will be able

- To select different special machines as part of control system components
- To use special machines as transducers for converting physical signals into electrical signals
- To use micro-processors for controlling different machines
- To understand the operation of different special machines

UNIT – I Special Types of DC Machines - I:

Series Booster-Shunt Booster-Non-reversible boost Reversible booster

Special Types of DC Machines – II:

Armature excited machines–Rosenberg generator The Amplidyne and metadyne– Rototrol and Regulex-third brush generator-three-wire generator-dynamometer.

UNIT – II Stepper Motors:

Introduction-synchronous inductor (or hybrid stepper motor), Hybrid stepping motor, construction, principles of operation, Energisation with two phase at a time essential conditions for the satisfactory operation of a 2-phase hybrid step motor- very slow speed synchronous motor for servo control-different configurations for switching the phase windings-control circuits for stepping motors-an open-loop controller for a 2-phase stepping motor.

UNIT – III Variable Reluctance Stepping Motors:

Variable reluctance (VR) Stepper motors, single stack VR step motors, Multiple stack VR motors-Open-loop control of 3-phase VR step motor-closed-Loop control of step motor, discriminator (or rotor position sensor) translator, major loop-characteristics of step motor in open-loop drive – comparison between open-loop position control with step motor and a position control servo using a conventional (dc or ac) servo motor- Suitability and areas of application of stepper motors-5-phase hybrid stepping motor-single phase-stepper motor, the construction, operating principle torque developed in the motor. Switched Reluctance Motor: Introduction – improvements in the design of conventional reluctance motors- Some distinctive differences between SR and conventional reluctance motors-principle of operation of SRM- Some design aspects of stator and rotor pole arcs, design of stator and rotor and pole arcs in SR motor-determination of $L(\theta)$--- θ profile – power converter for SR motor-A numerical example -Rotor sensing mechanism and logic control, drive and power circuits, position sensing of rotor with Hall problems–derivation of torque expression, general linear case.

UNIT – IV Permanent Magnet Materials and Motors:

Introduction, Hysteresis loops and recoil line stator frames (pole and yoke - part) of conventional

PM dc Motors, Equivalent circuit of a PM-Development of Electronically commutated dc motor from conventional dc motor. Brushless DC Motor: Types of construction – principle of operation of BLDM- sensing and switching logic scheme, sensing logic controller, lockout pulses –drive and power circuits, Base drive circuits, power converter circuit-Theoretical analysis and performance prediction, modelling and magnet circuit d-q analysis of BLDM -transient analysis formulation in terms of flux linkages as state variables-Approximate solution for current and torque under steady state –Theory of BLDM as variable speed synchronous motor (assuming sinusoidal flux distribution)- Methods or reducing Torque Pulsations, 180 degrees pole arc and 120 degree current sheet.

UNIT – V Linear Induction Motor:

Development of a double-sided LIM from rotary type IM- A schematic of LIM drive for electric traction development of one-sided LIM with back iron field analysis of a DSLIM fundamental assumptions.

TEXT BOOKS:

1. K. Venkataratnam, Special electrical machines, university press, 2009.
2. R. K. Rajput - Electrical machines, Laxmi Publications, 5th Edition 2016.
3. V.V. Athani - Stepper motor: Fundamentals, Applications and Design, New age International publishers, 1997.

REFERENCE BOOK:

1. “E. G. Janardanan”, Special electrical machines-PHI 2014.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2060277: CONTROL SYSTEMS LAB

III Year B. Tech EEE – II Sem.

L	T	P	C
0	0	2	1

Prerequisite: Control Systems

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

Course Outcomes: After completion of this lab the student is able to

- How to improve the system performance by selecting a suitable controller and/or a compensator for a specific application
- Apply various time domain and frequency domain techniques to assess the system performance
- Apply various control strategies to different applications (example: Power systems, electrical drives etc)
- Test system controllability and observability using state space representation and applications of state space representation to various systems

The following experiments are required to be conducted compulsory experiments:

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions, and application of speed control of motor.
4. Effect of feedback on DC servo motor
5. Transfer function of DC motor
6. Transfer function of DC generator
7. Temperature controller using PID
8. Characteristics of AC servo motor

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted

1. Effect of P, PD, PI, PID Controller on a second order systems
2. Lag and lead compensation – Magnitude and phase plot
3. (a) Simulation of P, PI, PID Controller.
4. (b) Linear system analysis (Time domain analysis, Error analysis) using suitable software
5. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using suitable software 6. State space model for classical transfer function using suitable software -Verification.
6. Design of Lead-Lag compensator for the given system and with specification using suitable software.

TEXT BOOKS:

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

REFERENCES:

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

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2060278: ELECTRICAL SYSTEMS SIMULATION LAB

III Year B.Tech. II Sem.

L	T	P	C
0	0	2	1

Prerequisite: Network Analysis, Analog Electronics, Power Electronics, Electrical Machines, Power Systems-II

Course Objectives:

- To Simulate and analyze electrical and electronic systems.
- To evaluate the performance of transmission lines.
- To Analyze various Faults in power systems
- To Model, simulate and analyze the performance of DC Machines and Induction Motors.
- To Analyze performance of feedback and load frequency control of the systems

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

- Design and Analyze electrical systems in time and frequency domain
- Analyze various transmission lines and perform fault analysis
- Model Load frequency control of Power Systems
- Design various Power Electronic Converters and Drives.

Any ten of the following experiments are required to be conducted using suitable software

1. Basic Operations on Matrices
2. Generation of various signals and sequences (Periodic and Aperiodic), such as unit Impulse, 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. Locating Poles and Zeros and Plotting Pole-Zero Maps In S-Plane And Z-Plane for The Given Transfer Function
5. Single Phase Diode Bridge Rectifier With R& RL &L Loads
6. Three Phase Half Wave Diode Rectifier
7. Finding the Fourier Transform of a Given Signal and Plotting Its Magnitude and Phase Spectrum
8. Design of first and second order circuits in time and frequency domain
9. Performance evaluation of medium and long transmission lines
10. Symmetrical component analysis
11. Transmission Line Fault Analysis
12. LG, LL and 3-Φ fault analysis of Transformer
13. Short Circuit Analysis of Power system models
14. Design of Single Phase and Three Phase Inverters
15. Design of Single Phase and Three Phase Full Converters

Reference Books:

1. C.L. Wadhwa: Electrical Power Systems –Third Edition, New Age International Pub. Co., 2001.
2. Hadi Sadat: Power System Analysis –Tata Mc Graw Hill Pub. Co.2002.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2060075: ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLSLAB

III Year B. Tech EEE – II Sem.

L	T	P	C
0	0	2	1

1. INTRODUCTION:

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and performthe following:

Gathering ideas and information to organize ideas relevantly and coherently.
Engaging in debates.
Participating in group discussions.
Facing interviews.
Writing project/research reports/technical reports.Making oral presentations.
Writing formal letters.
Transferring information from non-verbal to verbal texts and vice-versa.
Taking part in social and professional communication.

2. OBJECTIVES:

This Lab focuses on using multi-media instruction for language development to meet the followingtargets:

To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.

Further, they would be required to communicate their ideas relevantly and coherently in writing.To prepare all the students for their placements.

3. SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

Activities on Fundamentals of Inter-personal Communication and Building Vocabulary - Starting a conversation – responding appropriately and relevantly – using the right body language

– Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

Activities on Reading Comprehension –General Vs Local comprehension, reading for facts, guessingmeanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.

Activities on Writing Skills – Structure and presentation of different types of writing – letter writing/Resumewriting/ e-correspondence/Technical report writing/ – planning for writing – improving one's writing.

Activities on Presentation Skills – Oral

presentations (individual and group) through JAMsessions/seminars/PPTs and written presentations through posters/projects/reports/ e-mails/assignments etc.

Activities on Group Discussion and Interview Skills – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructuralfacilities to accommodate at least 35 students in the lab:

Spacious room with appropriate acoustics.

Round Tables with movable chairs
Audio-visual aids
LCDProjector
Public Address system
P – IV Processor, Hard Disk – 80 GB, RAM-512 MB Minimum, Speed – 2.8 GHZ
T. V, a digital stereo & Camcorder
Headphones of High quality

5. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.Oxford Advanced Learner's Compass, 7th Edition
DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.Lingua TOEFL CBT Insider, by Dream tech
TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt.Ltd. 2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCE BOOKS:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar andHemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford UniversityPress 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.

IV-I

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2070213: SWITCH GEAR PROTECTION

IV Year B.Tech EEE – I Sem.

L	T	P	C
3	0	0	3

Course Prerequisites: Power Systems - I & Power Systems - II

Course Objectives:

To introduce all kinds of circuit breakers and relays for protection of Generators

- Transformers and feeder bus bars from Over voltages and other hazards.
- To describe neutral grounding for overall protection.
- To understand the phenomenon of Over Voltages and its classification.

Course Outcomes

After completion of this course the student is able to

- After Completion of this course student will be able to
- Understand the types of Circuit breakers and choice of Relays for appropriate protection of power system equipment.
- Understand various types of Protective devices in Electrical Power Systems
- Interpret the existing transmission voltage levels and various means to protect the system against over voltages.
- Understand the importance of Neutral Grounding, Effects of Ungrounded Neutral grounding on system performance, Methods and Practices.

UNIT-I Introduction to Circuit Breakers:

Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages. - Restriking Phenomenon, Average and Maximum RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB ratings and Specifications: Types and Numerical Problems. – Autoreclosures. Description and Operation of following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum, and SF_6 circuit breakers.

Learning Outcomes:

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

- Acquire the Knowledge of circuit breakers (L1)
- Analyze the different types of circuit breakers (L3)
- Find the response arc interruption (L2)

UNIT-II Electromagnetic Relays:

Principle of Operation and Construction of Attracted armature, Balanced Beam, induction Disc and Induction Cup relays. Types of Over Current Relays: Instantaneous, DMT and IDMT types. Application of relays: Over current/ under voltage relays, Direction relays, Differential Relays and Percentage Differential Relays. Universal torque equation, Distance relays: Impedance, Reactance, and Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison.

Learning Outcomes:

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

- Evaluate the different types of relays (L1)
- Analyze the different types over current relays (L2)
- Utilization of distance relays (L3)

UNIT-III Static Relays:

Static Relays verses Electromagnetic Relays Amplitude and Phase comparators, Duality between AC and PC, Static amplitude comparator, integrating and instantaneous comparators., static phase comparators, coincidence type of phase comparator, static over current relays, static directional

relay, static differential relay, static differential relay, static distance relays, Multi input comparators, concept of quadrilateral and elliptical relay characteristics.

Learning Outcomes:

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

- Evaluate the amplitude and pulse comparator (L1)
- Analyze the static over current relays (L2)
- Utilization of quadrilateral and elliptical relays (L3)

UNIT-IV Protection of Power Equipment:

Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on % Winding Unprotected. Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CTs Ratio, Buchholtz relay Protection. Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays. Translay Relay**.** Protection of Bus bars – Differential protection.

Learning Outcomes:

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

- Analyze protection for generators (L1)
- Obtain functions Buchholtz relay & translay relay (L2)
- Learn the description of protection for bus bars. (L3)

UNIT-V Neutral Grounding:

Grounded and Ungrounded Neutral Systems. - Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance - Arcing Grounds and Grounding Practices.

Learning Outcomes:

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

- Analyze between grounded and un grounded system (L1)
- Evaluate different types of grounding methods (L2)
- Learn about grounding practices. (L3)

TEXT BOOKS:

1. “Badri Ram, D. N Viswakarma”, “Power System Protection and Switchgear”, TMH Publications, 2011
2. “Sunil S Rao”, “Switchgear and Protection”, Khanna Publishers, 2008.

REFERENCE BOOKS:

1. “Paithankar and S. R. Bhide”, “Fundamentals of Power System Protection”, PHI, 2003.
2. “C R Mason”, Art & Science of Protective Relaying – Wiley Eastern Ltd, 1966.
3. “C. L. Wadhwa”, “Electrical Power Systems”, New Age international (P) Limited, Publishers, 6th Edition 2007.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2070214: POWER SYSTEM OPERATION & CONTROL

IV Year B.Tech EEE – I Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Power System-I, Power System-II

Course Objectives:

- To understand real power control and operation
- To know the importance of frequency control
- To analyze different methods to control reactive power
- To understand unit commitment problem and importance of economic load dispatch
- To understand real time control of power systems

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

- Understand operation and control of power systems.
- Analyze various functions of Energy Management System (EMS) functions.
- Analyze whether the machine is in stable or unstable position.
- Understand power system deregulation and restructuring

UNIT - I Load Flow Studies

Graph Theory, Formation of Y bus using singular transformation method, Formation of Z bus by Building algorithm method, Bus classification - Nodal admittance matrix - Load flow equations - Iterative methods - Gauss Seidel Methods, Newton-Raphson Method - Fast Decoupled Method - Merits and demerits of the above methods - System data for load flow study.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the Classification of buses in the power systems (L2)
- Analyse the concept of load flow studies of power system (L4)
- Understand the different methods to solve load flow equations (L2)
- Able to Determination of Bus quantities and finding the line losses of bus voltages (L3)
- Understand the concept of Rectangular and Polar Coordinates (L2)
- Able to find the solution of Load flow equations using different methods. (L3)
- Able to Comparison of Different Methods used for solving Load flow equations(L3)

UNIT - II Economic Load Dispatch:

Statement of economic dispatch problem – cost of generation – incremental cost curve, IFR curve, Heat rate curve - co-ordination equations without loss and with loss by using B-Coefficients, solution by direct method and λ-iteration method.

Learning Outcomes: At the end of the unit, the student will be able to

- Solve optimum generation allocation without transmission line losses
- Coefficients, general Transmission line loss formula
- Understand optimal operation of generators in thermal power stations and their characteristics
- Analyzing the problems on co-ordination equations and λ-iteration method.

UNIT - III Load Frequency Control

Load –Frequency Control: Basics of speed governing mechanism and modeling – speed load characteristics – load sharing between two synchronous machines in parallel. Control area concept LFC control of a single-area system. Static and dynamic analysis of uncontrolled and

controlled cases. Integration of economic dispatch control with LFC. Two area system – modeling - static analysis of uncontrolled case - tie line with frequency bias control of two-area system - state variable model.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the Concepts of Speed-governing System and its mathematical Modeling.
- Identify the Importance of load Frequency controls.
- Interpret the block diagram representation of an isolated power system for Uncontrolled& Controlled case.

UNIT - IV Power System Stability

The stability problem-Steady state stability, transient stability and Dynamic Stability-Swing equation. Equal area criterion of stability-Applications of Equal area criterion, Step by step solution of swing equation-Factors affecting transient stability, Methods to improve steady state and Transient stability, Introduction to voltage stability.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of Steady State Stability in power systems (L2).
- Able to know the different terms associated with stability. (L3)
- Able to find the Steady State Stability limit using different methods(L3)
- Analyze Methods to improve steady state stability. (L4)
- Understand the concept of Transient State Stability in power systems(L2).
- Able to Understand the concept of Equal Area Criterion(L3)
- Analyze applications of Auto Reclosing and Fast Operating Circuit Breakers, Numerical analysis. (L4)

UNIT - V Computer Control of Power Systems

Need of computer control of power systems. Concept of energy control centre (or) load dispatch centre and the functions - system monitoring - data acquisition and control. System hardware configuration – SCADA and EMS functions. Network topology – Importance of Load Forecasting and simple techniques of forecasting.

Learning Outcomes: At the end of the unit, the student will be able to

- Design Suitable system Configurations for Data Acquisition and monitoring.
- Illustrate the need of Computer control In Power Systems.
- Analyze the concept of load fore casting and its techniques.

TEXT BOOKS

1. C. L. Wadhwa, Electrical Power Systems, 3rd Edn, New Age International Publishing Co., 2001.
2. D. P. Kothari and I. J. Nagrath, Modern Power System Analysis, 4th Edn, Tata McGraw Hill Education Private Limited 2011.

REFERENCES:

1. D. P. Kothari: Modern Power System Analysis-Tata Mc Graw Hill Pub. Co. 2003. 2. Hadi Sadat: Power System Analysis –Tata Mc Graw Hill Pub. Co. 2002.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2070215: POWER SEMICONDUCTOR DRIVES

IV Year B.Tech EEE – I Sem.

L	T	P	C
3	0	0	3

Prerequisite: Power Electronics, Electrical Machines – I, Electrical Machines – II

Course Objectives:

- To introduce the drive system and operating modes of drive and its characteristics
- To understand Speed – Torque characteristics of different motor drives by various power converter topologies
- To appreciate the motoring and braking operations of drive
- To differentiate DC and AC drives

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

- Identify the drawbacks of speed control of motor by conventional methods.
- Differentiate Phase controlled and chopper-controlled DC drives speed-torque characteristics merits and demerits
- Understand Ac motor drive speed–torque characteristics using different control strategies its merits and demerits
- Describe Slip power recovery schemes

UNIT - I Control of DC Motors

Introduction to Thyristor controlled Drives, Single Phase semi and fully controlled converters connected to D.C separately excited and D.C series motors – continuous current operation – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque Characteristics- Problems on Converter fed D.C motors. Three phase semi and fully controlled converters connected to D.C separately excited and D.C series motors – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque characteristics – Problems.

UNIT - II Four Quadrant Operation of DC Drives

Introduction to Four quadrant operation – Motoring operations, Electric Braking – Plugging, Dynamic, and Regenerative Braking operations. Four quadrant operation of D.C motors by single phase and three phase dual converters – Closed loop operation of DC motor (Block Diagram Only) Control of DC Motors by Choppers: Single quadrant, two quadrant and four quadrant chopper fed dc separately excited and series motors – Continuous current operation – Output voltage and current wave forms – Speed and torque expressions – speed-torque characteristics – Problems on Chopper fed D.C Motors – Closed Loop operation (Block Diagram Only).

UNIT - III Control of Induction Motor

Variable voltage characteristics-Control of Induction Motor by Ac Voltage Controllers – Waveforms – speed torque characteristics. Variable frequency characteristics-Variable frequency control of induction motor by Voltage source and current source inverter and cyclo converters- PWM control – Comparison of VSI and CSI operations – Speed torque characteristics – numerical problems on induction motor drives – Closed loop operation of induction motor drives (Block Diagram Only).

UNIT - IV Rotor Side Control of Induction Motor

Static rotor resistance control – Slip power recovery – Static Scherbius drive – Static Kramer Drive – their performance and speed torque characteristics – advantages, applications, problems.

UNIT - V Control of Synchronous Motors

Separate control and self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI, CSI and cyclo converters. Load commutated CSI fed Synchronous Motor – Operation – Waveforms – speed torque characteristics – Applications – Advantages and Numerical Problems – Closed Loop control operation of synchronous motor drives (Block Diagram Only), variable frequency control - Cyclo converter, PWM based VSI & CSI.

TEXT BOOKS:

1. “G K Dubey”, Fundamentals of Electric Drives, CRC Press, 2002.
2. “Vedam Subramanyam”, Thyristor Control of Electric drives, Tata McGraw Hill Publications, 1987.

REFERENCES:

1. “S K Pillai”, A First course on Electrical Drives, New Age International (P) Ltd. 2nd Edition. 1989
2. “P. C. Sen”, Thyristor DC Drives, Wiley-Blackwell, 1981
3. “B. K. Bose”, Modern Power Electronics, and AC Drives, Pearson 2015.
4. “R. Krishnan”, Electric motor drives - modeling, Analysis and control, Prentice Hall PTR, 2001.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2070220: ELECTRICAL DISTRIBUTION SYSTEMS
(Professional Elective-II)

IV Year B.Tech EEE – I Sem.

L	T	P	C
3	0	0	3

Prerequisites: Power System – I, Power System - II

Course Objectives:

- To distinguish between transmission and distribution systems
- To understand design considerations of feeders
- To compute voltage drop and power loss in feeders
- To understand protection of distribution systems
- To examine the power factor improvement and voltage control

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

- Distinguish between transmission, and distribution line and design the feeders
- Compute power loss and voltage drop of the feeders
- Design protection of distribution systems
- Understand the importance of voltage control and power factor improvement

UNIT-I: GENERAL CONCEPTS

Introduction to distribution system, Distribution system planning, Factors effecting the Distribution system planning, Load modelling and characteristics. Coincidence factor - contribution factor - Loss factor - Relationship between the load factor and loss factor. Load growth, Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

DISTRIBUTION FEEDERS: Design Considerations of Distribution Feeders: Radial, loop and network types of primary feeders, Introduction to low voltage distribution systems (LVDS) and High voltage distribution systems (HVDS), voltage levels, Factors effecting the feeder voltage level, feeder loading, Application of general circuit constants (A, B, C, D) to radial feeders, basic design practice of the secondary distribution system, secondary banking, secondary network types, secondary mains.

UNIT-II: SUBSTATIONS

Location of Substations: Rating of distribution substation, service area with ‘n’ primary feeders. Benefits derived through optimal location of substations. Optimal location of Substations (Perpendicular bisector rule and X, Y co-ordinate method). System Analysis: Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines, analysis of non-three phase systems, method to analyze the distribution feeder cost.

UNIT-III: PROTECTION

Objectives of distribution system protection, types of common faults and procedure for fault calculations, over current Protective Devices: Principle of operation of Fuses, Auto-Circuit Recloser - and Auto-line sectionalizes, and circuit breakers.

COORDINATION: Coordination of Protective Devices: Objectives of protection co-ordination, general coordination procedure, Types of protection coordination: Fuse to Fuse, Auto-Recloser to Fuse, Circuit breaker to Fuse, Circuit breaker to Auto-Recloser.

UNIT-IV: COMPENSATION FOR POWER FACTOR IMPROVEMENT

Capacitive compensation for power-factor control - Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), effect of series capacitors, difference between shunt and series capacitors, Calculation of Power factor correction, capacitor allocation - Economic justification of capacitors - Procedure to determine the best capacitor location.

UNIT-V: VOLTAGE CONTROL

Voltage Control: Importance of voltage control, methods of voltage control, Equipment for voltage control, effect of shunt capacitors, effect of series capacitors, effect of AVB/AVR on voltage control, line drop compensation, voltage fluctuations.

TEXT BOOKS:

1. Turan Gonen, Electric Power Distribution System Engineering, CRC Press, 3rd Edition 2014.
2. V. Kamaraju, Electrical Power Distribution Systems, Tata Mc Graw Hill Publishing Company, 2nd edition, 2010.

REFERENCES:

1. G. Ram Murthy, Electrical Power Distribution hand book, 2nd edition, University press 2004.
A.S. Pabla, Electric Power Distribution, Tata McGraw Hill Publishing company, 6th edition, 2013.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2070221: DIGITAL CONTROL SYSTEMS
(Professional Elective-II)

IV Year B.Tech EEE – I Sem.

L	T	P	C
3	0	0	3

Prerequisite: Control Systems

Course Objectives:

- To understand the fundamentals of digital control systems, z-transforms
- To understand state space representation of the control systems, concepts of controllability and observability
- To study the estimation of stability in different domains
- To understand the design of discrete time control systems, compensators, state feedback controllers, state observers through various transformations

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

- Obtain discrete representation of LTI systems.
- Analyze stability of open loop and closed loop discrete-time systems.
- Design and analyze digital controllers.
- Design state feedback and output feedback controllers.

UNIT-I: DISCRETE REPRESENTATION OF CONTINUOUS SYSTEMS

Basics of Digital Control Systems. Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modelling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency. ZOH equivalent.

UNIT-II: DISCRETE SYSTEM ANALYSIS

Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system.

STABILITY OF DISCRETE TIME SYSTEM

Stability analysis by Jury test. Stability analysis using bilinear transformation. Design of digital control system with dead beat response. Practical issues with dead beat response design.

UNIT-III: STATE SPACE APPROACH FOR DISCRETE TIME SYSTEMS

State space models of discrete systems, State space analysis. Controllability, reach-ability, Reconstructibility and observability analysis. Effect of pole zero cancellation on the controllability & observability.

UNIT-IV: DESIGN OF DIGITAL CONTROL SYSTEM

Design of Discrete PID Controller, Design of discrete state feedback controller. Design of set point tracker. Design of Discrete Observer for LTI System. Design of Discrete compensator.

UNIT-V: DISCRETE OUTPUT FEEDBACK CONTROL

Design of discrete output feedback control. Fast output sampling (FOS) and periodic output feedback controller design for discrete time systems.

TEXT BOOKS:

1. K. Ogata, “Digital Control Engineering”, Prentice Hall, Englewood Cliffs, 1995.
2. M. Gopal, “Digital Control Engineering”, Wiley Eastern, 1988.

REFERENCES:

1. G. F. Franklin, J. D. Powell and M. L. Workman, “Digital Control of Dynamic Systems”, Addison Wesley, 1998.
2. B.C. Kuo, “Digital Control System”, Holt, Rinehart and Winston, 1980.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2070419: VLSI DESIGN
(Professional Elective-II)

IV Year B.Tech EEE – I Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Electronic Circuit Analysis; Switching Theory and Logic Design

Course Objectives:

- Give exposure to different steps involved in the fabrication of ICs
- Explain electrical properties of MOS and BiCMOS devices to analyze the behaviour of inverters designed with various loads
- Give exposure to the design rules to be followed to draw the layout of any logic circuit
- Provide design concepts to design building blocks of data path of any system using gates
- Understand basic programmable logic devices and testing of CMOS circuits

Course Outcomes:

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

- Acquire qualitative knowledge about the fabrication process of integrated circuits using MOS transistors
- Draw the layout of any logic circuit which helps to understand and estimate parasitic effect of any logic circuit
- Design building blocks of data path systems, memories and simple logic circuits using PLA, PAL, FPGA and CPLD
- Understand different types of faults that can occur in a system and learn the concept of testing and adding extra hardware to improve testability of system
- Analyze standard cells and design a complex circuit

UNIT– I

Introduction: Introduction to IC Technology, MOS, PMOS, NMOS, CMOS, BiCMOS.

Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: Ids – Vds relationships, MOS Transistor Threshold Voltage, gm, gds, Figure of merit, Pass Transistor, NMOS Inverter, Various Pull-ups, CMOS inverter analysis and design, BiCMOS Inverters.

Learning Outcomes: At the end of this unit, the student will be able to

- Discuss IC technology evolution
- Learn the basic properties of MOS and BiCMOS
- Analyze the CMOS inverter analysis

UNIT – II 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.

Learning Outcomes: At the end of this unit, the student will be able to

- Describe the VLSI Design flow
- Analyze the Design rules and Layout
- Illustrate NMOS and CMOS Inverter design

UNIT – III Gate Level Design:
Logic Gates, Other Complex Gates, Switch Logic, Alternate Gate Circuits, Time Delays, Driving Large Capacitive Loads, Wiring Capacitance, Fan-in, Fan-out.

Learning Outcomes: At the end of this unit, the student will be able to

- Demonstrate Logic gates and complex gates
- Compute switch logic
- Understand wiring capacitances

UNIT – IV Data Path Sub Systems:
Sub System Design, Shifters, Adders, ALUs, Multipliers, Parity Generators, Comparators, Zero/One Detectors, Counters.
Array Sub Systems: SRAM, DRAM, ROM, Serial Access Memories.

Learning Outcomes: At the end of this unit, the student will be able to

- Analyze sub system design
- Understand different types of shifters, adders
- Discuss static and dynamic memories

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.

Learning Outcomes: At the end of this unit, the student will be able to

- Discuss about standard cells
- Examine the working of FPGAs and CPLDs
- Describe the basic test principles and chip level test techniques

TEXT BOOKS:

1. Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, “Essentials of VLSI Circuits and Systems,” PHI, 2nd Edition 2005.
2. Neil H. E. Weste, David Harris, Ayan Banarjee, “CMOS VLSI DESIGN - A Circuits and Systems Perspective,” 3rd Edition, Pearson, 2nd Edition, 2009.

REFERENCES:

1. Ming- BO Lin, “Introduction to VLSI Systems: A Logic, Circuit and system Perspective.” CRC Press, 2006.
2. John. P. Uyemura, “CMOS Logic Circuit Design,” Springer, 2nd Edition, 2007.
3. Wayne Wolf, “Modern VLSI Design,” Pearson Education, 3rd Edition, 1997.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2070222: MODERN POWER ELECTRONICS
(Professional Elective-II)

IV Year B.Tech EEE – I Sem.

L	T	P	C
3	0	0	3

Prerequisite: Power Electronics

Course Objectives:

- To understand various Power Electronics devices such as SCR, TRIAC, DIAC, IGBT, GTO etc.
- To understand application of aforesaid Power Electronics devices in Choppers, Inverters and Converters etc.
- To understand control of Electrical Motors through DC-DC converters, AC Converters etc.
- To understand the use of Inductors and Capacitors in Choppers, Inverters and Converters.

Course outcomes: Students are able to

- To understand various Power Electronics devices such as SCR, TRIAC, DIAC, IGBT, GTO etc.
- To understand application of aforesaid Power Electronics devices in Choppers, Inverters and Converters etc.
- To understand control of Electrical Motors through DC-DC converters, AC Converters etc.
- To understand the use of Inductors and Capacitors in Choppers, Inverters and Converters.

UNIT - I High-Power Semiconductor Devices:

Introduction, High-Power Switching Devices, Diodes, Silicon-Controlled Rectifier (SCR), Gate Turn-Off (GTO) Thyristor, Gate-Commutated Thyristor (GCT), Insulated Gate Bipolar Transistor (IGBT), Other Switching Devices, Operation of Series-Connected Devices, Main Causes of Voltage Unbalance, Voltage Equalization for GCTs,

UNIT-II Cascaded H-Bridge Multilevel Inverters:

Introduction, Sinusoidal PWM, Modulation Scheme, Harmonic Content, over modulation, Third Harmonic Injection PWM, Space Vector Modulation, Switching States, Space Vectors, Dwell Time Calculation, Modulation Index, Switching Sequence, Spectrum Analysis, Even-Order Harmonic Elimination, Discontinuous Space Vector Modulation. Introduction, H-Bridge Inverter, Bipolar Pulse-Width Modulation, Unipolar Pulse-Width Modulation.

UNIT - III Diode-Clamped Multilevel Inverters:

Three-Level Inverter, Converter Configuration, Switching State, Commutation, Space Vector Modulation, Stationary Space Vectors, Dwell Time Calculation, Relationship Between V_ref Location and Dwell Times, Switching Sequence Design, Inverter Output Waveforms and Harmonic Content, Even-Order Harmonic Elimination, Neutral-Point Voltage Control, Causes of Neutral-Point Voltage Deviation, Effect of Motoring and Regenerative Operation, Feedback Control of Neutral-Point Voltage

UNIT - IV DC-DC Switch-Mode Converters & Switching DC Power Supplies

Control of dc-dc converter, Buck converter, boost converter, buck-boost converter, cuk dc-dc converter, full bridge dc-dc converter, dc-dc converter comparison. Introduction, linear power supplies, overview of switching power supplies, dc-dc converters with electrical isolation, control of switch mode dc power supplies, power supply protection, and electrical isolation in the feedback loop, designing to meet the power supply specifications.

UNIT - V Resonant Converters & Power Conditioners and Uninterruptible Power Supplies

Classification of resonant converters, basic resonant circuit concepts, load-resonant converters, resonant-switch converters, zero-voltage-switching, resonant-dc-link inverters with zero-voltage switching's, high frequency-link integral-half cycle converters. Power line disturbances, Introduction to Power Quality, power Conditioners, uninterruptible power supplies, Applications.

TEXT BOOKS:

1. "M. H. Rashid", Power electronics circuits, Devices and applications, PHI, I edition – 1995.
2. "Ned Mohan, Tore M. Undeland and William P. Robbins, A", "Power Electronics converters, Applications and Design" John Wiley & Sons, Inc., Publication, 3rd Edition 2003.

REFERENCE BOOK:

1. "Bin Wu, A", "High-Power Converters and Ac Drives" John Wiley & Sons, Inc., Publication (Free down load from rapidshire.com) 2006.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2070418: DIGITAL SIGNAL PROCESSING
(Professional Elective-II)

IV Year B.Tech EEE – I Sem.

L	T	P	C
3	0	0	3

Pre-requisite: Signals and Systems

Course Objectives:

- Provide background and fundamental material for 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 for a given specifications
- Designs of FIR digital filters and analyze and synthesize for a given specifications
- 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

- Understand the LTI system characteristics and Multirate signal processing.
- Apply the knowledge of FFT Algorithms for computation of DFT.
- Design a IIR digital filter for a given specification.
- Design FIR filters using various methods.
- Understand the significance of various filter structures and Apply decimation and interpolation concepts for the design of sampling rate converters

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.

Learning Outcomes: At the end of this unit, the student will be able to

- Illustrate the concept of discrete time signals and systems
- Analyze the response of LTI system in time domain and frequency domain
- Understand the applications digital signal processing

UNIT– II Discrete Fourier series:

Relation between Fourier series, Fourier transform, Laplace transform and Z-transform. DFS representation of periodic sequences, Properties of discrete Fourier series.

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.

Learning Outcomes: At the end of this unit, the student will be able to

- Apply DTFT and DFT for spectral analysis of discrete signals
- Compute the convolution sum using overlap-add and overlap-save methods for filtering long duration sequences
- Construct the DIT-FFT and DIF-FFT algorithms for reducing computational complexity of DFT

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.

Learning Outcomes: At the end of this unit, the student will be able to

- Analyze the performance characteristics of IIR digital filters
- Model the IIR filters using various transformation techniques.
- Design a digital filter from analog filter for given specifications

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.

Learning Outcomes: At the end of this unit, the student will be able to

- Analyze the performance characteristics of FIR digital filters
- Model the FIR filters using various transformation techniques
- Design a digital filter using windowing technique

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.

Learning Outcomes: At the end of this unit, the student will be able to

- Realize the digital filters in terms of block diagram using direct, cascade, and parallel form structures
- Interpret the efficient implementation of sample rate conversion of digital signals to interface the digital systems with different sampling rates
- Design multi rate signal processing by sampling rate converters

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, “Digital signal processing, principles, algorithms and applications,” Prentice Hall, 4th Edition, 2007.

2. A.V. Oppenheim, R.W. Schaffer, “Discrete time signal processing,” PHI, 2nd Edition, 2006.

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,” SCITech, 6th Edition, 2015.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2070223: CONTROL SYSTEM DESIGN
(Professional Elective-III)

IV Year B.Tech EEE – I Sem.

L	T	P	C
3	0	0	3

Prerequisite: Control Systems

Course Objectives:

- To know the time and frequency domain design problem specifications.
- To understand the design of classical control systems in time-domain
- To analyze the design aspects of classical control systems in frequency-domain
- To know the design of various compensator controllers
- To identify the performance of the systems by design them in state-space
- To study the effects of nonlinearities on various systems performance

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

- Understand various design specifications.
- Design controllers to satisfy the desired design specifications using simple controller structures (P, PI, PID, compensators).
- Design controllers using the state-space approach.

UNTI-I: DESIGN SPECIFICATIONS

Introduction to design problem and philosophy. Introduction to time domain and frequency domain design specification and its physical relevance, Effect of gain on transient and steady state response, Effect of addition of pole on system performance, Effect of addition of zero on system response.

UNTI-II: DESIGN OF CLASSICAL CONTROL SYSTEM IN THE TIME DOMAIN

Introduction to compensator, Design of Lag, lead lag-lead compensator in time domain, Feedback and Feed forward compensator design, Feedback compensation, Realization of compensators.

UNTI-III: DESIGN OF PID CONTROLLERS

Design of P, PI, PD and PID controllers in time domain and frequency domain for first, second and third order systems, Control loop with auxiliary feedback – Feed forward control.

UNTI-IV: CONTROL SYSTEM DESIGN IN STATE SPACE

Review of state space representation. Concept of controllability & observability, effect of pole zero cancellation on the controllability & observability of the system, pole placement design through state feedback, Ackerman's Formula for feedback gain design, Design of Observer, Reduced order observer, Separation Principle.

UNTI-V: NONLINEARITIES AND ITS EFFECT ON SYSTEM PERFORMANCE

Various types of non-linearities, Effect of various non-linearities on system performance, Singular points, Phase plot analysis.

TEXT BOOKS:

1. N. Nise, "Control system Engineering", John Wiley, 2000.
2. I. J. Nagrath and M. Gopal, "Control system engineering", Wiley, 2000.

REFERENCES:

1. M. Gopal, “Digital Control Engineering”, Wiley Eastern, 1988.
2. K. Ogata, “Modern Control Engineering”, Prentice Hall, 2010.
3. B. C. Kuo, “Automatic Control system”, Prentice Hall, 1995.
4. J. J. D’Azzo and C. H. Houpis, “Linear control system analysis and design (conventional and modern)”, McGraw Hill, 1995.
5. R. T. Stefani and G. H. Hostetter, “Design of feedback Control Systems”, Saunders College Pub, 1994.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2070224: FLEXIBLE AC TRANSMISSION SYSTEMS
(Professional Elective-III)

IV Year B.Tech EEE – I Sem.

L	T	P	C
3	0	0	3

Prerequisite: Power Electronics, Power System Operation and Control

Course Objectives:

- To understand the fundamentals of FACTS Controllers
- To know the importance of controllable parameters and types of FACTS controllers & their benefits
- To understand the objectives of Shunt and Series compensation
- To Control STATCOM and SVC and their comparison and the regulation of STATCOM, Functioning and control of GCSC, TSSC and TCSC

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

- Choose proper controller for the specific application based on system requirements
- Understand various systems thoroughly and their requirements
- Understand the control circuits of Shunt Controllers SVC & STATCOM for various functions viz. Transient stability Enhancement, voltage instability prevention and power oscillation damping
- Understand the Power and control circuits of Series Controllers GCSC, TSSC and TCSC

UNIT - I Facts Concepts:

Transmission interconnections power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters, basic types of FACTS controllers, and benefits from FACTS controllers.

UNIT - II Voltage Source Converters:

Single phase, three phase full wave bridge converters transformer connections for 12 pulse operation. Three level voltage source converter, pulse width modulation converter, basic concept of current source Converters, and comparison of current source converters with voltage source converters.

UNIT - III Static Shunt Compensation:

Objectives of shunt compensation, midpoint voltage regulation, voltage instability prevention, improvement of transient stability, Power oscillation damping, Methods of controllable var generation, variable impedance type static var generators, switching converter type var generators and hybrid var generators.

UNIT - IV SVC and STATCOM:

SVC: FC-TCR and TSC-TCR. STATCOM: The regulation and slope. Comparison between SVC and STATCOM

UNIT - V Static Series Compensators:

Objectives of Series compensation, concept of series capacitive compensation, GTO thyristor-controlled series capacitor (GSC), thyristor switched series capacitor (TSSC), and thyristor-controlled series capacitor (TCSC) control schemes for GSC TSSC and TCSC.

TEXT BOOKS:

1. “N.G. Hingorani and L. Guygi”, Understanding FACTS Devices, IEEE Press Publications 2000.
2. “Yong- Hua Song, Allan Johns”, Flexible AC Transmission System, IEE Press 1999.

REFERENCE BOOKS:

1. “Kalyan K. Sen and Meylingsen”, Introduction to FACTS Controllers, John wiley& sons, Inc., Mohamed E. El – Hawary Series editor, 2009.
2. “K. R Padiyar, Motilal”, FACTS controllers in power transmission and distribution UK Books of India 2007.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2070225: UTILIZATION OF ELECTRICAL ENERGY
(Professional Elective-III)

IV Year B.Tech EEE – I Sem.

L	T	P	C
3	0	0	3

Prerequisite: Electrical Machines-I & Electrical Machines-II

Course Objectives:

- To understand the fundamentals of illumination and good lighting practices
- To understand the methods of electric heating and welding.
- To understand the concepts of electric drives and their application to electrical traction systems.

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

- Acquire knowledge on, electric drives characteristics and their applicability in industry based on the nature of different types of loads and their characteristics
- Understands the concepts and methods of electric heating, welding, illumination and electric traction
- Apply the above concepts to real-world electrical and electronics problems and applications.

UNIT – I Electric Drives:

Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization.

UNIT – II Electric Heating:

Advantages and methods of electric heating, resistance heating induction heating and dielectric heating. Electric Welding: Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT – III Illumination:

Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light. Various Illumination Methods: Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting.

UNIT – IV Electric Traction – I:

System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, methods of electric braking-plugging rheostat braking and regenerative braking. Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves.

UNIT – V Electric Traction-II:

Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and coefficient of adhesion.

TEXT BOOKS:

1. E. Openshaw Taylor, Utilisation of Electric Energy – by University press, 1961.
2. Partab, H., 'Art and Science of Utilisation of Electrical Energy', Dhanpat Rai and Sons, New Delhi, 1986.

REFERENCE BOOKS:

1. N. V. Suryanarayana, Utilization of Electrical Power including Electric drives and Electric traction, New Age International (P) Limited, Publishers, 1996.
2. C. L. Wadhwa, Generation, Distribution and Utilization of electrical Energy, New Age International (P) Limited, Publishers, 1997.
3. Tripathy, S.C., 'Electric Energy Utilisation and Conservation', Tata McGraw Hill Publishing Company Ltd. New Delhi, 1991.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2070279: POWER SYSTEMS LAB

IV Year B.Tech EEE – I Sem.

L	T	P	C
0	0	2	1

Prerequisite: Power System-I, Power System-II, Power System Protection, Power System Operation and Control, Electrical Machines

Course Objectives:

- perform testing of CT, PT's and Insulator strings
- To find sequence impedances of 3-Φ synchronous machine and Transformer
- To perform fault analysis on Transmission line models and Generators.

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

- Perform various load flow techniques
- Understand Different protection methods
- Analyze the experimental data and draw the conclusions.

The following experiments are required to be conducted as compulsory experiments:

Part - A

1. Characteristics of IDMT Over-Current Relay.
2. Differential protection of 1-Φ transformer.
3. Characteristics of Micro Processor based Over Voltage/Under Voltage relay.
4. A, B, C, D constants of a Long Transmission line
5. Finding the sequence impedances of 3-Φ synchronous machine.
6. Finding the sequence impedances of 3-Φ Transformer.

In addition to the above six experiments, at least any four of the experiments from the following list are required to be conducted.

Part - B

1. Formation of YBUS.
2. Load Flow Analysis using Gauss Seidal (GS) Method.
3. Load Flow Analysis using Fast Decoupled (FD) Method.
4. Formation of ZBUS.
5. Simulation of Compensated Line

TEXT BOOKS:

1. C.L. Wadhwa: Electrical Power Systems –Third Edition, New Age International Pub. Co., 2001.
2. Hadi Sadat: Power System Analysis –Tata Mc Graw Hill Pub. Co. 2002.

REFERENCES:

1. D. P. Kothari: Modern Power System Analysis-Tata Mc Graw Hill Pub. Co. 2003.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2070280: ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB

IV Year B.Tech EEE – I Sem. L T P C
0 0 2 1

Pre-requisite: Measurements and Instrumentation

Course Objectives:

- To calibrate LPF Watt Meter, energy meter, P. F Meter using electro dynamo meter type instrument as the standard instrument
- To determine unknown inductance, resistance, capacitance by performing experiments on D.C Bridges & A. C Bridges
- To determine three phase active & reactive powers using single wattmeter method practically
- To determine the ratio and phase angle errors of current transformer and potential transformer.

Course Outcomes:

After completion of this lab the student is able to

- To choose instruments
- Test any instrument
- Find the accuracy of any instrument by performing experiment
- Calibrate PMMC instrument using D.C potentiometer

The following experiments are required to be conducted as compulsory experiments

1. Calibration and Testing of single-phase energy Meter.
2. Calibration of dynamometer power factor meter.
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter.
4. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.
5. Dielectric oil testing using H.T. testing Kit.
6. Schering Bridge & Anderson Bridge.
7. Measurement of 3 - Phase reactive power with single-phase wattmeter.
8. Measurement of displacement with the help of LVDT. In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted
9. Calibration LPF wattmeter – by Phantom testing.
10. Measurement of 3-phase power with single watt meter and two CTs.
11. C.T. testing using mutual Inductor – Measurement of % ratio error and phase angle of given CT by Null method.
12. PT testing by comparison – V. G. as Null detector – Measurement of % ratio error and phase angle of the given PT
13. Resistance strain gauge – strain measurements and Calibration.
14. Transformer turns ratio measurement using AC bridges.
15. Measurement of % ratio error and phase angle of given CT by comparison.

TEXT BOOKS:

1. "G. K. Banerjee", "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition, 2016
2. "S. C. Bhargava", "Electrical Measuring Instruments and Measurements", BS Publications, 2012.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2070281: POWER ELECTRONICS LAB

IV Year B.Tech EEE – I Sem. **L T P C**
0 0 2 1

Prerequisite: Power Electronics

Course Objectives:

- Apply the concepts of power electronic converters for efficient conversion/control of power from source to load.
- Design the power converter with suitable switches meeting a specific load requirement.

Course Outcomes: After completion of this course, the student is able to

- Understand the operating principles of various power electronic converters.
- Use power electronic simulation packages& hardware to develop the power converters.
- Analyze and choose the appropriate converters for various applications

1. Study of Characteristics of SCR, MOSFET & IGBT,
2. Gate firing circuits for SCR's
3. Single Phase AC Voltage Controller with R and RL Loads
4. Single Phase half controlled &fully controlled bridge converter with R and RL loads
5. Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E)
6. Single Phase Cycloconverter with R and RL loads
7. Single Phase series& parallel inverter with R and RL loads
8. Single Phase Bridge inverter with R and RL loads

Any two experiments should be conducted

1. DC Jones chopper with R and RL Loads
2. Three Phase half-controlled bridge converter with R-load
3. Single Phase dual converter with RL loads
4. (a)Simulation of single-phase Half wave converter using R and RL loads
   (b)Simulation of single-phase full converter using R, RL and RLE loads
   (c)Simulation of single-phase Semi converter using R, RL and RLE loads
5. (a)Simulation of Single-phase AC voltage controller using R and RL loads
   (b)Simulation of Single phase Cyclo-converter with R and RL-loads
6. Simulation of Buck chopper
7. Study of PWM techniques

Reference Books:

1. M. H. Rashid, Simulation of Electric and Electronic circuits using PSPICE – by M/s
2. PHI Publications.

IV-II

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2080226: POWER QUALITY
(Professional Elective-IV)

IV Year B.Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Power Systems - II

Course Objectives:

- Definition of power quality and different terms of power quality.
- Study of voltage power quality issue – short and long interruption.
- Detail study of characterization of voltage sag magnitude and three phase unbalanced voltage sag.
- Know the behaviour of power electronics loads; induction motors, synchronous motor etc by the power quality issues.
- Overview of mitigation of power quality issues by the VSI converters.

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

- Know the severity of power quality problems in distribution system
- Understand the concept of voltage sag transformation from up-stream (higher voltages) to down-stream (lower voltage)
- Concept of improving the power quality to sensitive load by various mitigating custom power devices

UNIT – I Introduction:

Introduction of the Power Quality (PQ) problem, Terms used in PQ: Voltage, Sag, Swell, Surges, Harmonics, over voltages, spikes, Voltage fluctuations, Transients, Interruption, overview of power quality phenomenon, Remedies to improve power quality, power quality monitoring.

UNIT – II Long & Short Interruptions:

Interruptions – Definition – Difference between failures, outage, Interruptions – causes of Long Interruptions – Origin of Interruptions – Limits for the Interruption frequency – Limits for the interruption duration – costs of Interruption – Overview of Reliability evaluation to power quality, comparison of observations and reliability evaluation. Short interruptions: definition, origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to re-closing, voltage during the interruption, monitoring of short interruptions, difference between medium and low voltage systems. Multiple events, single phase tripping – voltage and current during fault period, voltage and current at post fault period, stochastic prediction of short interruptions.

UNIT – III Single and Three Phase Voltage Sag Characterization:

Voltage sag – definition, causes of voltage sag, voltage sag magnitude, and monitoring, theoretical calculation of voltage sag magnitude, voltage sag calculation in non-radial systems, meshed systems, and voltage sag duration. Three phase faults, phase angle jumps, magnitude and phase angle jump for three phase unbalanced sags, load influence on voltage sags.

UNIT – IV Power Quality Considerations in Industrial Power Systems:

Voltage sag – equipment behaviour of Power electronic loads, induction motors, synchronous

motors, computers, consumer electronics, adjustable speed AC drives and its operation. Mitigation of AC Drives, adjustable speed DC drives and its operation, mitigation methods of DC drives.

UNIT - V Mitigation of Interruptions & Voltage Sags:

Overview of mitigation methods – from fault to trip, reducing the number of faults, reducing the fault clearing time changing the power system, installing mitigation equipment, improving equipment immunity, different events and mitigation methods. System equipment interface – voltage source converter, series voltage controller, shunt controller, combined shunt and series controller. Power Quality and EMC Standards: Introduction to standardization, IEC Electromagnetic compatibility standards, European voltage characteristics standards, PQ surveys.

TEXT BOOKS:

1. “Math H J Bollen”, “Understanding Power Quality Problems”, IEEE Press, 2000.
2. “R. Sastry Vedam and Mulukutla S. Sarma”, “Power Quality VAR Compensation in Power Systems”, CRC Press, 2008.

REFERENCE BOOKS:

1. C. Sankaran, Power Quality, CRC Press 2001.
2. Roger C. Dugan, Mark F. Mc Granaghan, Surya Santoso, H. Wayne Beaty, Electrical Power Systems Quality, Tata McGraw Hill Education Private Ltd, 3rd Edition 2012.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2080227: INDUSTRIAL ELECTRICAL SYSTEMS
(Professional Elective-IV)

IV Year B.Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Utilization of Electric Energy

Course Objectives:

- To understand the various electrical system components
- To know the residential and commercial electrical systems
- To study the illumination systems
- To discuss about the industrial electrical systems

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

- Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.
- Understand various components of industrial electrical systems.
- Analyze and select the proper size of various electrical system components.

UNIT-I: ELECTRICAL SYSTEM COMPONENTS

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices

UNIT-II: RESIDENTIAL AND COMMERCIAL ELECTRICAL SYSTEMS

Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

UNIT-III: ILLUMINATION SYSTEMS

Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premise, flood lighting.

UNIT-IV: INDUSTRIAL ELECTRICAL SYSTEMS I

HT connect ion, industrial substation, Transformer select ion, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

UNIT-V: INDUSTRIAL ELECTRICAL SYSTEMS II

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

TEXT BOOKS:

1. S. L. Uppal and G. C. Garg, “Electrical Wiring, Estimating & costing”, Khanna publishers, 2008.
2. K. B. Raina, “Electrical Design, Estimating & Costing”, New age International, 2007.

REFERENCES:

1. S. Singh and R. D. Singh, “Electrical estimating and costing”, Dhanpat Rai and Co., 1997.
2. Web site for IS Standards. 3. H. Joshi, “Residential Commercial and Industrial Systems”, McGraw Hill Education, 2008.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2080228: ELECTRICAL MACHINE DESIGN
(Professional Elective-IV)

IV Year B.Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Electrical Machines-I, Electrical Machines-II

Course Objectives:

- To know the major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings
- To analyze the thermal considerations, heat flow, temperature rise, rating of machines.
- To understand the design of transformers
- To study the design of induction motors
- To know the design of synchronous machines
- To understand the CAD design concepts

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

- Understand the construction and performance characteristics of electrical machines.
- Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines
- Understand the principles of electrical machine design and carry out a basic design of an ac machine.
- Use software tools to do design calculations.

UNIT-I: INTRODUCTION

Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines.

UNIT-II: TRANSFORMERS

Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

UNIT-III: INDUCTION MOTORS

Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of poly-phase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.

UNIT-IV: SYNCHRONOUS MACHINES

Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of airgap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.

UNIT-V: COMPUTER AIDED DESIGN (CAD)

Limitations (assumptions) of traditional designs need for CAD analysis, synthesis and hybrid

methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design. Introduction to complex structures of modern machines-PMSMs, BLDCs, SRM and claw-pole machines.

TEXT BOOKS:

1. A. K. Sawhney, “A Course in Electrical Machine Design”, Dhanpat Rai and Sons, 1970.
2. M.G. Say, “Theory & Performance & Design of A.C. Machines”, ELBS London.

REFERENCES:

1. S. K. Sen, “Principles of Electrical Machine Design with computer programmes”, Oxford and IBH Publishing, 2006.
2. K. L. Narang, “A Text Book of Electrical Engineering Drawings”, SatyaPrakashan, 1969.
3. A. Shanmugasundaram, G. Gangadharan and R. Palani, “Electrical Machine Design Data Book”, New Age International, 1979.
4. M. V. Murthy, “Computer Aided Design of Electrical Machines”, B.S. Publications, 2008.
5. Electrical machines and equipment design exercise examples using Ansoft’s Maxwell 2D machine design package.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2080229: ELECTRICAL & HYBRID VEHICLES
(Professional Elective-IV)

IV Year B.Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Power Semiconductor Drives, Utilization of Electric Power

Course Objectives:

- To understand the fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
- To know the various aspects of hybrid and electric drive train such as their configuration, types of electric machines that can be used energy storage devices, etc.

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

- Understand the models to describe hybrid vehicles and their performance.
- Understand the different possible ways of energy storage.
- Understand the different strategies related to energy storage systems.

UNIT - I INTRODUCTION

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.

UNIT - II INTRODUCTION TO HYBRID ELECTRIC VEHICLES

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

HYBRID ELECTRIC DRIVE-TRAINS:

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT - III ELECTRIC TRAINS

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

ELECTRIC PROPULSION UNIT:

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT - IV ENERGY STORAGE

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems

UNIT-V: ENERGY MANAGEMENT STRATEGIES

Energy Management Strategies: Introduction to energy management strategies used in hybrid

and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. CASE STUDIES: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

TEXT BOOKS:

1. C. Mi, M. A. Masrur and D. W. Gao, “Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives”, John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, “Hybrid Electric Vehicles: Energy Management Strategies”, Springer, 2015.

REFERENCES:

1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design”, CRC Press, 2004.
2. T. Denton, “Electric and Hybrid Vehicles”, Routledge, 2016.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2080230: IOT WITH ELECTRICAL APPLICATIONS
(Professional Elective-V)

IV Year B.Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices.

Course Outcomes:

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

UNIT - I Introduction to Internet of Things

Overview of Internet of Things- the Edge, Cloud and the Application Development, Anatomy of the Thing, Industrial Internet of Things (MOT - Industry 4.0), Quality Assurance, Predictive Maintenance, Real Time Diagnostics, Design and Development for IOT, Understanding System Design for IOT, Design Model for IOT.

UNIT - II System Design of Connected Devices

Embedded Devices, Embedded Hardware, Connected Sensors and Actuators, Controllers, Battery Life Conservation and designing with Energy Efficient Devices, SoCs, Single Chip Controllers with integrated Processing and Network Core with Hardware Crypto Engines.

UNIT - III Understanding Internet Protocols

Simplified OSI Model, Network Topologies, Standards, Types of Internet Networking - Ethernet, WiFi, Local Networking, Bluetooth, Bluetooth Low Energy (BLE), Zigbee, 6LoWPAN, Sub 1 GHz, RFID, NFC, Proprietary Protocols, Simplicity, Networking Design - Push, Pull and Polling, Network APIs.

UNIT - IV IoT Physical Devices and Endpoints

Introduction to Raspberry PI - Interfaces (serial, SPI, I2C). Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT - V Domain specific IOT and their challenges

Illustrated domains-home automation, smart cities, environment, energy, retail, logistics, health and life style. Case Study of Rapid Internet Connectivity with Cloud Service Providers with CC3200 Controller.

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547.
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.
3. Foundational Elements of an IOT Solution - The Edge, Cloud and Application Development, Joe Biron& Jonathan Follett, Oreilly, First Edition, March 2016.
4. Designing Connected Products, 1st Edition, Elizabeth Goodman, Alfred Lui, Martin Charlier, Ann Light, Claire Rowland.
5. The Internet of Things (A Look at Real World Use Cases and Concerns), Kindle Edition, 2016, Lucas Darnell.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2080231: SMART GRID TECHNOLOGIES
(Professional Elective-V)

IV Year B.Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Power Systems-I, Power systems-II

Course Objectives:

- To group various aspects of the smart grid
- To defend smart grid design to meet the needs of a utility
- To select issues and challenges that remain to be solved
- To analyze basics of electricity, electricity generation, economics of supply and demand, and the various aspects of electricity market operations in both regulated and deregulated environment.

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

- Understand the features of small grid in the context of Indian grid.
- Understand the role of automation in transmission and distribution.
- Apply evolutionary algorithms for smart grid.
- Understand operation and maintenance of PMUs, PDCs, WAMs, and voltage and frequency control in micro grid

UNIT-I: INTRODUCTION TO SMART GRID

Working definitions of Smart Grid and Associated Concepts –Smart grid Functions Traditional Power Grid and Smart Grid –New Technologies for Smart Grid – Advantages –Indian Smart Grid – Key Challenges for Smart Grid.

UNIT-II: SMART GRID ARCHITECTURE

Components and Architecture of Smart Grid Design –Review of the proposed architectures for Smart Grid. The fundamental components of Smart Grid designs –Transmission Automation – Distribution Automation – Renewable Integration.

UNIT-III: TOOLS AND TECHNIQUES FOR SMART GRID

Computational Techniques –Static and Dynamic Optimization Techniques –Computational Intelligence Techniques –Evolutionary Algorithms –Artificial Intelligence techniques.

UNIT-IV: DISTRIBUTION GENERATION TECHNOLOGIES

Introduction to Renewable Energy Technologies –Micro grids –Storage Technologies –Electric Vehicles and plug –in hybrids –Environmental impact and Climate Change –Economic Issues.

COMMUNICATION TECHNOLOGIES AND SMART GRID

Introduction to Communication Technology –Synchro-Phasor Measurement Units (PMUs) – Wide Area Measurement Systems (WAMS).

UNIT-V: CONTROL OF SMART POWER GRID SYSTEM

Load Frequency Control (LFC) in Micro Grid System –Voltage Control in Micro Grid System – Reactive Power Control in Smart Grid. Case Studies and Test beds for the Smart Grids.

TEXT BOOKS:

1. Stuart Borlase, Smart Grids, Infrastructure, Technology and Solutions, CRC Press, 2013
2. Gil Masters, Renewable and Efficient Electric Power System, Wiley-IEEE Press, 2004.

REFERENCES:

1. A.G. Phadke and J.S. Thorp, “Synchronized Phasor Measurements and their Applications”, Springer Edition, 2010.
2. T. Ackermann, Wind Power in Power Systems, Hoboken, NJ, USA, John Wiley, 2005.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2080232; AI TECHNIQUES IN ELECTRICAL ENGINEERING
(Professional Elective-V)

IV Year B.Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Power Systems Operation and Control

Course Objectives:

- To locate soft commanding methodologies, such as artificial neural networks, Fuzzy logic and genetic Algorithms.
- To observe the concepts of feed forward neural networks and about feedback neural networks.
- To practice the concept of fuzziness involved in various systems and comprehensive knowledge of fuzzy logic control and to design the fuzzy control
- To analyze genetic algorithm, genetic operations and genetic mutations.

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

- Understand feed forward neural networks, feedback neural networks and learning techniques.
- Understand fuzziness involved in various systems and fuzzy set theory.
- Develop fuzzy logic control for applications in electrical engineering
- Develop genetic algorithm for applications in electrical engineering.

UNIT-I: ARTIFICIAL NEURAL NETWORKS

Introduction, Models of Neuron Network-Architectures –Knowledge representation, Artificial Intelligence and Neural networks–Learning Process-Error correction learning, Hebbian learning –Competitive learning-Boltzman learning, supervised learning-Unsupervised learning–Reinforcement Learning-Learning tasks.

UNIT-II: ANN PARADIGMS

Multi-layer perceptron using Back propagation Algorithm (BPA), Self –Organizing Map (SOM), Radial Basis Function Network-Functional Link Network (FLN), Hopfield Network.

UNIT-III: FUZZY LOGIC

Introduction –Fuzzy versus crisp, Fuzzy Sets-Membership function –Basic Fuzzy set operations, Properties of Fuzzy sets –Fuzzy Cartesian Product, Operations on Fuzzy relations –Fuzzy logic–Fuzzy Quantifiers, Fuzzy Inference-Fuzzy Rule based system, Defuzzification methods.

UNIT-IV: GENETIC ALGORITHMS

Introduction-Encoding –Fitness Function-Reproduction operators, Genetic Modelling –Genetic Operators-Cross over-Single site cross over, two-point cross over –Multi point cross over Uniform cross over, Matrix cross over Cross over Rate-Inversion & Deletion, Mutation operator –Mutation –Mutation Rate-Bit-wise operators, Generational cycle-convergence of Genetic Algorithm.

UNIT-V: APPLICATIONS OF AI TECHNIQUES

Load forecasting, Load flow studies, Economic load dispatch, Load frequency control, Single area system and two area system, Reactive power control, Speed control of DC and AC Motors.

TEXT BOOKS

1. S.Rajasekaran and G.A.V.Pai Neural Networks, Fuzzy Logic & Genetic Algorithms, PHI, New Delhi, 2003.
2. Rober J. Schalkoff, Artificial Neural Networks, Tata McGraw Hill Edition, 2011.

REFERENCES:

1. P.D.Wasserman; Neural Computing Theory & Practice, Van Nostrand Reinhold, New York, 1989.
2. Bart Kosko; Neural Network & Fuzzy System, Prentice Hall,1992
3. D.E.Goldberg, Genetic Algorithms, Addison-Wesley 1999.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2080233: HVDC TRANSMISSION SYSTEM
(Professional Elective-V)

IV Year B.Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Power Systems & Power Electronics

Course Objectives:

- To compare EHV AC and HVDC systems
- To analyze Graetz circuit and also explain 6 and 12 pulse converters
- To control HVDC systems with various methods and to perform power flow analysis in AC/DC systems
- To describe various protection methods for HVDC systems and Harmonics

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

- Compare EHV AC and HVDC system and to describe various types of DC links
- Analyze Graetz circuit for rectifier and inverter mode of operation
- Describe various methods for the control of HVDC systems and to perform power flow analysis in AC/DC systems
- Describe various protection methods for HVDC systems and classify Harmonics and design different types of filters

UNIT – I Basic Concepts:

Necessity of HVDC systems, Economics and Terminal equipment of HVDC transmission systems, Types of HVDC Links, Apparatus required for HVDC Systems, Comparison of AC and DC Transmission, Application of DC Transmission System, Planning and Modern trends in D.C. Transmission. Analysis of HVDC Converters: Choice of Converter Configuration, Analysis of Graetz circuit, Characteristics of 6 Pulse and 12 Pulse converters, Cases of two 3 phase converters in Y/Y mode – their performance.

UNIT – II Converter and HVDC System Control:

Principle of DC Link Control, Converters Control Characteristics, firing angle control, Current and extinction angle control, Effect of source inductance on the system, Starting and stopping of DC link, Power Control. Reactive Power Control In HVDC: Introduction, Reactive Power Requirements in steady state, sources of reactive power- Static VAR Compensators, Reactive power control during transients.

UNIT – III Power Flow Analysis in AC/DC Systems:

Modelling of DC Links, DC Network, DC Converter, Controller Equations, Solution of DC load flow, P.U. System for DC quantities, solution of AC-DC Power Flow-Simultaneous Method-Sequential method.

UNIT - IV Converter Faults and Protection:

Converter faults, protection against over current and over voltage in converter station, surge arresters, smoothing reactors, DC breakers, Audible noise, space charge field, corona effects on DC lines, Radio interference.

UNIT – V Harmonics:

Generation of Harmonics, Characteristics harmonics, calculation of AC Harmonics, Non-

Characteristics harmonics, adverse effects of harmonics, Calculation of voltage and Current harmonics, Effect of Pulse number on harmonics Filters: Types of AC filters, Design of Single tuned filters –Design of High pass filters.

TEXT BOOKS:

1. "K. R. Padiyar", HVDC Power Transmission Systems: Technology and system Interactions, New Age International (P) Limited, and Publishers, 1990.
2. "S K Kamakshaiah, V Kamaraju", HVDC Transmission, TMH Publishers, 2011
3. "S. Rao", EHVAC and HVDC Transmission Engineering and Practice, Khanna publications, 3 rd Edition 1999.

REFERENCE BOOKS:

1. "Jos Arrillaga", HVDC Transmission, The institution of electrical engineers, IEE power & energy series 29, 2nd edition 1998.
2. "E. W. Kimbark", Direct Current Transmission, John Wiley and Sons, volume 1, 1971.
3. "E. Uhlmann", Power Transmission by Direct Current, B. S. Publications, 2009

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2080234: ADVANCED CONTROL OF ELECTRIC DRIVES
(Professional Elective-VI)

IV Year B.Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Prerequisites: Power Electronics, Power Semiconductor Drives

Course Objectives:

- To know the power electronic converters
- To analyze the various control strategies of power converters for drives control
- To understand the advanced control techniques for DC and AC motor drives
- To go through the control strategies for drives using digital signal processors.

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

- Understand the operation of power electronic converters and their control strategies.
- Understand the vector control strategies for ac motor drives
- Understand the implementation of the control strategies using digital signal processors.

UNIT-I: POWER CONVERTERS FOR AC DRIVES

PWM control of inverter, selected harmonic elimination, space vector modulation, current control of VSI, three level inverter, Different topologies, SVM for 3 level inverter, Diode rectifier with boost chopper, PWM converter as line side rectifier, current fed inverters with self-commutated devices. Control of CSI, H Bridge as a 4-Q drive.

UNIT-II: INDUCTION MOTOR DRIVES

Different transformations and reference frame theory, modelling of induction machines, voltage fed inverter control-v/f control, vector control, direct torque and flux control (DTC).

UNIT-III: SYNCHRONOUS MOTOR DRIVES

Modelling of synchronous machines, open loop v/f control, vector control, direct torque control, CSI fed synchronous motor drives.

UNIT-IV: PERMANENT MAGNET MOTOR DRIVES

Introduction to various PM motors, BLDC and PMSM drive configuration, comparison, block diagrams, Speed and torque control in BLDC and PMSM.

SWITCHED RELUCTANCE MOTOR DRIVES

Evolution of switched reluctance motors; various topologies for SRM drives, comparison, closed loop speed and torque control of SRM.

UNIT-V: DSP BASED MOTION CONTROL

Use of DSPs in motion control, various DSPs available, and realization of some basic blocks in DSP for implementation of DSP based motion control.

TEXT BOOKS:

1. B. K. Bose, “Modern Power Electronics and AC Drives”, Pearson Education, Asia, 2003.
2. P. C. Krause, O. Wasynczuk and S. D. Sudhoff, “Analysis of Electric Machinery and Drive Systems”, John Wiley & Sons, 2013.

REFERENCES:

1. H. A. Taliyat and S. G. Campbell, “DSP based Electromechanical Motion Control”, CRC press, 2003.
2. R. Krishnan, “Permanent Magnet Synchronous and Brushless DC motor Drives”, CRC Press, 2009.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2080235: ESTIMATION & COSTING OF ELECTRICAL SYSTEMS
(Professional Elective-VI)

IV Year B.Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Basic Electrical Engineering, Electrical Workshop, Utilization of Electrical Energy, Power Systems-I, Power Systems-II.

Course Objectives:

- To emphasize the estimation and costing aspects of all electrical equipment, installation and designs on the cost viability.
- To design and estimation of wiring
- To design overhead and underground distribution lines, substations and illumination

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

- Infer various wiring systems and estimate the materials required for domestic wiring
- Estimate the materials required for power loads, irrigation pumps and earthing system
- Understand the design considerations of electrical installations.
- Design electrical installation for buildings and small industries.
- Identify and design the various types of light sources for different applications.
- Estimate materials required for overhead line and distribution substations.

UNIT-I WIRING SYSTEMS AND ESTIMATION OF LIGHTING / DOMESTIC LOAD

Types of house wiring systems - Various types of cables – Various types of Main switches - Different types of fuses, fuse carriers, isolators and MCBs -Types of service mains - Estimation of domestic lighting installation and their specifications - quantity of materials required – Estimation and selection of interior wiring system suitable to a given building.

UNIT-II ESTIMATION OF POWER LOADS, IRRIGATION PUMPS AND EARTHING SYSTEM

Wiring layouts - Estimate for a small workshop - Estimate for the installation of Irrigation pump up to 10 HP - Estimate for the installation of submersible pump - estimation of materials required in electrical Earthing.

UNIT-III ESTIMATION OF OH LINES AND DISTRIBUTION SUBSTATIONS

Distribution lines of 11 kV and 400Volt OH lines - estimation - Cross arms - clamps - insulators - Estimation of quantity of materials required for structures- pole mounted substation and plinth mounted substation –Indian Electricity act 2003.

OVERHEAD AND UNDERGROUND TRANSMISSION AND DISTRIBUTION LINES

Introduction, supports for transmission lines, Distribution lines – Materials used, Underground cables, Mechanical Design of overhead lines, Design of underground cables.

UNIT – IV DESIGN CONSIDERATIONS OF ELECTRICAL INSTALLATIONS

Electric Supply System, Three phase four wire distribution system, Protection of Electric Installation against over load, short circuit and Earth fault, Earthing, General requirements of electrical installations, testing of installations, Indian Electricity rules, Neutral and Earth wire, Types of loads, Systems of wiring, Service connections , Service Mains, Sub-Circuits, Location of Outlets, Location of Control Switches, Location of Main Board and Distribution board, Guide lines for Installation of Fittings, Load Assessment, Permissible voltage drops and sizes of wires, estimating and costing of Electric installations.

UNIT – V ELECTRICAL INSTALLATION FOR DIFFERENT TYPES OF BUILDINGS AND SMALL INDUSTRIES

Electrical installations for residential buildings – estimating and costing of material, Electrical installations for commercial buildings, Electrical installations for small industries.

TEXT BOOKS:

1. "K. B. Raina, S. K. Bhattacharya", "Electrical Design Estimating and Costing", New Age International Publisher, 2010.
2. "Er. V. K. Jain, Er. Amitabh Bajaj", "Design of Electrical Installations", University Science Press.

REFERENCE BOOKS:

1. "Gupta J. B., Katson, Ludhiana", "Electrical Installation, estimating and costing", S. K. Kataria and sons, 2013.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2080236: MACHINE LEARNING TECHNIQUES TO POWER SYSTEM SECURITY
(Professional Elective-VI)

IV Year B.Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Power System-I, Power System-II, Artificial Intelligence.

Course Objectives:

- To Generate new innovative ideas in the Electrical power system field using Machine learning methods.
- To find new methods to improve power system security.
- To Initiate further research by making use of the mathematical theories in power engineering

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

- Understand Machine learning for security assessment and Overview of learning methods.
- Analyse different Artificial Neural Network techniques.
- To know Transient Stability in power system

UNIT-I: INTRODUCTION

Machine learning for security assessment, Overview of security problems, Analytical tools, Overview of learning methods.

COMPUTER BASED LEARNING METHODS

Representation of objects by attributes, Classification problems, Regression problems, Clustering problems, Probabilities.

UNIT-II: MACHINE LEARNING

Introduction, General principles of tree induction, Main variants, Ulg method, Other classes of machine learning methods.

STATISTICAL METHODS

Introduction, Parametric methods, Nonparametric methods, Clustering methods, Data pre-processing.

UNIT-III: ARTIFICIAL NEURAL NETWORKS

Introduction, Multi-Layer Perceptron, Kohonen Feature Maps, Hybrid Approaches, Machine Learning and Neural Networks, Machine Learning and Distance Computations, Comparing Supervised Learning Methods

UNIT-IV: POWER SYSTEM SECURITY PROBLEMS

Applications of learning techniques, Physical phenomena, Problem formulation, Off-line studies, On-line applications, Computing environments, Typical applications, On-line preventive security assessment, Emergency state detection, Random sampling of states.

UNIT-V: TRANSIENT STABILITY

Introduction, EDF System, Effect of Attributes, Quality Improvement, Hydro-Quebec, Transient Stability Power Flow Limits, Global Decision Trees, Quality Improvement, Voltage Security.

TEXT BOOKS:

1. “Machine Learning for Absolute Beginners: A Plain English Introduction”, second edition. 2018.
2. “Machine Learning for Dummies”, John Paul Mueller, Luca Massaron, 2018.

REFERENCES:

1. O’Reilly’ “Hands-On Machine Learning with Scikit-Learn and TensorFlow”, AurélienGéron, 2018.
2. “Pattern Recognition and Machine Learning”, Christoper M. Bishop. 2019.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2080238: PROGRAMMABLE LOGIC CONTROLLERS
(Professional Elective-VI)

IV Year B.Tech EEE – II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Basic Electrical Course or equivalent.

Course Objectives:

- To provide knowledge levels needed for PLC programming and operating.
- To make the students how devices to which PLC input and output modules are connected
- To train the students to create ladder diagrams from process control descriptions.
- To make the students understand various types of PLC registers
- Apply PLC Timers and Counters for the control of industrial processes
- To make the students understand PLC functions, Data Handling Function

Course Outcomes: After completion of this course, the student

- Understand the purpose, functions, and operations of a PLC
- Identify the basic components of the PLC and how they function
- View a directory of processor files using PLC software
- Ability to gain knowledge on Programmable Logic Controllers
- Will understand different types of Devices to which PLC input and output modules are Connected
- To provide the knowledge about understand various types of PLC registers
- Able to create ladder diagrams from process control descriptions
- Ability to apply PLC timers and counters for the control of industrial processes
- Able to use different types PLC functions, Data Handling Function.

UNIT - I

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT - II

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT - III

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT - IV

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT - V

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing, analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

TEXT BOOKS:

1. "John W Webb and Ronald A Reiss", Programmable Logic Controllers – Principle and Applications, PHI, 5 th Edition 2003.
2. "JR Hackworth and F. D Hackworth Jr", Programmable Logic Controllers – Programming Method and Applications by - Pearson, 2004

REFERENCE BOOKS:

1. "W. Bolton", Programmable Logic Controllers, Newnes, 4 th Edition 2000.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

OPEN ELECTIVES:

COURSE	COURSE CODE	SUBJECT NAME
OPEN ELECTIVE-I	2050216	RENEWABLE ENERGY SOURCES
OPEN ELECTIVE-II	2060225	UTILIZATION OF ELECTRICAL ENERGY
OPEN ELECTIVE-III	2070229	ELECTRICAL & HYBRID VEHICLES

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

2050216: RENEWABLE ENERGY SOURCES

III Year B. Tech EEE – I Sem.

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Prerequisites: Power System-I, Power System-II

Course Objectives:

- To recognize the awareness of energy conservation in students
- To understand the concepts and Importance of renewable energy sources such as solar, wind, biomass, tidal power.
- To make the students understand the advantages and disadvantages of different renewable energy sources
- To identify the use of renewable energy sources for electrical power generation

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

- Understand the principles of wind power and solar photovoltaic power generation, fuel cells.
- To understand the basic principle of operations of renewable energy sources.
- To understand the applications of renewable energy sources.
- To understand the technology processes of renewable energy sources.

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UNIT-I Review of Conventional and Non-Conventional Energy Sources

Need for nonconventional energy sources Types of Non- conventional energy sources - Fuel Cells - Principle of operation with special reference to H2 °2 Cell - Classification and Block diagram of fuel cell systems - Ion exchange membrane cell - Molten carbonate cells - Solid oxide electrolyte cells - Regenerative system- Regenerative Fuel Cell - Advantages and disadvantages of Fuel Cells — Polarization - Conversion efficiency and Applications of Fuel Cells.

UNIT-II Solar Energy

Solar radiation and its measurements - Solar Energy collectors -Solar Energy storage systems - Solar Pond - Application of Solar Pond - Applications of solar energy.

UNIT-III Wind Energy

Principles of wind energy conversion systems - Nature of wind - Power in the Wind-Basic components of WECS -Classification of WECS -Site selection considerations -Advantages and disadvantages of WECS -Wind energy collectors - Wind electric generating and control systems - Applications of Wind energy - Environmental aspects.

UNIT-IV Ocean Energy

Ocean Thermal Electric Conversion (OTEC) methods - Principles of tidal power generation - Advantages and limitations of tidal power generation -Ocean waves - Wave energy conversion devices -Advantages and disadvantages of wave energy - Geo-thermal Energy - Types of Geo-thermal Energy Systems - Applications of Geo-thermal Energy.

UNIT-V Biomass Energy

Biomass conversion technologies / processes - Photosynthesis - Photosynthetic efficiency - Biogas generation - Selection of site for Biogas plant - Classification of Biogas plants - Details of commonly used Biogas plants in India - Advantages and disadvantages of Biogas generation -Thermal gasification of biomass -Biomass gasifiers.

TEXT BOOKS:

1. Rai G.D, Non-Conventional Sources of Energy, Khandala Publishers, New Delhi, 1999.
2. M.M.El-Wakil, Power Plant Technology. McGraw Hill, 1984.
3. Felix A. Farret, M. Godoy Simoes, “Integration of Alternative Sources of Energy”, John Wiley& Sons, 2006.
4. Solanki: Renewable Energy Technologies: Practical Guide for Beginneers, PHI Learning Pvt. Ltd., 2008.

REFERENCES:

1. D.Mukherjee: Fundamentals Of Renewable Energy Systems, New Age International publishers, 2007.
2. Remus Teodorescu, Marco Liserre, Pedro Rodríguez: Grid Converters for Photovoltaic and Wind Power Systems, John Wiley & Sons, 2011.
3. Gilbert M. Masters: Renewable and Efficient Electric Power Systems, John Wiley & Sons, 2004.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2060225 UTILIZATION OF ELECTRICAL ENERGY

III Year B. Tech – II Sem.	L	T	P	C
(Open Elective-II)	3	0	0	3

Prerequisite: Electrical Machines-I & Electrical Machines-II

Course Objectives:

- To understand the fundamentals of illumination and good lighting practices
- To understand the methods of electric heating and welding.
- To understand the concepts of electric drives and their application to electrical traction systems.

Course Outcomes:

After completion of this course, the student will be able to

- Acquire knowledge on, electric drives characteristics and their applicability in industry based on the nature of different types of loads and their characteristics
- Understands the concepts and methods of electric heating, welding, illumination and electric traction
- Apply the above concepts to real-world electrical and electronics problems and applications.

UNIT – I Electric Drives:

Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization.

UNIT – II Electric Heating & Welding:

Advantages and methods of electric heating, resistance heating induction heating and dielectric heating. Electric Welding: Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT – III Illumination

Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light. Various Illumination Methods: Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting.

UNIT – IV Electric Traction – I

System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, methods of electric braking-plugging rheostat braking and regenerative braking. Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves.

UNIT – V Electric Traction-II

Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and coefficient of adhesion.

TEXT BOOKS:

1. E. Openshaw Taylor, Utilisation of Electric Energy - by University press, 1961.
2. Partab, H., 'Art and Science of Utilisation of Electrical Energy', Dhanpat Rai and Sons, New Delhi, 1986.

REFERENCE BOOKS:

1. N. V. Suryanarayana, Utilization of Electrical Power including Electric drives and Electric traction, New Age International (P) Limited, Publishers, 1996.
2. C. L. Wadhwa, Generation, Distribution and Utilization of electrical Energy, New Age International (P) Limited, Publishers, 1997.
3. Tripathy, S.C., 'Electric Energy Utilisation and Conservation', Tata McGraw Hill Publishing Company Ltd. New Delhi, 1991

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(AUTONOMOUS)

2070229 ELECTRICAL & HYBRID VEHICLES

(Open Elective-III)

L	T	P	C
3	0	0	3

Prerequisite: Power Semiconductor Drives, Utilization of Electric Power

Course Objectives:

- To understand the fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
- To know the various aspects of hybrid and electric drive train such as their configuration, types of electric machines that can be used energy storage devices, etc.

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

- Understand the models to describe hybrid vehicles and their performance.
- Understand the different possible ways of energy storage.
- Understand the different strategies related to energy storage systems

UNIT - I INTRODUCTION

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.

UNIT - II INTRODUCTION TO HYBRID ELECTRIC VEHICLES

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

HYBRID ELECTRIC DRIVE-TRAINS:

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT - III ELECTRIC TRAINS

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

ELECTRIC PROPULSION UNIT:

Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT - IV ENERGY STORAGE

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of

different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems

UNIT-V: ENERGY MANAGEMENT STRATEGIES

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. CASE STUDIES: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

TEXT BOOKS:

1.C. Mi, M. A. Masrur and D. W. Gao, “Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives”, John Wiley & Sons, 2011.

2.S. Onori, L. Serrao and G. Rizzoni, “Hybrid Electric Vehicles: Energy Management Strategies”, Springer, 2015.

REFERENCES:

1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design”, CRC Press, 2004.
2. T. Denton, “Electric and Hybrid Vehicles”, Routledge, 2016.