## I YEAR

### I SEMESTER

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JNTUH COLLEGE OF ENGINEERING HYDERABAD  
(AUTONOMOUS)  
B.TECH. FOUR YEAR DEGREE COURSE  
(ELECTRICAL AND ELECTRONICS ENGINEERING)  
COURSE STRUCTURE

II YEAR

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II YEAR

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# Course Structure

## III Year

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## III Year

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# JNTUH COLLEGE OF ENGINEERING HYDERABAD  
(AUTONOMOUS)  
B.TECH. FOUR YEAR DEGREE COURSE  
(ELECTRICAL AND ELECTRONICS ENGINEERING)  
COURSE STRUCTURE

## IV YEAR

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## IV YEAR

### II SEMESTER

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Total: 160
Professional Elective-I:
1. Computer Architecture
2. High Voltage Engineering
3. Electric Machine Design

Professional Elective-II:
1. Digital signal processing
2. Power Semiconductor Drives
3. Wind and Solar Energy systems

Professional Elective-III:
1. Digital Control systems
2. Optimization Techniques
3. Electrical and Hybrid Vehicles

Professional Elective-IV:
1. HVDC Transmission
2. Power System Reliability
3. Industrial Electrical Systems

Professional Elective-V:
1. Power Quality & FACTS
2. Control System Design
3. AI Techniques in Electrical Engineering

Professional Elective-VI:
1. Smart Grid Technologies
2. Electrical Distribution Systems
3. Advanced Control of Electric Drives
MATHEMATICS-I  
(LINEAR ALGEBRA AND CALCULUS)

I Year B.Tech. I-Sem  

Pre-requisites: Mathematical Knowledge of 12th/intermediate level

Course Objectives:
1. Types of matrices and their properties.
2. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
3. Concept of Eigen values and Eigenvectors and to reduce the quadratic form to canonical form
4. Concept of Sequence.
5. Concept of nature of the series.
6. Geometrical approach to the mean value theorems and their application to the mathematical problems
7. Evaluation of surface areas and volumes of revolutions of curves.
8. Evaluation of improper integrals using Beta and Gamma functions.
9. Partial differentiation, concept of total derivative
10. Finding maxima and minima of function of two and three variables.

Course Outcomes: After learning the contents of this paper the student must be able to
1. Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations
2. Find the Eigen values and Eigenvectors
3. Reduce the quadratic form to canonical form using orthogonal transformations.
4. Analyze the nature of sequence and series.
5. Solve the applications on the mean value theorems.
6. Evaluate the improper integrals using Beta and Gamma functions
7. Find the extreme values of functions of two variables with/without constraints.

UNIT-I:
MATRICES
Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations, Gauss elimination method; Gauss Seidel Iteration Method.

UNIT-II:
EIGEN VALUES AND EIGEN VECTORS
Linear Transformation and Orthogonal Transformation: 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 and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation

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; Cauchy’s Integral test; Cauchy’s root test; logarithmic test. Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

UNIT-IV:
CALCULUS
Mean value theorems: Rolle’s Theorem, Lagrange’s Mean value theorem with their Geometrical Interpretation and applications, Cauchy’s Mean value Theorem. Taylor’s Series.
Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT-V:
MULTIVARIABLE CALCULUS (PARTIAL DIFFERENTIATION AND APPLICATIONS)
Definitions of Limit and continuity. 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.

TEXT BOOKS:

REFERENCES:
I Year B.Tech. I-Sem

**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.
- To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry.
- To acquire the skills pertaining to spectroscopy and to apply them for medical field etc.
- To impart then 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 field etc.
- The knowledge and configurational and conformational analysis of molecules and reaction mechanisms.

**UNIT-I:**
**MOLECULAR STRUCTURE AND THEORIES OF BONDING**
Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N₂, O₂ and F₂ molecules. π Molecular orbitals of butadiene and benzene.

**UNIT-II:**
**WATER AND ITS TREATMENT**

**UNIT-III:**
**ELECTROCHEMISTRY AND CORROSION**
Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).


UNIT-IV:
STEREOCHEMISTRY, REACTION MECHANISM AND SYNTHESIS OF DRUG MOLECULES

Introduction to representation of 3-dimensional structures, Structural and stereoisomers, configurations, symmetry and chirality. Enantiomers, diastereomers, optical activity and Absolute configuration. Conformation analysis of n- butane.


UNIT-V:
SPECTROSCOPIC TECHNIQUES AND APPLICATIONS


TEXT BOOKS:

REFERENCES:
1. Physical Chemistry, by P.W. Atkins
2. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan
4. Fundamentals of Molecular Spectroscopy, by C.N. Banwell
BASIC ELECTRICAL ENGINEERING

I Year B.Tech. I-Sem

Pre-requisites: --

Course Objectives:
- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To import the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.

Course Outcomes:
- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations

UNIT-I:
D.C. CIRCUITS
Time-domain analysis of first-order RL and RC circuits.

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

UNIT-III:
TRANSFORMERS
Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Autotransformer and three-phase transformer connections.

UNIT-IV:
ELECTRICAL MACHINES
Construction and working of synchronous generators.

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


REFERENCES:

ENGINEERING WORKSHOP

I Year B.Tech. I-Sem

Pre-requisites: Practical skill

Course Objectives:
- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- To practice the process of Installation of operating system windows.

Course Outcomes: At the end of the course, the student will be able to:
- Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, and foundry, house wiring and welding.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
- Apply basic electrical engineering knowledge for house wiring practice.

I. TRADES FOR EXERCISES:
(Any six trades from the following with minimum of two exercises in each trade)
1. Carpentry – 2 Lectures
2. Fitting- 1Lecture
3. Tin-Smithy- 1Lecture
4. Black Smithy-1Lecture
5. House-wiring-1Lecture
6. Foundry- 2 Lectures
7. Plumbing-1Lecture

II. TRADES FOR DEMONSTRATION & EXPOSURE
1. Demonstration of power tools & wiring -1 Lecture
2. Welding – 2 Lecture
3. Machine Shop -2 Lectures

III. IT Workshop I: Computer hardware, identification of parts, Disassembly, Assembly of computer to working Condition, simple diagnostic exercises.

IV. IT Workshop II: Installation of operating system windows and Linux simple diagnostic exercises.

TEXT BOOKS:
1. Workshop Practice by B.L.Juneja Cengage Learning
ENGLISH

I Year B.Tech. I-Sem

INTRODUCTION

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt and for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. The focus in this syllabus is on skill development in the areas of Vocabulary, Grammar, Reading and Writing Skills, fostering ideas and practice of language skills in various contexts.

LEARNING OBJECTIVES

The course will help students to
a. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
b. Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
c. Develop study skills and communication skills in formal and informal situations.

COURSE OUTCOMES

Students should be able to
1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Communicate confidently in various contexts and different cultures.
4. The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

SYLLABUS

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

Unit –I
Vocabulary Building: The Concept of Word Formation --The Use of Prefixes and Suffixes.
Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading.

Unit –II
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.


Unit –III
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: Writing Introduction and Conclusion - Essay Writing.

Unit –IV
Vocabulary: Standard Abbreviations in English
Grammar: Redundancies and Clichés in Oral and Written Communication.
Reading: Comprehension- Intensive Reading and Extensive Reading.
Writing: Writing Practices--Précis Writing.

Unit –V
Vocabulary: Technical Vocabulary and their usage
Grammar: Common Errors in English
Reading: Reading Comprehension-Exercises for Practice

Note: Listening and Speaking skills which are given under Unit-6 are covered in the syllabus of ELCS Lab Course.

References:

iii. English: Context and Culture by Board of Editors published by Orient BlackSwan Pvt. Ltd.
ENGINEERING CHEMISTRY LAB

I Year B.Tech. I-Sem

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Course Objectives:
The chemistry laboratory course consists of experiments related to the principles of chemistry required to the engineering student. The course will make the student to 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 an 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 included in the chemistry laboratory will make the student to gain the skills on

- Determination of parameters like hardness and chloride content in water.
- Estimation of rate constant of a reaction from concentration – time relationships.
- Determination of physical properties like adsorption and viscosity.
- Calculation of $R_f$ values of some organic molecules by TLC technique.

List of Experiments:

1. Determination of total hardness of water by complexometric method using EDTA
2. Determination of chloride content of water by Argentometry
3. Estimation of an HCl by Conductometric titrations
4. Estimation of Acetic acid by Conductometric titrations
5. Estimation of HCl by Potentiometric titrations
6. Estimation of $Fe^{2+}$ by Potentiometry using KMnO$_4$
7. Determination of rate constant of acid catalysed hydrolysis of methyl acetate
8. Synthesis of Aspirin and Paracetamol
9. Thin layer chromatography calculation of $R_f$ values. eg ortho and para nitro phenols
10. Determination of acid value of coconut oil
11. Verification of freundlich adsorption isotherm-adsorption of acetic acid on charcoal
12. Determination of viscosity of castor oil and ground nut oil by using Ostwald’s viscometer.
13. Determination of partition coefficient of acetic acid between n-butanol and water.

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)
ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

I Year B.Tech. I-Sem

The 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:
- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in students’ pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize their mother tongue influence
- To train students to use language appropriately for public speaking and interviews

Course Outcomes: After the end of this course Students will be able to:
- Attain Better understanding of nuances of English language through audio- visual experience and group activities
- Attain Neutralization of accent for intelligibility
- Attain Speaking skills with clarity and confidence which in turn enhances their employability skills

Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:
- Computer Assisted Language Learning (CALL) Lab
- Interactive Communication Skills (ICS) Lab

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

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.
- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills: Objectives
1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
   • Oral practice: Just A Minute (JAM) Sessions
   • Describing objects/situations/people
   • Role play – Individual/Group activities
The following course content is prescribed for the English Language and Communication Skills Lab based on Unit-6 of AICTE Model Curriculum 2018 for B.Tech First English. As the syllabus is very limited, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the Lab.

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.

Exercise-II:
**CALL Lab:**
*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.

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:**
1. Introduction to Interview Skills.
2. Common errors in speaking.
Minimum Requirement of infrastructural facilities for ELCS Lab:

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

System Requirement (Hardware component):
Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

   i) Computers with Suitable Configuration
   ii) High Fidelity Headphones

2. Interactive Communication Skills (ICS) Lab:
   The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public-Address System, a LCD and a projector etc.
BASIC ELECTRICAL ENGINEERING LAB

I Year B.Tech. I-Sem

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Pre-requisites: Basic Electrical Engineering

Course Objectives:
- To analyze a given network by applying various electrical laws and network theorems
- To know the response of electrical circuits for different excitations
- To calculate, measure and know the relation between basic electrical parameters.
- To analyze the performance characteristics of DC and AC electrical machines

Course Outcomes:
- Get an exposure to basic electrical laws.
- Understand the response of different types of electrical circuits to different excitations.
- Understand the measurement, calculation and relation between the basic electrical parameters
- Understand the basic characteristics of transformers and electrical machines.

List of experiments/demonstrations:
1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits for DC excitation
4. Transient Response of RLC Series circuit for DC excitation
5. Resonance in series RLC circuit
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit
11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor
15. No-Load Characteristics of a Three-phase Alternator

TEXT BOOKS:

REFERENCES:
MATHEMATICS-II
(ADVANCED CALCULUS)

I Year B.Tech. II-Sem

L   T    P   C
3     1    0   4

Pre-requisites: Mathematical Knowledge of 12th/intermediate level

Course Objectives:
- Methods of solving the differential equations of first and higher order.
- Evaluation of multiple integrals and their applications
- 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:
- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real world problems
- Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and gravity for cubes, sphere and rectangular parallel piped
- Evaluate the line, surface and volume integrals and converting them from one to another

UNIT-I:
FIRST ORDER ODE
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

UNIT-II:
ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER
Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type $e^{ax}, \sin ax, \cos ax$, polynomials in $x$, $e^{ax}V(x)$ and $xV(x)$; method of variation of parameters; Equations reducible to linear ODE with constant coefficients: Legendre’s equation, Cauchy-Euler equation.

UNIT-III:
MULTIVARIABLE CALCULUS (INTEGRATION)
Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

APPLICATIONS:
Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallel piped).
UNIT-IV: VECTOR DIFFERENTIATION
Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors

UNIT-V: VECTOR INTEGRATION
Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications

TEXT BOOKS:

REFERENCES:
APPLIED PHYSICS

I Year B.Tech. II-Sem

L    T    P    C
3     1    0    4

Course Objectives:
- Understand basic principle of quantum mechanics
- Gain the knowledge of carrier concentration and recombination process of semiconductor materials.
- Learn about various types of optoelectronic devices
- Various types of lasers and significance of optical fibers in communication system
- Learn about material properties like dielectrics and magnetic materials.

Course Outcomes:
- Analyze the wave particle duality and about energy levels and uncertainty principle
- Evaluate the mobility of charge carrier concentration of a given semiconductor material.
- Justify how the graded index optical fiber is more efficient than step index optical fiber in fiber optic communication system.
- Will be to learn about working of LED, solar cell and photo detector
- Gain the knowledge and applications of dielectric and magnetic materials

UNIT-I:
QUANTUM MECHANICS
Introduction to quantum physics, Black body radiation, Planck’s law, photoelectric effect Compton effect, wave-particle duality, de Broglie hypothesis, Davission 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, potential barrier.

UNIT-II:
SEMICONDUCTOR PHYSICS

UNIT-III:
OPTOELECTRONICS

UNIT- IV:
LASERS AND FIBRE OPTICS
UNIT-V:
DIELECTRIC AND MAGNETIC PROPERTIES OF MATERIALS

TEXT BOOKS:

REFERENCES:
1. Richard Robinett, Quantum Mechanics.
3. Online Course: “Optoelectronic Materials and Devices” by Monica Katiyar and Deepak Gupta on NPTEL.
PROGRAMMING FOR PROBLEM SOLVING

I Year B.Tech. II-Sem

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: After the end of this course student able to:
- Write algorithms and to draw flowcharts for solving problems.
- Translate the algorithms/flowcharts to programs (in C language).
- Code and test a given logic in C programming language.
- Formulate simple algorithms for arithmetic and logical problems.
- Decompose a problem into functions and to develop modular reusable code.
- Use arrays, pointers, strings and structures to formulate algorithms and programs.
- Searching and sorting problems.

UNIT-I:
INTRODUCTION TO C LANGUAGE – Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples.

UNIT-II:
STATEMENTS – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Simple C Programming examples.
DESIGNING STRUCTURED PROGRAMS- Functions, basics, user defined functions, inter function communication, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C programs

UNIT-III:
ARRAYS AND STRINGS – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C program examples. Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

UNIT-IV:
POINTERs – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments.
INPUT AND OUTPUT – Concept of a file, streams, standard input / output functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (error handling), C program examples.
UNIT-V:
**DERIVED TYPES** – Structures – Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit fields, enumerated types, C programming examples.

**SORTING AND SEARCHING** – Selection sort, Bubble sort, Insertion sort, Linear search and Binary search methods.

**TEXT BOOKS:**

3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/ Pearson Education

**REFERENCES:**

3. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
ENGINEERING GRAPHICS

I Year B.Tech. II-Sem

Pre-requisites: Nil

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

Course Outcomes: At the end of the course, the student will be able to:
- Preparing working drawings to communicate the ideas and information.
- Read, understand and interpret engineering drawings.

UNIT-I:
INTRODUCTION TO ENGINEERING DRAWING

UNIT-II:
ORTHOGRAPHIC PROJECTIONS:

UNIT-III:
Projections of Regular Solids – Auxiliary Views.

UNIT-IV
Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere. Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone

UNIT-V:
ISOMETRIC PROJECTIONS :
Auto CAD: Basic principles only

TEXT BOOKS:
1. Engineering Drawing N.D. Bhatt / Charotar

REFERENCES:
1. A Text Book of Engineering Drawing / Dhawan R K / S. Chand
APPLIED PHYSICS LAB

I Year B.Tech. II-Sem

Course Objectives:
- To provide an experimental foundation for the theoretical concepts introduced in the lectures.
- To teach how to make careful experimental observations and how to think about and draw conclusions from such data.
- To help students understand the role of direct observation in physics and to distinguish between inferences based on theory and the outcomes of experiments.

Course Outcomes: At the end of the course students will be able:
1. Make careful experimental observations and draw conclusions from such data.
2. Distinguish between inferences based on theory and the outcomes of experiments.
3. Write a technical report which communicates scientific information in a clear and concise manner.

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. Light emitting diode: Plot V-I and P-I characteristics of light emitting diode.
4. Stewart – Gee’s experiment: Determination of magnetic field along the axis of a current carrying coil.
5. Hall Effect: To determine Hall co-efficient of a given semiconductor.
6. Photoelectric effect: To determine work function of a given material.
7. LASER: To study the characteristics of LASER sources.
8. Optical fiber: To determine the bending losses of Optical fibers.
9. LCR Circuit: To determine the Quality factor of LCR Circuit.
10. R-C Circuit: To determine the time constant of R-C circuit.
11. BJT: Characteristics of NPN transistor.
12. Zener diode: To study the V-I Characteristics of Zener diode.

Note: Any 8 experiments are to be performed by each student.
PROGRAMMING FOR PROBLEM SOLVING LAB

I Year B.Tech. II-Sem

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: At the end of this course student will able to:
- Write algorithms and to draw flowcharts for solving problems.
- Translate the algorithms/flowcharts to programs (in C language).
- Code and test a given logic in C programming language.
- Formulate simple algorithms for arithmetic and logical problems.
- Decompose a problem into functions and to develop modular reusable code.
- Use arrays, pointers, strings and structures to formulate algorithms and programs.
- Searching and sorting problems.

Week 1:
1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to find the roots of a quadratic equation.

Week 2:
5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Week 3:
9. Write a C program to find both the largest and smallest number in a list of integers.
10. Write a C program that uses functions to perform the following:
    i) Addition of Two Matrices    ii) Multiplication of Two Matrices

Week 4:
11. Write a C program that uses functions to perform the following operations:
    i) To insert a sub-string in to a given main string from a given position.
    ii) To delete n Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not
13. Write a C program that displays the position or index in the string S where the string T begins, or −1 if S doesn’t contain T.
14. Write a C program to count the lines, words and characters in a given text.
Week 5:
15. Write a C program to generate Pascal’s triangle.
16. Write a C program to construct a pyramid of numbers.
17. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:

\[ 1 + x + x^2 + x^3 + \ldots + x^n \]

For example: if n is 3 and x is 5, then the program computes 1+5+25+125.
  Print x, n, the sum
  Perform error checking.
  For example, the formula does not make sense for negative exponents – if n is less than 0.
  Have your program print an error message if n<0, then go back and read in the next pair of numbers of
  Without computing the sum. Are any values of x also illegal? If so, test for them too.

Week 6:
18. 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2’s complement of 11100 is 00100. Write a C program to find the 2’s complement of a binary number.
19. Write a C program to convert a Roman numeral to its decimal equivalent.

Week 7:
20. Write a C program that uses functions to perform the following operations:
   i) Reading a complex number
   ii) Writing a complex number
   iii) Addition of two complex numbers
   iv) Multiplication of two complex numbers
   (Note: represent complex number using a structure.)

Week 8:
21. . i) Write a C program which copies one file to another.
   ii) Write a C program to reverse the first n characters in a file.
   (Note: The file name and n are specified on the command line.)
22. . i) Write a C program to display the contents of a file.
   ii) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of
       the second are put in the third file)

Week 9:
23. Write a C 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

Week 10:
24. Write C programs 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
TEXT BOOKS:
3. The C Programming Language, B.W. Kernighan and Dennis M. Ritchie, PHI/Pearson Education

REFERENCES:
3. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
MATHEMATICS-III
(NUMERICAL METHODS AND COMPLEX VARIABLES)

II Year B.Tech. I-Sem

L  T  P  C
3  1  0  4

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

Course Objectives:
- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- Various methods to the find roots of an equation.
- Concept of finite differences and to estimate the value for the given data using interpolation.
- Evaluation of integrals using numerical techniques
- Solving ordinary differential equations using numerical techniques.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy’s integral formula and Cauchy’s residue theorem.
- Expansion of complex functions using Taylor’s and Laurent’s series.

Course Outcomes: After learning the contents of this paper the student must be able to
- Use the Laplace transforms techniques for solving ODE’s
- Find the root of a given equation.
- Estimate the value for the given data using interpolation
- Find the numerical solutions for a given ODE’s
- Analyze the complex function with reference to their analyticity, integration using Cauchy’s integral and residue theorems
- Taylor’s and Laurent’s series expansions of complex function

UNIT-I: LAPLACE TRANSFORMS
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.

UNIT-II: NUMERICAL METHODS-I
Solution of polynomial and transcendental equations – Bisection method, Iteration Method, Newton-Raphson method and Regula-Falsi method.
Finite differences- forward differences- backward differences-central differences-symbolic relations and separation of symbols; Interpolation using Newton’s forward and backward difference formulae. Central difference interpolation: Gauss’s forward and backward formulae; Lagrange’s method of interpolation
UNIT-III:
NUMERICAL METHODS-II
Ordinary differential equations: Taylor’s series; Picard’s method; Euler and modified Euler’s methods;
Runge-Kutta method of fourth order.

UNIT-IV:
COMPLEX VARIABLES (DIFFERENTIATION)
Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof),
Milne- Thomson methods, analytic functions, harmonic functions, finding harmonic conjugate;
elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

UNIT-V:
COMPLEX VARIABLES (INTEGRATION)
Line integrals, Cauchy’s theorem, Cauchy’s Integral formula, Liouville’s theorem, Maximum-Modulus
theorem (All theorems without proof); zeros of analytic functions, singularities, Taylor’s series, Laurent’s
series; Residues, Cauchy Residue theorem (without proof)

TEXT BOOKS:

REFERENCES:
Computations, New Age International publishers.
ELECTRICAL CIRCUIT ANALYSIS

II Year B.Tech. EEE I-Sem

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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 behavior.

UNIT-I:
NETWORK 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 and AC Excitations.

UNIT-III:
SINUSOIDAL STEADY STATE ANALYSIS
Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer.

UNIT-IV:
ELECTRICAL CIRCUIT ANALYSIS USING LAPLACE TRANSFORMS
UNIT-V:
TWO PORT NETWORK AND NETWORK FUNCTIONS
Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks.

TEXT BOOKS:

REFERENCES:
ANALOG ELECTRONICS

II Year B.Tech. I-Sem

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Prerequisite: -

Course Objectives:
- To introduce components such as diodes, BJT s 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.
- A thorough understanding, functioning of OP-AMP, design OP-AMP based circuits with linear integrated circuits.

UNIT-I:
DIODE CIRCUITS
P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, clamping 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,

UNIT-II:
MOSFET CIRCUITS
MOSFET structure and I-V 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.

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

UNIT-IV:
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.

TEXT BOOKS:

REFERENCES:
ELECTRICAL MACHINES-I

II Year B.Tech. I-Sem

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Prerequisite: Basic Electrical Engineering

Course Objectives:
- To study and understand different types of DC generators, Motors and Transformers, their construction, operation and applications.
- To analyze performance aspects of various testing methods.

Course Outcomes: At the end of this course, students will demonstrate the ability to
- Identify different parts of a DC machine & understand its operation
- Carry out different testing methods to predetermine the efficiency of DC machines
- Understand different excitation and starting methods of DC machines
- Control the voltage and speed of a DC machines
- Analyze single phase and three phase transformers circuits.

UNIT-I:
D.C. GENERATORS

UNIT-II:
D.C MOTORS

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. motor 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.
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 – Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and openΔ

TEXT BOOKS:

REFERENCES:
ELECTRO MAGNETIC FIELDS

II Year B.Tech. I-Sem

Prerequisite: Mathematics-II (Ordinary Differential Equations and Multivariable Calculus) & Applied Physics

Course Objectives:
- To introduce the concepts of electric field and magnetic field.
- Applications of electric and magnetic fields in the development of the theory for power transmission lines and electrical machines.

Course Outcomes:
At the end of the course, students will demonstrate the ability
- To understand the basic laws of electromagnetism.
- To obtain the electric and magnetic fields for simple configurations under static conditions.
- To analyze time varying electric and magnetic fields.
- To understand Maxwell’s equation in different forms and different media.
- To understand the propagation of EM waves.

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.

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.

UNIT-III:
STATIC MAGNETIC FIELDS AND MAGNETIC FORCES

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.
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. Poynting theorem.

TEXT BOOKS:

REFERENCES:
ELECTRICAL MACHINES LAB– I

II Year B.Tech. I-Sem

Prerequisite: Electrical Machines-I

Course Objectives:
- To expose the students to the operation of DC Generator
- To expose the students to the operation of DC Motor.
- To examine the self excitation in DC generators.

Course Outcomes: After completion of this lab the student is able to
- Start and control the Different DC Machines.
- Assess the performance of different machines using different testing methods
- Identify different conditions required to be satisfied for self - excitation of DC Generators.
- Separate iron losses of DC machines into different components

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)

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

9. Brake test on DC shunt motor (Determination of performance curves)
10. Retardation test on DC shunt motor (Determination of losses at rated speed)

TEXT BOOKS:

REFERENCES:
ANALOG ELECTRONICS LAB

II Year B.Tech. I-Sem

Prerequisite: 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, casceded, 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.
- A thorough understanding, functioning of OP-AMP, design OP-AMP based circuits with linear integrated circuits.

List of Experiments
1. PN Junction diode characteristics A) Forward bias B) 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
11. Current Shunt Feedback amplifier
12. RC Phase shift Oscillator
13. Hartley and Colpitt’s Oscillators
14. Class A power amplifier
ELECTRICAL CIRCUITS LAB

II Year B.Tech. I-Sem

Prerequisite: Basic Electrical Engineering, Electrical Circuit 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 Thevenin’s and Norton’s Theorems
2. Verification of Superposition, Reciprocity and Maximum Power Transfer theorems
3. Locus Diagrams of RL and RC Series Circuits
4. Series and Parallel Resonance
7. Two port network parameters – A, B, C, D & Hybrid parameters, Analytical verification

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

9. Verification of compensation & Milliman’s theorems
10. Harmonic Analysis of non-sinusoidal waveform signals using Harmonic Analyzer and plotting frequency spectrum.
11. Determination of form factor for non-sinusoidal waveform
12. Measurement of Active Power for Star and Delta connected balanced loads
13. Measurement of Reactive Power for Star and Delta connected balanced loads

TEXT BOOKS:

REFERENCES:
CONSTITUTION OF INDIA

III Year B.Tech. II-Sem

Pre-Requisites: Nil
Course Objectives: Students will be able to:
1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution

UNIT – I:
History of Making of the Indian Constitution:
- History
- Drafting Committee, (Composition & Working)

Philosophy of the Indian Constitution:
- Preamble
- Salient Features

UNIT – II:
Contours of Constitutional Rights & Duties:
- Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties

UNIT – III:
Organs of Governance:
- Parliament
- Composition
- Qualifications and Disqualifications
- Powers and Functions
Executive:
- President
- Governor
- Council of Ministers
- Judiciary, Appointment and Transfer of Judges, Qualifications
- Powers and Functions

UNIT – IV:
Local Administration:
- District’s Administration head: Role and Importance,
- Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation.
- Elected officials and their roles, CEO ZilaPachayat: Position and role.
- Block level: Organizational Hierarchy (Different departments),
- Village level: Role of Elected and Appointed officials,
- Importance of grass root democracy

UNIT – V:
Election Commission:
- Election Commission: Role and Functioning.
- Chief Election Commissioner and Election Commissioners.
- State Election Commission: Role and Functioning.
- Institute and Bodies for the welfare of SC/ST/OBC and women.

Text Books:
1. The Constitution of India, 1950 (Bare Act), Government Publication.

Course Outcomes:
Students will be able to:
1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
Discuss the passage of the Hindu Code Bill of 1956
ENGINEERING MECHANICS

II Year B.Tech. II-Sem

Prerequisites: Nil

Course Objectives:
- Work comfortably with basic engineering mechanics concepts required for analyzing static structures
- Identify an appropriate structural system to studying a given problem and isolate it from its environment.
- Model the problem using good free-body diagrams and accurate equilibrium equations
- Identify and model various types of loading and support conditions that act on structural systems.
- Apply pertinent mathematical, physical and engineering mechanical principles to the system to solve and analyze the problem.
- Understand the meaning of centers of gravity (mass)/centroids and moments of Inertia using integration methods.
- Communicate the solution to all problems in an organized and coherent manner and elucidate the meaning of the solution in the context of the problem.

Course Outcomes: At the end of the course, the student will be able to:
- Solve problems dealing with forces in a plane or in space and equivalent force Systems.
- Solve beam and cable problems and understand distributed force systems.
- Solve friction problems and determine moments of Inertia and centroid using integration methods.
- Understand and know how to solve three-dimension force and moment problems.
- Understand and know how to use vector terminology.

UNIT-I:
INTRODUCTION OF ENGINEERING MECHANICS

UNIT-II:
FRICION

UNIT-III:
CENTROID AND CENTER OF GRAVITY
Centroids – Theorem of Pappus- Centroids of Composite figures – Centre of Gravity of Bodies.
AREA MOMENT OF INERTIA
Polar Moment of Inertia – Transfer Theorem - Moment of Inertia of Composite Figures.

UNIT-IV:
KINEMATICS
Introduction – Rectilinear motion – Motion with uniform and variable acceleration – Curvilinear motion – Components of motion –Projectiles- Instantaneous centre.
UNIT-V:

KINETICS


TEXT BOOKS:

1. Singers Engineering Mechanics by Dr K. Vijayakumar Reddy and Dr. J. Suresh Kumar, BS Publications
2. Engineering Mechanics by S.Timoshenko and DH Young, Tata Mc Hill

REFERENCES:

4. Engineering Mechanics (Statics and Dynamics) by Hibbler; Pearson Education.
ELECTRICAL MACHINES – II

II Year B.Tech. II-Sem

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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 applications in 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 machines-production of a rotating magnetic field - principle of operation - rotor EMF and rotor frequency - rotor reactance, rotor current and Power factor at standstill and during operation.

UNIT-II:
CHARACTERISTICS OF INDUCTION MACHINES
Rotor power input, rotor copper loss and mechanical power developed and their inter relation-torque equation-deduction from torque equation - expressions for maximum torque and starting torque - torque slip characteristic - equivalent circuit - phasor diagram - crawling and coggng -.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 an EMF into rotor circuit (qualitative treatment only)-induction generator-principle of operation.

UNIT-III:
SYNCHRONOUS MACHINES
UNIT-IV:
PARALLEL OPERATION OF SYNCHRONOUS MACHINES

UNIT-V:
SINGLE PHASE & SPECIAL MACHINES

TEXT BOOKS:

REFERENCES:
DIGITAL ELECTRONICS

II Year B.Tech. II-Sem

Prerequisite: 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.
- To implement synchronous state machines using flip-flops.

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.

UNIT-I:
FUNDAMENTALS OF DIGITAL SYSTEMS AND LOGIC FAMILIES
Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one’s and two’s complements arithmetic, codes, error detecting and correcting codes, characteristics of digital ICs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.

UNIT-II:
COMBINATIONAL DIGITAL CIRCUITS
Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don’t care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial ladder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

UNIT-III:
SEQUENTIAL CIRCUITS AND SYSTEMS
A 1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J- K-T and D-types flipflops, applications of flipflops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC’s, asynchronous sequential counters, applications of counters.
UNIT-IV:
A/D AND D/A CONVERTERS
Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs

UNIT-V:
SEMICONDUCTOR MEMORIES AND PROGRAMMABLE LOGIC DEVICES
Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

TEXT BOOKS:

REFERENCES:
CONTROL SYSTEMS

II Year B.Tech. II-Sem

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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 modeling 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.

UNT-I:
INTRODUCTION TO CONTROL PROBLEM

UNT-II:
TIME RESPONSE ANALYSIS OF STANDARD TEST SIGNALS.

UNT-III:
FREQUENCY-RESPONSE ANALYSIS

UNT-IV:
INTRODUCTION TO CONTROLLER DESIGN
UNT-V:
STATE VARIABLE ANALYSIS AND CONCEPTS OF STATE VARIABLES

TEXT BOOKS:

REFERENCES:
POWER SYSTEM-I

II Year B.Tech. II-Sem

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

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


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.

UNIT-III:
OVERHEAD LINE INSULATORS & INSULATED 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.

UNIT-IV:
INDUCTANCE & CAPACITANCE CALCULATIONS OF TRANSMISSION LINES
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.

**UNIT-V:**

**AC 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 A.C. 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.- Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor.

**TEXT BOOKS:**


**REFERENCES:**

DIGITAL ELECTRONICS LAB

II Year B.Tech. II-Sem

Prerequisite: 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.
- To implement synchronous state machines using flip-flops.

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.

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.
8. Design and realization a Synchronous and Asynchronous counters 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. State machines

TEXT BOOKS:


REFERENCES:

**ELECTRICAL MACHINES LAB—II**

**II Year B.Tech. II-Sem**

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<td>Prerequisite:</td>
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Prerequisite: Electrical Machines – I & Electrical Machines - II

**Course Objectives:**

- To understand the operation of synchronous machines
- To understand the analysis of power angle curve of a synchronous machine
- To understand the equivalent circuit of a single phase transformer and single phase induction motor
- To understand the circle diagram of an induction motor by conducting a blocked rotor test.

**Course Outcomes:** After the completion of this laboratory course, the student will be able

- Assess the performance of different machines using different testing methods
- To convert the Phase from three phase to two phase and vice versa
- Compensate the changes in terminal voltages of synchronous generator after estimating the change by different methods
- Control the active and reactive power flows in synchronous machines
- Start different machines and control the speed and power factor

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 Xd and Xq 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
7. Vector grouping of Three Transformer
8. Scott Connection of transformer

**TEXT BOOKS:**


**REFERENCES:**


CONTROL SYSTEMS LAB

II Year B.Tech. II-Sem

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.
7. Design of Lead-Lag compensator for the given system and with specification using suitable software

TEXT BOOKS:

REFERENCES:
POWER ELECTRONICS

III Year B.Tech. I-Sem

Prerequisite: Analog Electronics, Digital 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: At the end of this course students will demonstrate the ability to

- Understand the differences between signal level and power level devices.
- Analyze controlled rectifier circuits.
- Analyze the operation of DC-DC choppers.
- Analyze the operation of voltage source inverters.

UNIT-I:
POWER SWITCHING DEVICES
Concept of power electronics, scope and applications, types of power converters; Power semiconductor switches and their V-I characteristics - Power Diodes, Power BJT, SCR, Power MOSFET, Power IGBT; Thyristor ratings and protection, methods of SCR commutation, UJT as a trigger source, gate drive circuits for BJT and MOSFETs

UNIT-II:
AC-DC CONVERTERS (PHASE CONTROLLED RECTIFIERS)

UNIT-III:
DC-DC CONVERTERS (CHOPPER/SMPS)
Introduction, elementary chopper with an active switch and diode, concepts of duty ratio, average inductor voltage, average capacitor current. Buck converter - Power circuit, analysis and waveforms at steady state, duty ratio control of output voltage. Boost converter - Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage. Buck-Boost converter - Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

UNIT-IV:
AC-DC CONVERTERS (INVERTERS)
Introduction, principle of operation, performance parameters, single phase bridge inverters with R, RL loads, 3-phase bridge inverters - 120 and 180 degrees mode of operation, Voltage control of single phase inverters -single pulse width modulation, multiple pulse width modulation, sinusoidal pulse width modulation.
UNIT-V:
AC-AC CONVERTERS

TEXT BOOKS:

REFERENCES:
POWER SYSTEM – II

III Year B.Tech. I-Sem

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 LINES
Representation of lines, short transmission lines, medium length lines, nominal T and PI- representations, long transmission lines. The 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.

UNIT-II:

VOLTAGE CONTROL
Introduction – 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.

UNIT-III:

PER UNIT REPRESENTATION OF POWER SYSTEMS
The one line diagram, impedance and reactance diagrams, per unit quantities, changing 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.
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.

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, 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.

TEXT BOOKS:

REFERENCES:
MEASUREMENTS AND INSTRUMENTATION

III Year B.Tech. I-Sem

Pre-requisite: Basic Electrical Engineering, Analog Electronics, Electrical Circuit 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.

UNIT-II:
POTENTIOMETERS & INSTRUMENT TRANSFORMERS

UNIT-III:
MEASUREMENT OF POWER & ENERGY

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.
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

TEXT BOOKS:

REFERENCES:
COMPUTER ARCHITECTURE
(Professional Elective-I)

III Year B.Tech. I-Sem

Prerequisite: Digital Electronics

Course Objectives:

- To understand basic components of computers.
- To understand the architecture of 8086 processor.
- To understand the instruction sets, instruction formats and various addressing modes of 8086.
- To understand the representation of data at the machine level and how computations are performed at machine level.
- To understand the memory organization and I/O organization.
- To understand the parallelism both in terms of single and multiple processors.

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

- Understand the concepts of microprocessors, their principles and practices.
- Write efficient programs in assembly language of the 8086 family of microprocessors.
- Organize a modern computer system and be able to relate it to real examples.
- Develop the programs in assembly language for 80286, 80386 and MIPS processors in real and protected modes.
- Implement embedded applications using ATOM processor.

UNIT-I:
INTRODUCTION TO COMPUTER ORGANIZATION
Architecture and function of general computer system, CISC Vs RISC, Data types, Integer Arithmetic - Multiplication, Division, Fixed and Floating point representation and arithmetic, Control unit operation, Hardware implementation of CPU with Micro instruction, microprogramming, System buses, Multi-bus organization.

UNIT-II:
MEMORY ORGANIZATION
System memory, Cache memory - types and organization, Virtual memory and its implementation, Memory management unit, Magnetic Hard disks, Optical Disks.

INPUT – OUTPUT ORGANIZATION

UNIT-III:
16 AND 32 MICROPROCESSORS
80x86 Architecture, IA – 32 and IA – 64, Programming model, Concurrent operation of EU and BIU, Real mode addressing, Segmentation, Addressing modes of 80x86, Instruction set of 80x86, I/O addressing in 80x86

UNIT-IV:
Pipelining
Introduction to pipelining, Instruction level pipelining (ILP), compiler techniques for ILP, Data hazards, Dynamic scheduling, Dependability, Branch cost, Branch Prediction, Influence on instruction set.
UNIT-V:
DIFFERENT ARCHITECTURES
VLIW Architecture, DSP Architecture, SoC architecture, MIPS Processor and programming

TEXT BOOKS:

REFERENCES:
HIGH VOLTAGE ENGINEERING
(Professional Elective-I)

III Year B.Tech. I-Sem

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.

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.

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.

UNIT-IV:
LIGHTNING AND SWITCHING OVER-VOLTAGES
Charge formation in clouds, Stepped leader, Dart leader, Lightning Surges. Switching overvoltages, Protection against over-voltages, Surge diverters, Surge modifiers.
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.

TEXT BOOKS:

REFERENCES:
4. Various IS standards for HV Laboratory Techniques and Testing
ELECTRICAL MACHINE DESIGN
(Professional Elective-I)

III Year B.Tech. I-Sem

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: 

REFERENCES: 
5. Electrical machines and equipment design exercise examples using Ansoft’s Maxwell 2D machine 
   design package.
BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

III Year B.Tech. I-Sem

Course Objectives:
- To prepare engineering students to analyze cost/revenue/financial data
- To make economic and financial analysis in decision making process
- To examine the performance of companies engaged in engineering.

Course Outcomes:
- To Perform and evaluate present and future worth of the alternate projects and to Appraise projects by using traditional and DCF Methods. To Carry out cost benefit analysis of projects and to calculate BEP of different alternative projects.

UNIT-I:

UNIT-II:

UNIT-III:

UNIT-IV:
CAPITAL BUDGETING TECHNIQUES: Significance of Capital Budgeting - cash flows-Time Value of Money- Choosing between alternative investment proposals- Methods of Appraisal Techniques- Pay Back Period - Average Rate of Return – Net Present Value- Internal Rate of Return – Profitability Index.

UNIT-V:

TEXT BOOKS:

REFERENCES:
ELECTRICAL SIMULATION LAB

III Year B.Tech. I-Sem

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Prerequisite: Basic Electrical Engineering, Electrical Circuit Analysis, Control Systems, Power Electronics, Measurements and Instrumentation

Course Objectives:
- To develop the simulation skills.
- To generate various signals and synthesis for the engineering systems.
- To analyze harmonics in the systems.
- To analyze electrical circuit in simulation environment.

Course Outcomes: After going through this lab the student will be able to
- Apply signal generation in different systems.
- Analyze networks by various techniques
- Analyze circuit responses
- Analyze bridge rectifiers
- Analyze control systems problems
- Analyze basic converters and inverters

The following experiments are required to be conducted compulsory experiments:
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. Mesh and Nodal Analysis of Electrical circuits
5. Application of Network Theorems to Electrical Networks
6. Waveform Synthesis using Laplace Transform
7. Locating the Zeros and Poles and Plotting the Pole-Zero maps in S plane and Z-Plane for the given transfer function
8. Harmonic analysis of non sinusoidal waveforms

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted.
9. Simulation of DC Circuits
10. Transient Analysis
11. Measurement of active Power of three phase circuit for balanced and unbalanced load
12. Simulation of single phase diode bridge rectifiers with filter for R & RL load
13. Simulation of three phase diode bridge rectifiers with R, RL load
14. Design of Low Pass and High Pass filters
15. Finding the Even and Odd parts of Signal / Sequence and Real and imaginary parts of Signal
16. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum
17. Design of first and second order circuits in time and frequency domain
18. Design and analysis of feedback control systems
19. Design of Single Phase Inverters
20. Design of Single Phase Converters
POWER ELECTRONICS LAB

III Year B.Tech. I-Sem

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

Any eight experiments should be conducted
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 Cyclo-converter 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
9. DC Jones chopper with R and RL Loads
10. Three Phase half controlled bridge converter with R-load
11. Single Phase dual converter with RL loads
12. (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
13. (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
14. Simulation of Buck chopper
15. Simulation of single phase Inverter with PWM control
17. Study of PWM techniques

TEXT BOOKS:
2. User’s manual of related software’s

REFERENCES:
1. Reference guides of related software’s
2. Rashid, Spice for power electronics and electric power, CRC Press
MEASUREMENTS AND INSTRUMENTATION LAB

III Year B.Tech. I-Sem

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
2. Calibration of dynamometer power factor meter.
5. Dielectric oil testing using H.T. testing Kit.
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.
14. Transformer turns ratio measurement using AC bridges.
15. Measurement of % ratio error and phase angle of given CT by comparison.

TEXT BOOKS:
REFERENCES:
ADVANCED COMMUNICATION SKILLS LAB

III Year B.Tech. I-Sem

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 globalised context.
The proposed course should be a laboratory course to enable students to use ‘good’ English and perform the 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 following targets:
- 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:
1. 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.
2. Activities on Reading Comprehension – General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/e-mails/assignments etc.

5. **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 infrastructural facilities to accommodate at least 35 students in the lab:
- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- 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:**

**REFERENCES:**
DIGITAL SIGNAL PROCESSING
(Professional Elective-II)

III Year B.Tech. II-Sem

Pre-requisites: Laplace Transforms, Numerical Methods and Complex variables, Control Systems

Course Objectives:
- To provide background and fundamental material for the analysis and processing of digital signals.
- To familiarize the relationships between continuous-time and discrete time signals and systems.
- To study fundamentals of time, frequency and Z-plane analysis and to discuss the inter-relationships of these analytic method.
- To study the designs and structures of digital (IIR and FIR) filters from analysis to synthesis for a given specifications.
- The impetus is to introduce a few real-world signal processing applications.
- To acquaint in FFT algorithms, Multi-rate signal processing techniques and finite word length effects.

Course Outcomes: On completion of this subject, the student should be able to:
- Perform time, frequency, and Z -transform analysis on signals and systems.
- Understand the inter-relationship between DFT and various transforms.
- Understand the significance of various filter structures and effects of round off errors.
- Design a digital filter for a given specification.
- Understand the fast computation of DFT and appreciate the FFT processing.
- Understand the tradeoffs between normal and multi rate DSP techniques and finite length word effects.

UNIT-I:
INTRODUCTION
Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Normalized Frequency, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems


UNIT-II:
DISCRETE FOURIER TRANSFORMS

UNIT-III:
**IIR DIGITAL FILTERS**

UNIT-IV:
**FIR DIGITAL FILTERS**

UNIT-V:
**MULTI-RATE DIGITAL SIGNAL PROCESSING**
Introduction, Down Sampling, Decimation, Upsampling, Interpolation, Sampling Rate Conversion, Conversion of Band Pass Signals, Concept of Resampling, Applications of Multi Rate Signal Processing.

**FINITE WORD LENGTH EFFECTS:** Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round off Noise, Methods to Prevent Overflow, Tradeoff between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

**TEXT BOOKS:**

**REFERENCES:**
III Year B.Tech. II-Sem

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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 d.c 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

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:

REFERENCES:
WIND AND SOLAR ENERGY SYSTEMS  
(Professional Elective-II)

III Year B.Tech. II-Sem  
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Prerequisite: Renewable Energy Systems

Course Objectives:
- To study the physics of wind power and energy
- To understand the principle of operation of wind generators
- To know the solar power resources
- To analyze the solar photo-voltaic cells
- To discuss the solar thermal power generation
- To identify the network integration issues

Course Outcomes: At the end of this course, students will demonstrate the ability to
- Understand the energy scenario and the consequent growths of the power generate renewable energy sources.
- Understand the basic physics of wind and solar power generation.
- Understand the power electronic interfaces for wind and solar generation.
- Understand the issues related to the grid-integration of solar and wind energy systems

UNIT-I:  
PHYSICS OF WIND POWER  
History of wind power, Indian and Global statistics, Wind physics, Betz limit ratio, stall and pitch control, Wind speed statistics-probability distributions, and Wind power-cumulative distribution functions.

UNIT-II:  
WIND GENERATOR TOPOLOGIES  

UNIT-III:  
THE SOLAR RESOURCE  
Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

SOLAR PHOTOVOLTAIC  

UNIT-IV:  
NETWORK INTEGRATION ISSUES  
Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems.
UNIT-V:
SOLAR THERMAL POWER GENERATION
Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.

TEXT BOOKS:

REFERENCES:
SIGNS AND SYSTEMS

III Year B.Tech. II-Sem

Prerequisite: Digital Signal Processing, Control Systems, Laplace Transforms, Numerical Methods and Complex variables

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

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.

UNIT-I:
INTRODUCTION TO SIGNALS AND SYSTEMS
Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, reliability. Examples.

UNIT-II:
BEHAVIOR OF CONTINUOUS AND DISCRETE-TIME LTI SYSTEMS

UNIT-III:
FOURIER TRANSFORMS
UNIT-IV:
LAPLACE AND Z-TRANSFORMS
Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

UNIT-V:
SAMPLING AND RECONSTRUCTION

TEXT BOOKS:

REFERENCES:
MICROPROCESSORS AND MICROCONTROLLERS

III Year B.Tech. II-Sem

Prerequisite: Computer Architecture, Digital Electronics

Course Objectives:
- To develop an understanding of the operations of microprocessors and micro controllers; machine language programming and interfacing techniques.

Course Outcomes:
- Understands the internal architecture and organization of 8086, 8051 and ARM processors/controllers.
- Understands the interfacing techniques to 8086 and 8051 and can develop assembly language programming to design microprocessor/ micro controller based systems.

UNIT-I:
8086 Architecture-Pin diagram, Register Organization, Memory Segmentation, Programming Model, Modes of operation, Timing diagrams, Memory addresses, Physical Memory Organization, interrupts of 8086.

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, Software Debugging tools, MDS.

UNIT-II:
I/O INTERFACE: 8255 PPI, Various modes of operations and interface of I/O devices to 8086, A/D, D/A Converter Interfacing.

INTERFACING WITH ADVANCED DEVICES: 8086 System bus structure, Memory and I/O Interfacing with 8086, Interfacing through various IC Peripheral Chips, 8257 (DMA Controller), 8259 (Interrupt Priority Control).

UNIT-III:
COMMUNICATION INTERFACE: Serial Communication Standards, USART Interfacing RS-232, IEEE-488, 20mA Current Loop, Prototyping and Trouble shooting,

UNIT-IV:
INTRODUCTION TO MICRO CONTROLLERS: Overview of 8051 Micro Controller, Architecture, I/O ports and Memory Organization, Addressing modes and Instruction set of 8051, Simple Programs using Stack Pointer, Assembly language programming of 8051


UNIT-V:
INTERFACING AND INDUSTRIAL APPLICATIONS: Applications of Micro Controllers, Interfacing 8051 to LED’s, Keyboard Interfacing, Interfacing Seven Segment Display, ADC and DAC Interfacing, Stepper Motor Interfacing
TEXT BOOKS:

REFERENCES:
POWER SYSTEM PROTECTION

III Year B.Tech. II-Sem

Pre-requisites: 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: At the end of the course the student will be able to:
- Compare and contrast electromagnetic, static and microprocessor based relays
- Apply technology to protect power system components.
- Select relay settings of over current and distance relays.
- Analyze quenching mechanisms used in air, oil and vacuum circuit breakers

UNIT-I: PROTECTIVE RELAYS
Introduction, Need for power system protection, effects of faults, evolution of protective relays, zones of protection, primary and backup protection, essential qualities of protection, classification of protective relays and schemes, current transformers, potential transformers, basic relay terminology.

OPERATING PRINCIPLES AND RELAY CONSTRUCTION: Electromagnetic relays, thermal relays, static relays, microprocessor based protective relays.

UNIT-II: OVER-CURRENT PROTECTION
Time-current characteristics, current setting, over current protective schemes, directional relay, protection of parallel feeders, protection of ring mains, Phase fault and earth fault protection, Combined earth fault and phase fault protective scheme, Directional earth fault relay.

DISTANCE PROTECTION: Impedance relay, reactance relay, MHO relay, input quantities for various types of distance relays, Effect of arc resistance, Effect of power swings, effect of line length and source impedance on the performance of distance relays, selection of distance relays, MHO relay with blinders, Reduction of measuring units, switched distance schemes, auto re-closing.

UNIT-III: PILOT RELAYING SCHEMES
Wire Pilot protection, Carrier current protection.

AC MACHINES AND BUS ZONE PROTECTION: Protection of Generators, Protection of transformers, Bus-zone protection, frame leakage protection.

UNIT-IV: STATIC 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 distance relays, Multi input comparators, concept of Quadrilateral and Elliptical relay characteristics.

**MICROPROCESSOR BASED RELAYS:** Advantages, over current relays, directional relays, distance relays.

**UNTI-V:**

**CIRCUIT BREAKERS**
Introduction, arcing in circuit breakers, arc interruption theories, re-striking and recovery voltage, resistance switching, current chopping, interruption of capacitive current, oil circuit breaker, air blast circuit breakers, SF6 circuit breaker, operating mechanism, selection of circuit breakers, high voltage d.c. breakers, ratings of circuit breakers, testing of circuit breakers.

**FUSES:** Introduction, fuse characteristics, types of fuses, application of HRC fuses, discrimination.

**TEXT BOOKS:**

**REFERENCES:**
2. L.P.Singh “Protective relaying from Electromechanical to Microprocessors”, New Age International
POWER SYSTEM OPERATION AND CONTROL

III Year B.Tech. II-Sem

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
Introduction, Bus classification - Nodal admittance matrix - Load flow equations - Iterative methods -
Gauss and Gauss Seidel Methods, Newton-Raphson Method-Fast Decoupled method-Merits and demerits
of the above methods-System data for load flow study

UNIT-II:
ECONOMIC OPERATION OF POWER SYSTEMS
Distribution of load between units within a plant-Transmission loss as a function of plant generation,
Calculation of loss coefficients-Distribution of load between plants.

UNIT-III:
LOAD FREQUENCY CONTROL
Introduction, load frequency problem-Megawatt frequency (or P-f) control channel, MVAR voltages (or
Q-V) control channel-Dynamic interaction between P-f and Q-V loops. Mathematical model of speed-
governing system-Turbine models, division of power system into control areas, P-f control of single
control area (the uncontrolled and controlled cases)-P-f control of two area systems (the uncontrolled
cases and controlled cases)

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
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.

TEXT BOOKS

REFERENCES:
POWER SYSTEM LAB

III Year B.Tech. II-Sem

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
2. Differential protection of 1-Φ transformer.
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 Y_{BUS}.
4. Formation of Z_{BUS}.
5. Simulation of Compensated Line

TEXT BOOKS:

REFERENCES:
MICROPROCESSORS AND MICROCONTROLLERS LAB

III Year B.Tech. II-Sem

Prerequisites: Digital Electronics, Microprocessors and Microcontrollers

Course Objectives:
- To develop an understanding of the operations of microprocessors and micro controllers; machine language programming and interfacing techniques.

Course Outcomes:
- Understands the internal architecture and organization of 8086, 8051 and ARM processors/controllers.
- Understands the interfacing techniques to 8086 and 8051 and can develop assembly language programming to design microprocessor/ micro controller based systems.

The following programs/experiments are to be written for assembler and to be executed the same with 8086 and 8051 kits.

List of Experiments:
1. Programs for 16 bit arithmetic operations 8086(using various addressing modes)
2. Programs for sorting an array for 8086.
3. Programs for searching for a number of characters in a string for 8086.
4. Programs for string manipulation for 8086.
5. Programs for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086.
7. Parallel communication between two microprocessor kits using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor.
11. Program and verify Timer/Counter in 8051.
12. Program and verify interrupt handling in 8051.
13. UART operation in 8051.
14. Communication between 8051 kit and PC
15. Interfacing LCD to 8051
16. Interfacing Matrix/Keyboard to 8051
17. Data transfer from peripheral to memory through DMA controller 8237/8257

TEXT BOOKS:

REFERENCES:
SIGNALS AND SYSTEMS LAB

III Year B.Tech. II-Sem

Prerequisites: Signals and Systems

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

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.

List of Experiments:
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
   (i) Unit step (ii) Unit impulse (iii) Ramp (iv) 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. Write a program to find the trigonometric Fourier series coefficients of a rectangular 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. Generate a discrete time sequence by sampling a continuous time signal. Show that 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.
TEXT BOOKS:

REFERENCES:
ENVIRONMENTAL SCIENCE

II Year B.Tech. I-Sem

Pre-Requisites: NIL

Course Objectives:
1. Creating the awareness about environmental problems among students.
2. Imparting basic knowledge about the environment and its allied problems.
3. Developing an attitude of concern for the environment.
4. Motivating students to participate in environment protection and environment improvement.

UNIT-I:
MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES:
Definition, Scope and Importance – Need for Public Awareness.
NATURAL RESOURCES: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

UNIT-II:
ECOSYSTEMS: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem:
a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT-III:
ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of:
a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

UNIT-IV:
SOLID WASTE MANAGEMENT: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution - Pollution case studies - Disaster management: floods, earthquake, cyclone and landslides.

UNIT-V:

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

Reference Books:
1. Textbook of Environmental Sciences and Technology by M. Anji Reddy, BS Publication.

Course Outcomes:
At the end of the course, it is expected that students will be able to:
1. Identify and analyze environmental problems as well as the risks associated with these problems
2. Understand what it is to be a steward in the environment
3. Studying how to live their lives in a more sustainable manner
DIGITAL CONTROL SYSTEMS  
(Professional Elective-III)

IV Year B.Tech. I-Sem  

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

UNIT-II:  
DISCRETE SYSTEM ANALYSIS

STABILITY OF DISCRETE TIME SYSTEM

UNIT-III:  
STATE SPACE APPROACH FOR DISCRETE TIME SYSTEMS

UNIT-IV:  
DESIGN OF DIGITAL CONTROL SYSTEM

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:

REFERENCES:
OPTIMIZATION TECHNIQUES
(Professional Elective-III)

IV Year B.Tech. I-Sem

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Prerequisite: Mathematics –I, Mathematics –II

Course Objectives:
- To introduce various optimization techniques i.e classical, linear programming, transportation problem, simplex algorithm, dynamic programming
- Constrained and unconstrained optimization techniques for solving and optimizing an electrical and electronic engineering circuits design problems in real world situations.
- To explain the concept of Dynamic programming and its applications to project implementation.

Course Outcomes: After completion of this course, the student will be able to
- explain the need of optimization of engineering systems
- understand optimization of electrical and electronics engineering problems
- apply classical optimization techniques, linear programming, simplex algorithm, transportation problem
- apply unconstrained optimization and constrained non-linear programming and dynamic programming
- Formulate optimization problems.

UNIT-I:
INTRODUCTION AND CLASSICAL OPTIMIZATION TECHNIQUES

CLASSICAL OPTIMIZATION TECHNIQUES:
- Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum
- Multivariable Optimization with equality constraints.

UNIT-II:
LINEAR PROGRAMMING (8 hours)

TRANSPORTATION PROBLEM:
Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel’s approximation method – testing for optimality of balanced transportation problems.

UNIT-III:
UNCONSTRAINED NONLINEAR PROGRAMMING
One dimensional minimization methods, Classification, Fibonacci method and Quadratic interpolation method

UNCONSTRAINED OPTIMIZATION TECHNIQUES:
Uni-variant method, Powell’s method and steepest descent method.
UNIT-IV:
CONSTRAINED NONLINEAR PROGRAMMING
Characteristics of a constrained problem - classification - Basic approach of Penalty Function method -
Basic approach of Penalty Function method - Basic approaches of Interior and Exterior penalty function
methods - Introduction to convex programming problem.

UNIT-V:
DYNAMIC PROGRAMMING
Dynamic programming multistage decision processes – types – concept of sub optimization and the
principle of optimality – computational procedure in dynamic programming – examples illustrating the
calculus method of solution - examples illustrating the tabular method of solution.

TEXT BOOKS:

REFERENCES:
1. George Bernard Dantzig, Mukund Narain Thapa, “Linear programming”, Springer series in
ELECTRICAL AND HYBRID VEHICLES
(Professional Elective-III)

IV Year B.Tech. I-Sem

Prerequisite: Power Semiconductor Drives, Electrical Drives and Control, Utilization of Electric Energy

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.
TEXT BOOKS:

REFERENCES:
HVDC TRANSMISSION
(Professional Elective-IV)

IV Year B.Tech. I-Sem

Prerequisite: Power System-I, Power System-II, Power System Protection, Power System Operation and Control, 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

ANALYSIS OF HVDC CONVERTERS:

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

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:

REFERENCES:
POWER SYSTEM RELIABILITY
(Professional Elective-IV)

IV Year B.Tech. I-Sem

Prerequisite: Reliability Engineering, Power System-I, Power System-II, Power System Operation and Control

Course Objectives:
- To describe the generation system model and recursive relation for capacitive model building
- To explain the equivalent transitional rates, cumulative probability and cumulative frequency
- To develop the understanding of risk, system and load point reliability indices
- To explain the basic and performance reliability indices

Course Outcomes: Upon the completion of this course, the student will be able to
- Estimate loss of load and energy indices for generation systems model
- Describe merging generation and load models
- Apply various indices for distribution systems
- Evaluate reliability of interconnected systems

UNIT-I:
BASIC PROBABILITY THEORY
Elements of probability, probability distributions, Random variables, Density and Distribution functions-
Binomial distribution- Expected value and standard deviation - Binomial distribution, Poisson
distribution, normal distribution, exponential distribution, Weibull distribution.

DEFINITION OF RELIABILITY: Definition of terms used in reliability, Component reliability,
Hazard rate, derivation of the reliability function in terms of the hazard rate. Hazard models - Bath tub
curve, Effect of preventive maintenance. Measures of reliability: Mean Time to Failure and Mean Time
between Failures.

UNIT-II:
GENERATING SYSTEM RELIABILITY ANALYSIS
Generation system model – capacity outage probability tables – Recursive relation for capacitive model
building – sequential addition method – unit removal – Evaluation of loss of load and energy indices –
Examples. Frequency and Duration methods – Evaluation of equivalent transitional rates of identical and
non-identical units – Evaluation of cumulative probability and cumulative frequency of non-identical
generating units – 2-level daily load representation - merging generation and load models – Examples.

UNIT-III:
OPERATING RESERVE EVALUATION
Basic concepts - risk indices – PJM methods – security function approach – rapid start and hot reserve
units – Modeling using STPM approach.

BULK POWER SYSTEM RELIABILITY EVALUATION:
Basic configuration – conditional probability approach – system and load point reliability indices –
weather effects on transmission lines – Weighted average rate and Markov model – Common mode
failures.

INTER CONNECTED SYSTEM RELIABILITY ANALYSIS
Probability array method – Two inter connected systems with independent loads – effects of limited and
unlimited tie capacity - imperfect tie – Two connected Systems with correlated loads – Expression for
cumulative probability and cumulative frequency.
UNIT-IV:
**DISTRIBUTION SYSTEM RELIABILITY ANALYSIS**

UNIT-V:
**SUBSTATIONS AND SWITCHING STATIONS**

TEXT BOOKS:

REFERENCES:
3. Reliability Engineering by E. Balaguruswamy, TMH Publications.
INDUSTRIAL ELECTRICAL SYSTEMS
(Professional Elective-IV)

IV Year B.Tech. I-Sem

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 premises, flood lighting.

UNIT-IV:
INDUSTRIAL ELECTRICAL SYSTEMS I
HT connection, industrial substation, Transformer selection, 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:

REFERENCES:
2. Web site for IS Standards.
MANAGEMENT FUNDAMENTALS FOR ENGINEERS

IV Year B.Tech. I-Sem

Course Objectives:
- To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills for Engineers.

Course Outcome:
The students Understand the significance of Management in their Profession. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area.

UNIT-I:
INTRODUCTION TO MANAGEMENT: Evolution of Management, Nature & Scope-Functions of Management-Role of Manager-levels of Management-Managerial Skills - Challenges-Planning-Planning Process-Types of Plans-MBO

UNIT-II:

UNIT–III:

UNIT-IV:

UNIT-V:

TEXT BOOKS:

REFERENCES:
ELECTRICAL AND ELECTRONICS DESIGN LAB

IV Year B.Tech. I-Sem

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.

Group A:
1. Design and fabrication of reactor/ electromagnet for different inductance values.
2. Design and fabrication of single phase Induction/three phase motor stator.
4. Wiring of distribution box with MCB, ELCB, RCCB and MCCB.
5. Wiring of 40 W tube, T-5, LED, Metal Halide lamps and available latest luminaries.
6. Assembly of various types of contactors with wiring.
7. Assembly of DOL and 3 point starter with NVC connections and overload operation.

Group B: This group consists of electronic circuits which must be assembled and tested on general purpose PCB or bread boards.

1. Design and development of 5 V regulated power supply.
2. Design and development of precision rectifier.
3. Design and development of first order/ second order low pass/high pass filters with an application.
5. Peak detector using op-amplifiers.
7. PCB design and layout.
POWER QUALITY AND FACTS  
(Professional Elective-V)  

IV Year B.Tech. II-Sem  

Prerequisite: Power Electronics, Power System Operation and Control, HVDC Transmission  

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.  
- 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 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  
- 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: POWER QUALITY PROBLEMS IN DISTRIBUTION SYSTEMS  

UNIT-II: TRANSMISSION LINES AND SERIES/SHUNT REACTIVE POWER COMPENSATION  
UNIT-III:  
STATIC SHUNT COMPENSATORS  
Objectives of shunt compensation, Methods of controllable VAR generation, Static Var Compensator, its characteristics, TCR, TSC, FC-TCR configurations, STATCOM, basic operating principle, control approaches and characteristics

UNIT-IV:  
STATIC SERIES COMPENSATORS  
Objectives of series compensator, variable impedance type of series compensators, TCSC, TSSC- operating principles and control schemes, SSSC, Power Angle characteristics, Control range and VAR rating, Capability to provide reactive power compensation, external control

UNIT-V:  
COMBINED COMPENSATORS  
Introduction to Unified Power Flow Controller, Basic operating principles, Conventional control capabilities, Independent control of real and reactive power.

TEXT BOOKS:  

REFERENCES:  
CONTROL SYSTEMS DESIGN
(Professional Elective-V)

IV Year B.Tech. II-Sem

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 nonlinearity 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

UNTI-III:
DESIGN OF CLASSICAL CONTROL SYSTEM IN FREQUENCY DOMAIN
Compensator design in frequency domain to improve steady state and transient response. Feedback and Feed forward compensator design using bode diagram.

UNTI-IV:
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-V:
CONTROL SYSTEM DESIGN IN STATE SPACE

NONLINEARITIES AND ITS EFFECT ON SYSTEM PERFORMANCE
TEXT BOOKS:

REFERENCES:
AI TECHNIQUES IN ELECTRICAL ENGINEERING  
(Professional Elective-V)

IV Year B.Tech. II-Sem

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

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

UNIT-IV:
GENETIC ALGORITHMS
Introduction-Encoding –Fitness Function-Reproduction operators, Genetic Modeling –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

REFERENCES:
   2. Bart Kosko; Neural Network & Fuzzy System, Prentice Hall, 1992
SMART GRID TECHNOLOGIES
(Professional Elective-VI)

IV Year B.Tech. II-Sem

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Pre-requisites: None

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
What is 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

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

TEXT BOOKS:

REFERENCES:
ELECTRICAL DISTRIBUTION SYSTEMS  
(Professional Elective-VI)

IV Year B.Tech. II-Sem  

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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

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:

REFERENCES:
ADVANCED CONTROL OF ELECTRIC DRIVES
(Professional Elective-VI)

IV Year B.Tech. II-Sem

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:
PPOWER 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, modeling of induction machines, voltage fed inverter control-v/f control, vector control, direct torque and flux control (DTC).

UNIT-III:
SYNCHRONOUS MOTOR DRIVES
Modeling 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:

REFERENCES: