### III – Semester (II – Year)

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Electrical Circuit Analysis-II

Pre-requisite: Electrical Circuit Analysis-I

Course Objectives:
1. To evaluate Network parameters of given Electrical network
2. To analyse the networks using Theorems and circuit analysis.
3. To analyse AC transients in electrical systems.
4. To analyse the magnetic circuits

Module I

Unit 1: Laplace Transforms & Its applications

Unit 2: Magnetic Circuits

Module II

Unit 1: Network Functions
Network Functions for One-port and Two-port networks, Properties of driving point and transfer functions, Poles and Zeros of Network Functions, Significance of Poles and Zeros.

Unit 2: Two Port Networks
Two Port Networks, relationship of two port variables, impedance parameters, admittance parameters, Transmission Parameters and Hybrid Parameters, Interrelation of Parameters, Interconnections of two port networks.

Module III

Unit 1: Network Theorems-I
Thevenin’s, Norton’s, Superposition and Maximum Power Transfer theorem, Theorem for AC excitations.

Unit 2: Network Theorems-II
Millmans Theorem, Substitution Theorem, Compensation Theorem and Tellegens Theorem for AC excitations.
Module IV

Unit 1: Transient response of DC networks
Transient response of R-L, R-C, R-L-C circuits (Series and parallel combinations) for D.C –
Initial conditions - Solution using differential equation approach and Laplace transforms.

Unit 2: Transient response of AC networks
Transient response of R-L, R-C, R-L-C circuits (Series and parallel combinations) for
sinusoidal excitations – Initial conditions - Solution using differential equation approach and
Laplace transforms.

Module V

Unit 1: Network Topology-I
Basic definitions of graph theory, Incidence Matrices, Branch path incidence matrices,
numerical problems.

Unit 2: Network Topology-II
Cut set matrices, Relation between branch currents $I_b$ and loop currents $I_l$, Tie set matrices, the
relation between branch voltages and node voltages. Duality concept and numerical problems.

Text Books:

   Education, 2013

Reference Books:

1. Network Analysis by M. E. Van Valkenburg, PHI.
3. Engineering Network Analysis and Filter Design by Gopal G.Bhise, Prem R. Chadda,
   Durgesh C. Kulshreshtha, Umesh Publications

Web Resources:

1. https://nptel.ac.in/courses/108/105/108105159/
2. https://nptel.ac.in/content/storage2/courses/108104051/chapter_6/6_2.html

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

1. CO1 – Apply network theorems for the analysis of electrical circuits
2. CO2 – Analyse the magnetic circuits
3. CO3 – Obtain the transient and steady-state response of electrical circuits.
4. CO4 – Analyse the behaviour of two-port networks

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ELECTRICAL MACHINES - I

Pre-requisite: Basic Electrical Engineering

Course Objectives:

1. To study and understand different types of DC generators, Motors and Transformers, their construction, operation and applications.
2. To analyse performance aspects of various testing methods.

Module I

Unit 1: Electro-Mechanical energy conversion & D.C. Generators

Unit 2: Armature Reaction & Characteristics
Armature reaction and their effects, commutation, methods of improving commutation. Load Characteristics of shunt, series and compound generators.

Module II

Unit 1: D.C Motors
Principle of operation, Significance of Back E.M.F, Torque equation, characteristics of shunt, series and compound motors, Losses, calculation of efficiency and condition for maximum efficiency, 3-point and 4-point starters

Unit 2: Speed control of DC Motors
Armature voltage and field flux control methods.

Module III

Unit 1: Testing of DC Machines
Brake test, Swinburne’s test and Hopkinson’s test.

Unit 2: Performance of DC Machines
Regenerative testing, Separation of stray losses in a DC Motor and Field’s test.

Module IV

Unit 1: Single Phase Transformers
Principle of operation of single phase Transformer, constructional details, EMF equation, Operation of Transformer on no-load and load condition - phasor diagrams
Unit 2: Performance of Transformer
Losses, efficiency, regulation and Equivalent circuit, All day efficiency. Auto transformer, Comparison with two winding transformers.

Module V
Unit 1: Testing of Transformers
Parallel operation with equal and unequal voltage ratios, OC and SC tests, Sumpner’s test, separation of losses test

Unit 2: Poly-Phase Transformers
Poly-phase transformers – Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ.

Text Books:

Reference Books:

Equivalent MOOC Courses if any:
1. https://nptel.ac.in/courses/108/105/108105155/
2. https://nptel.ac.in/courses/108/105/108105131/

E-Books:
https://1lib.in/book/672020/d9fa45

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

1. CO1 – Explain different parts of a DC machine & understand its operation
2. CO2 – analyse different testing methods to predetermine the efficiency of DC machines
3. CO3 – Describe different excitation and starting methods of DC machines and Control the voltage and speed of a DC machines
4. CO4 – analyse single phase and three phase transformers circuits
## CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)  
3 – High; 2 – Medium; 1 - Low

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- CO1: 2
- CO2: 3
- CO3: 2 2
- CO4: 2 2
Electromagnetic Fields

**Pre-requisite:** Concepts of physics, Vector algebra, Derivatives and integration

**Course Objectives:**
1. To Apply the concepts of coordinate systems
2. To Analyze concepts of electrostatic field
3. To understand concepts of magnetic field
4. To understand the concepts of time varying fields
5. To Analyze the Maxwell’s equation in different forms and different media

**Module I**
**Unit 1: Concept of Electric field and its laws**
Review of Vector Algebra, Co-ordinate Systems, Coulomb's Law, Electric Field Intensity, Electric field due to different charge distributions. Electric field due to Line charge, Surface charge, Volume charge distribution, Electric Flux Density, Gauss’s law, Divergence theorem Applications of above laws

**Unit 2: Concept of Electric potential**
Electric potential, potential difference, calculation of potential differences for different configurations. Electric dipole

**Module II**
**Unit 1: Electrostatic fields**
Energy in electrostatic field, Poisson’s and Laplace Equation, Uniqueness theorem, Solution of Laplace’s equation, Conductors, Dielectric capacitance, calculation of capacitance of a two wire line.

**Unit 2: Boundary conditions in Electric field**
Boundary conditions of conductors and dielectric materials

**Module III**
**Unit 1: Concept of Magnetic field and its laws**
Steady magnetic field, Biot-savart’s law, Ampere’s law, Magnetic flux and Magnetic flux density, Force on a moving charge, Force on a differential current elements, Applications of above laws.

**Unit 2: Boundary conditions in Magnetic field**
Magnetic circuits, self and mutual inductances, Magnetic boundary conditions.

**Module IV**
**Unit 1: Maxwell’s equations**
Maxwell’s equations in differential and integral forms for static and time varying fields, Continuity equation.

**Unit 2: Magnetic potentials**
Scalar and Vector magnetic potentials, Energy storage in electric and magnetic fields.
Module V

Unit 1: Electromagnetic waves
Derivation of Wave Equation, Uniform Plane Waves, Plane wave in free space and in a homogenous material, Plane waves in loss dielectrics.

Unit 2: Poynting Theorem
Introduction of poynting vector and poynting theorem, Average power density, Integral and point forms of poynting theorem.

Text Books:

Reference Books:

Equivalent MOOC Courses if any:
1. https://nptel.ac.in/courses/108/104/108104087/
2. https://nptel.ac.in/courses/108/104/108104130/

E-Books:

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

CO1: To analyse electric fields due to simple charge configurations
CO2: To analyse magnetic fields and forces due to different configurations
CO3: To analyse Maxwell’s equation in different forms and media
CO4: To Understand the Electromagnetic waves in different mediums

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CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – High; 2 – Medium; 1 – Low
Electrical Circuit Analysis II Lab

**Prerequisite:** Electrical Circuit Analysis - I

**Course Objectives:**
1. To determine the parameters of two port networks.
2. To Understand the Transient Response of RL, RC & RLC Circuits.
3. To analyse a given network by applying various network theorem
4. To gain sufficient knowledge on the programming and simulation of Electrical circuits

**List of experiments/demonstrations:**

**PART A (All experiments are mandatory)**
1. Determination of Z and Y Parameters.
2. Determination of ABCD parameters.
3. Determination of Hybrid parameters.
5. Transient response of Series RLC circuit using DC excitation.
6. Verification of Thevenin’s and Norton's Theorem using digital simulation
7. Verification of Superposition and Reciprocity Theorem using digital simulation
8. Verification of Maximum Power Transfer Theorem using digital simulation

**PART -B (Any Two experiments)**
9. Verification of Self and Mutual inductance in a Coupled Circuit.
10. Verification of Nodal and Mesh Analysis using digital simulation
11. Determination of average value, RMS value, form factor, peak factor of sinusoidal wave using digital simulation.
12. Harmonic Analysis of non-sinusoidal waveform signals using Harmonic Analyser and Plotting frequency spectrum.

**Text Books:**

**Reference Books:**
**Course Outcomes:** After completion of this lab the student is able to
3. Determine the parameters of two port networks.
5. Analyze complicated circuits using different network theorems
6. Acquire skills of using MATLAB software for electrical circuit studies

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Electrical Machines – I Lab

Pre-requisite: Electrical Machines-I

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

List of Experiments:
Any Ten of the following experiments should be conducted
1. Determination of critical field resistance and critical speed by Magnetization characteristics of DC shunt generator
2. Determination of characteristics by Load test on DC shunt generator
3. Determination of characteristics by Load test on DC compound generator.
4. Determination of performance curves by Brake test on DC shunt motor
5. Determination of performance curves by Brake test on DC compound motor
6. Determination of performance curves by Brake test on DC Series motor
7. Predetermination of efficiencies by Swinburne’s test of DC shunt motor
8. Predetermination of efficiency by Hopkinson’s test on DC shunt machines
9. Determination of efficiency by Fields test on DC series machines
10. Analyse Speed control methods of DC shunt motor
11. Determination of losses at rated speed by Retardation test on DC shunt motor

Text Books:

Reference Books:

Course Outcomes: After completion of this lab the student is able to
1. Start and control the Different DC Machines.
2. Assess the performance of different machines using different testing methods
3. Identify different conditions required to be satisfied for self - excitation of DC Generators.
4. Separate iron losses of DC machines into different components
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HR21

B. Tech II Year–III Sem

Subject Code: 21ES3CS01

DATASTRUCTURES

Prerequisite: Knowledge of C Programming

Course Objectives:
1: To make student knowledgeable in data structure concepts
2: To make students apply the data structure concepts in relevant applications
3: To make students apply the graph techniques in relevant applications
4: To make students determine the best sorting technique to process the data

Course Outcomes:
At the end of the course the students will be able to:
1: Identify the concepts of data structures in relevant applications
2: Apply the concept of data structures for the new situations
3: Apply the graph traversal techniques to solve map related problems
4: Analyze the best sorting technique pertaining to the area applied

Module 1:
Algorithm Analysis: Asymptotic analysis, simple justification techniques, Recursion, Illustrative examples, Analyzing Recursive algorithms, Designing Recursive algorithms.

Sorting: Bubble sort, selection sort, Insertion sort, Merge sort, Quick Sort, Randomized Quick sort, Comparison of sorting algorithms, Polynomials and Sparse Matrices.

Module 2:

Module 3:
Linked Lists – Singly Linked List, Implementation using arrays, Implementation using Queues, Circular Linked List- Doubly linked list- Implementation of doubly linked list, implementation using De queue.
Trees- General trees, Binary trees, Implementation using array and linked representation, tree traversals- in order, preorder, post order, Breadth-first traversal, Implementation, Application of tree traversals.

Module 4:
Priority Queue-ADT, Implementation, Heap, sorting with a priority Queue, Adaptable priority Queues Hash Tables and Skip Lists-Maps and Dictionaries, Hash tables, Sorted Maps, Skip lists, Sets, Multi sets and Multi maps

Graphs: Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Traversal methods: Breadth First Search and Depth First Search.
Module 5:
- **Search trees** - Binary search tree, Implementation, Operations, Balanced Search trees - AVL Trees, Splay trees, (2, 4) trees, Red Black trees.

**Text Books:**

**Reference Books:**
2. Data Structures using C by E. Balaguruswamy.
3. Data Structures, S. Lipscutz Schumaum; Outlines, TMH

**CO-PO/PSO Mapping:**

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DATA STRUCTURES LAB

Pre-requisite: Programming in C and Problem Solving

Course Objectives:

1. Understand various data representation techniques in the real world.
2. Implement linear and non-linear data structures.
3. Analyze various algorithms based on their time and space complexity.
4. Develop real-time applications using suitable data structure.
5. Identify suitable data structure to solve various computing problems.

Course Outcomes:

1. Identify the appropriate data structures and algorithms for solving real world problems
2. Implement various kinds of searching and sorting techniques.
3. Implement data structures such as stacks, queues, search trees, and hash tables to solve various computing problems
4. Choose appropriate traversal method to find shortest distance

List of Experiments:

1. Develop a program to read a linear list of items and store it in an array.
   a. Copy the contents from one array to another array
   b. Copy the contents from one array to another array in reverse order
   c. Delete the duplicate elements from an array.

2. Develop a program to implement various sorting techniques:
   a. Insertion sort
   b. Selection Sort
   c. Bubble Sort
   d. Merge Sort
   e. Quick Sort

3. a. Develop a program to create a stack and perform various operations on it.
   b. Develop a program to create a queue and perform various operations on it.

4. Develop programs for the following:
   a. Uses Stack operations to convert infix expression into postfix expression.
   b. Uses Stack operations for evaluating the postfix expression.

5. Design a program to create a singly linked list for the following operations
   a. Insert a Node at Beginning, at Ending and at a given Position
   b. Delete a Node at Beginning, at Ending and at a given Position
   c. Search, Count the Number of Nodes and Display
6. Design a program to create a doubly linked list for the following operations  
   a. Insert a Node at Beginning, at Ending and at a given Position  
   b. Delete a Node at Beginning, at Ending and at a given Position  
   c. Search, Count the Number of Nodes and Display

7. Design a program to create a binary tree and perform various traversals.  
   a. In order  
   b. Pre Order  
   c. Post Order

8. Develop a program to Perform Linear Search and Binary Search on a list stored in an array.

9. Design a program to create a Hash table for the following operations  
   a. Insert  
   b. Delete  
   c. Search

10. Develop programs to implement the following graph traversal algorithms:  
    a. Depth first search.  
    b. Breadth first search.

Text/Reference Books:  
2. Data structures using C - A. S. Tanenbaum, Y. L. Angsam, and MJ Augestien, PHI Pearson Education

CO-PO/PSO Mapping Chart:

| Course Outcomes (COs) | Program Outcomes (POs) | Program Specific Outcomes*
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Universal Human Values (UHV)
(Common to ECE, EEE, ME, CSE, CSD, CSO, CSC, CSM branches)

Course Objectives:

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they ‘really want to be’ in their life and profession.
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.

Module I

UNIT 1: Self-Exploration on UHV Basic Guidelines

Content and Process for Value Education Understanding the need, basic guidelines, Self-Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration.

UNIT 2: Continuous Happiness and Prosperity

A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity.

Module II

UNIT 1: Understanding Harmony in the Human Being

Harmony in Myself Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha, Understanding the Body as an instrument of ‘I’

UNIT 2: Understanding Harmony in self

Understanding the characteristics and activities of ‘I’ and harmony in ‘I’, Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail.
Module III

UNIT 1: Understanding Harmony in the Family

Harmony and Values in Relationships in the Family- the basic unit of human interaction, Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas & Samman; Difference between intention and competence,

UNIT 2: Understanding Harmony in the Society

Understanding the harmony in the society: Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing Undivided Society (Akhand Samaj), Universal Order (SarvabhaumVyawastha).

Module IV

UNIT 1: Understanding Harmony in the Nature and Existence

Whole existence as Co-existence Understanding the harmony in the Nature, Interconnectededness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature

UNIT 2: Understanding Harmony in the Existence

Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

Module V

UNIT 1: Exploring Attitudes towards gender


UNIT 2: Gender relationship and Culture

Gender roles and relationship matrix, sex selection and consequences, declining sex ratio, Gender Issues- Gender sensitive language, Just Relationships: Being together as equals.

Text Books:

2. Towards a World of Equals: a bilingual Textbook on Gender. A Suneetha, and others... Telugu Academy, Telangana Gov. 2015
References:


MOOC Course: NPTEL - Exploring Human Values: Visions of Happiness and Perfect Society - Web course

Course Outcome: On completion of this course, the students will be able to

CO1: Explore on the basic aspiration of Human being and its fulfilment

CO2: Distinguish the difference between the Self and the Body

CO3: Explore the value of harmony in family, society and nature

CO4: Understanding of gender related issues and gender relationship.

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<th>O-PO Mapping Chart</th>
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Control Systems

(ECE/ECE)

Pre-requisite: Electrical circuit Analysis, M-II.

Course Objectives:
1. To model the electrical & Mechanical LTI Systems
2. To obtain the transfer function model
3. To Study the time domain response of LTI system.
4. To study the frequency response of LTI System.
5. To model system using state space analysis

Module I
Unit 1: Mathematical modelling of systems

Unit 2: Block diagram algebra & Servo motors
Block diagram representation of systems considering electrical systems as examples - Block diagram algebra – Representation by Signal flow graph - Reduction using Mason’s gain formula, Synchro’s, AC & DC servo motor characteristics.

Module II
Unit 1: Time domain Analysis

Unit 2: Frequency domain Analysis
Advantages of frequency response, frequency response of LTI system, Frequency domain specifications, correlation between time domain and frequency domain specifications.

Module III
Unit 1: Stability analysis using Routh-Hurwitz & Root Locus

Unit 2: Frequency response plots
Module IV
Unit 1: P, PI and PID controllers
Effect of addition of pole and zero to open loop transfer function, Design specifications—
Effects of proportional derivative, proportional integral systems, and PID controllers.
Unit 2: Design of compensators.
  • Practical constraints to implement PID controllers, Designing of Lag, Lead and
  Lead- Lag compensators, Design problems.

Module V
Unit 1: State Space Model
Concepts of state, state variables and state space model, derivation of state models from block
diagrams, Solution of state equations. Eigen values and Stability Analysis. Diagonalization of
State Matrix.
Unit 2: Solution of state equations of LTI systems
Solving the Time invariant state Equations- State Transition Matrix and its Properties.
Controllability and Observability. Pole-placement by state feedback. Discrete-time systems.
discrete-time systems.

Text Books:

Reference Books:
1. Modern Control Engineering – Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd.,
  1998.
4. “Modeling & Control of Dynamic Systems” – Narciso F. Macia George J. Thaler,

Equivalent MOOC Courses if any:
https://onlinecourses.nptel.ac.in/noc20_ee90

E-Books:

Course Outcomes:
1. CO1 – Apply various control strategies to different applications (power systems,
electrical drives, mechanical systems)
2. CO2 – Apply various time domain and frequency domain techniques to assess the system performance.
3. CO3 – Design a suitable controller and/or a compensator for the specific application to improve the system performance.
4. CO4 – Test system controllability and observability using state space representation and applications of state space representation to various systems.

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CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation)
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Power Systems-I

Pre-requisite: Basic Electrical Engineering, Electrical Machines-I, Electrical Machines-II.

Course Objectives:
1. To understand the different types of power generating stations.
2. To illustrate the economic aspects of power generation and tariff methods.
3. To evaluate the transmission line parameters calculations
4. To examine A.C. and D.C. distribution systems.
5. To analyse the performance of transmission lines.

Module I
Unit 1: Conventional Power Plants
Conventional Sources (Qualitative): Hydro station, Steam Power Plant, Nuclear Power Plant.
Unit 2: Non-Conventional Power Plants

Module II
Unit 1: Transmission Line parameters
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.
Unit 2: 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

Module III
Unit 1: Overhead Line Insulators
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
Unit 2: Underground Cables
Underground Cables, 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.

Module IV
Unit 1: A.C Distribution systems
A.C. Distribution: Introduction, AC distribution, Single phase, 3-phase, 3 phase 4 wire system, bus bar arrangement, Selection of site for substation. Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

**Unit 2: D.C Distribution systems**

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.

**Module V**

**Unit 1: 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.

**Unit 2: Tariff**

Cost of electrical energy-fixed cost, running cost, Tariff on charge to customer

**Text Books:**


**Reference Books:**


**E books:**


**Equivalent MOOC Courses if any:**

1. [https://www.coursera.org/learn/electric-power-systems](https://www.coursera.org/learn/electric-power-systems)
2. [https://www.coursera.org/learn/renewable-power-electricity-systems](https://www.coursera.org/learn/renewable-power-electricity-systems)

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

1. CO1 – Understand the concepts of power systems.
2. CO2 – Understand the operation of conventional generating stations and renewable sources of electrical power.
3. CO3 – Evaluate the power tariff methods.
4. CO4 – Determine the electrical circuit parameters of transmission lines
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Prerequisites: Basic Electronics

Module I

Unit 1: P-N Junctions
P-N junction diode working, I-V characteristics of a diode, half-wave and full-wave rectifiers, clamping and clipping circuits, Special purpose diode - Zener diode, Varactor diode.

Unit 2: Bipolar Junction Transistors (BJT)
Transistor fundamentals and operations, Input output characteristics of BJT in CB, CE, CC configurations, DC operating point, Load line analysis, common-emitter, common-base and common collector amplifiers; design and analysis of the fixed bias, emitter bias with and without emitter resistance circuits, variation of operating point and its stability.

Module II

Unit 1: Field Effect transistors
JFET- current-voltage characteristics and issues related to its performance, MOSFET structure, I-V characteristics of MOSFET, MOSFET as a switch, small signal equivalent circuits - gain, input and output impedance

Unit 2: Transistors Amplifier
Small Signal BJT amplifiers: AC equivalent circuit, hybrid model and their use in amplifier design.

Module III

Unit :1 Feedback and Oscillator Circuits
Concepts of feedback, Effect of positive and negative feedbacks, basic feedback topologies & their properties, Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators.

Units :2 Fundamentals of Digital Systems
Decimal, binary, octal, hexadecimal number systems and their conversion, binary weighted codes, signed numbers, 1s and 2s complement codes, error detecting and correcting codes, Binary arithmetic, Binary logic functions, Boolean laws, truth tables, associative and distributive properties, De Morgans theorems, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations,

Module IV

Unit:1 Minimization of Boolean Expressions
Standard representation for logic functions, SOP, POS, K-map representation, and simplification of logic functions using K-map, Quine-McCluskey minimization technique.
Unit: 2 Combinational Circuits
Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, digital comparator, priority encoders, decoders, ALU.

Module V

Unit: 1 Sequential Circuits
Sequential circuits, flip-flops, latches, the clocked SR flip flop, J, K, T and D types flip-flops, State diagrams and tables, transition table, excitation table and equations, applications of flip-flops.

Unit: 2 Applications of Sequential circuits
shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters.

TEXT BOOKS:

REFERENCE BOOKS:

Web resources:
1. https://www.youtube.com/watch?v=yQDfVJzEymI
2. https://www.tutorialspoint.com/
3. https://www.youtube.com/watch?v=2xXErGeeb_Q

Course Outcomes:
CO1- Understanding of different basic analog and digital electronic circuits
CO2-Thorough understanding of biasing techniques
CO3-Design and understanding of transistor based circuits and their applications
CO4-Design and analyze combinational and sequential circuits for various application
**CO-PO/PSO Mapping:**

**CO-PO/PSO Mapping Chart**  
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Electrical Machines - II

Pre-requisite: Basic Electrical Engineering, Electrical Machines - I

Course Objectives:
1. To deal with the detailed analysis of poly-phase induction motors & Alternators
2. To understand operation, construction and types of single phase motors and their applications in household appliances and control systems.
3. To introduce the concept of parallel operation of alternators
4. To introduce the concept of regulation and its calculations.

Module I
Unit 1: Poly-Phase Induction Machines
Principle of operation, Constructional details, production of a rotating magnetic field, effect of slip on rotor EMF, rotor frequency, rotor reactance, rotor current and Power factor at standstill and during operation.

Unit 2: Equivalent circuit
Torque equation, expressions for maximum torque and starting torque, torque Vs slip characteristic, equivalent circuit, phasor diagram, crawling and cogging.

Module II
Unit 1: Characteristics of Induction Machines
Rotor power input, rotor copper loss and mechanical power developed and their inter relation, No-load Test and Blocked rotor test, Predetermination of performance, Methods of starting.

Unit 2: Speed Control Methods
Change of voltage, change of frequency, voltage/frequency and injection of an EMF into the rotor circuit.

Module III
Unit 1: Synchronous Machines
Principle and Constructional details of round rotor and salient pole machines, Armature windings– Integral slot and fractional slot windings; Distributed and concentrated windings, distribution, pitch and winding factors, E.M.F Equation. Harmonics in generated EMF, armature reaction - leakage reactance, synchronous reactance and impedance, phasor diagram

UNIT-2: Regulation methods
Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods, salient pole alternators, two reaction analysis, determination of Xd and Xq (Slip test), Phasor diagrams, Regulation of salient pole alternators

Module IV
Unit 1: Parallel Operation of Synchronous Machines
Synchronizing of alternators, parallel operation and load sharing- Effect of change of excitation and mechanical power input.
Unit 2: Synchronous Motors
Principle of operation, phasor diagram, Variation of current and power factor with excitation, synchronous condenser, and Mathematical analysis for power developed, hunting and its suppression, Methods of starting.

Module V
Unit 1: Single Phase Induction Motor
Single phase induction motor principle of operation, Double revolving field theory, Types of Single phase motors, Constructional features of split-phase motors, shaded pole motor

Unit 2: Special Machines
Universal Motor, Reluctance and Stepper motor.

Text Books:

Reference Books:

Equivalent MOOC Courses if any:
https://nptel.ac.in/courses/108/105/108105155/
https://nptel.ac.in/courses/108/105/108105131/

E-Books:
https://1lib.in/book/672020/d9fa45

Course Outcomes:
At the end of this course, students will demonstrate the ability to
1. CO-1: Describe different parts in induction motors and specify their functions
2. CO-2: Explain the operation of induction motors
3. CO-3: Analyse performance characteristics of ac machines.
4. CO-4: Describe the construction, operation, characteristics, of single phase motors and special machines
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Electrical Machines – II Lab

Pre-requisite: Electrical Machines-I, Electrical Machines-II

Course Objectives:
1. To understand the operation of synchronous machines
2. To understand the analysis of power angle curve of a synchronous machine
3. To understand the equivalent circuit of a single phase transformer and single phase induction motor
4. To understand the circle diagram of an induction motor by conducting a blocked rotor test.

List of Experiments:
Any Ten of the following experiments should be conducted
1. Analyse O.C. & S.C. Tests on Single Phase Transformer
2. Predetermination of Efficiency by Sumpner’s test on a pair of single phase transformers
3. Determine Equivalent circuit parameters by No-load & Blocked rotor tests on three phase Induction motor
4. Determine Regulation of a three –phase alternator by synchronous impedance &MMF. methods
5. Plot the V and Inverted V curves of a three—phase synchronous motor.
6. Analyse Equivalent Circuit parameters of a single phase induction motor
7. Determination of Xd and Xq of a salient pole synchronous machine
8. Determination of Efficiency by Load test on three phase Induction Motor
9. Analyse Separation of core losses of a single phase transformer
10. Determination of Efficiency of a three-phase alternator
11. Parallel operation of Single phase Transformers
12. Determine Regulation of a three –phase alternator by ZPF & ASA methods

Text Books:

Reference Books:
**Course Outcomes:** After the completion of this laboratory course, the student will be able
1. Assess the performance of different machines using different testing methods
2. To convert the Phase from three phase to two phase and vice versa
3. Compensate the changes in terminal voltages of synchronous generator after estimating the change by different methods
4. Control the active and reactive power flows in synchronous machines

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Analog and Digital Electronics Lab

Prerequisites: Basic Electronics

Course Objectives:

The student should be able to:

- Use appropriate design equations / methods to design the given circuit.
- Know the characteristics of various electronic components.
- Design and analyze small signal amplifier circuits.
- Design and analyze combinational and sequential circuits.

PART A (Analog Electronic Circuits):

1. Design and observe P-N junction diode characteristics in forward and reverse bias condition.
2. Design and observe Zener diode characteristics in forward and reverse bias condition.
   Realize its application as voltage regulator.
3. Design and implement half wave rectifier circuit, and calculate its efficiency.
4. Design and implement full wave rectifier circuit with and without filters, and calculate their efficiency.
5. Design and realize input and output characteristics of common emitter amplifier of BJT.
6. Realize the Input and output characteristics of FET in common source configuration.

PART B (Digital Electronic Circuits)

1. Design and realization of Boolean expression using basic gates.
2. Design and realization of Boolean expression using universal gates.
3. Design and implementation of half adder and full adder using universal gates.
4. Design and implement of half sub tractor and full sub tractor using basic gates.
7. Design and realization of Boolean expression using basic gates.
8. Design and realization of Boolean expression using universal gates.
9. Design and implementation of half adder and full adder using universal gates.
10. Design and implement of half sub tractor and full sub tractor using basic gates.
TEXT BOOKS:

Course Outcomes: After completion of this lab the student is able to
CO1-Analyze the physical operation of components
CO2-Apply concepts of electronic circuits across engineering
CO3-Understand the physical operation of digital components
CO4-Analyze how to design digital circuits

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CONTROL SYSTEMS LAB

Prerequisite: Control Systems

Course Objectives:
1. To understand the different ways of system representations such as Transfer function Representation and state-space representations and to assess the system dynamic response
2. To assess the system performance using time-domain analysis and methods for improving it
3. To assess the system performance using frequency domain analysis and techniques for Improving the performance
4. To design various controllers and compensators to improve system performance

Mandatory Eight Experiments Should be conducted
1. Analyse the Time Domain Specifications of the Second-order system
2. Determination of Characteristics of Synchro Transmitter-Receiver pair
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions, and application of speed control of the motor.
4. Analyse the feedback effect on DC servo motor Speed using PID Controller
5. Determination of Transfer function of DC motor
6. Determination of Transfer function of DC generator
7. Analyse the Temperature using P, I, and PID Controller
8. Determine the Speed vs Torque and Speed vs Back EMF Characteristics of AC servo motor

Any Four Experiments Should be conducted
1. Analyse the Steady State Error and Overshoot of a second-order system using PID Controller
2. Determine the Magnitude and Phase plot for Lag, Lead, and Lag-Lead Compensator Networks
3. Determine the Displacement-Time characteristics for P, PI, PID Controller using MATLAB
4. Determination of the Time Domain Specifications for Linear System using MATLAB
5. Determine Stability analysis for Bode, Root Locus, and Nyquist for Linear Time-Invariant Systems using MATLAB
6. Analysing State-space model for classical transfer function using MATLAB
7. Design of Lead-Lag compensator using MATLAB to determine the Magnitude and Phase plots
8. Determine the Characteristics between Control Current and Load Current by connecting in series and Parallel manner for Magnetic Amplifier
Text Books:

Reference Books:

Course Outcomes:
1. CO1: Improve the system performance by selecting a suitable controller and/or a compensator for a specific application.
2. CO2: Apply various time domain and frequency domain techniques to assess the system performance.
3. CO3: Apply various control strategies to different applications (example: Power systems, electrical drives, etc.).
4. CO4: Test system controllability and observability using state space representation and applications

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DOING ENGINEERING - 1

Pre-requisite: Basic Mathematics & Physics

Course Objectives:
1. To provide knowledge levels needed for PLC programming and operating.
2. To make the students how devices to which PLC input and output modules are connected
3. To train the students to create ladder diagrams from process control descriptions.
4. To make the students understand various types of PLC registers
5. Apply PLC Timers and Counters for the control of industrial processes

Module I: PLC & I/O modules
UNIT 1: Introduction to PLC
Architectural Evolution of PLC, Role of PLC in Automation, Introduction to the field devices attached to PLC, Block Diagram, Power supply, I/O modules and interfacing CPU processor programming equipment programming formats, Communication Cards.

UNIT 2: I/O modules of PLC
Types of PLC, Various range available in PLC, Type of inputs & Outputs, Source sink Concept in PLC, Scan cycle execution.

Module II: PLC software & Programming
UNIT 1: Introduction of PLC software

UNIT 2: Ladder Programming
Construction of PLC ladder diagrams, devices connected to I/O modules, Applications.

Module III: PLC Programming with Examples
UNIT 1: PLC Programming: PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils.

UNIT 2: Logic Gates Programming: Digital logic gates programming in the Boolean algebra system, conversion examples, Latching, ladder diagram construction and Block diagram of Start/Stop motor control with latching.

Module IV: Functions of PLC
UNIT 1: PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions- Timer function industrial applications, counters, counter function industrial applications.
UNIT 2: Projects on Industrial Applications - Controlling the motor to run forward when Forward is pressed, run reverse when Reverse is pressed and stop when Stop is pressed, Daily production data maintenance recorded.

Module V: Computer control of power systems
UNIT 1: SCADA: 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
UNIT 2: Load Forecasting: Importance of Load Forecasting and simple techniques of forecasting.

TEXTBOOKS:

REFERENCE BOOKS:

Web Resources:
2. https://nptel.ac.in/courses/108/105/108105088/

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

1. CO1 – Understand different types of Devices to which PLC input and output modules are connected.
2. CO2 – Able to write ladder instructions from process control descriptions
3. CO3 – Able to apply PLC timers and counters for the control of industrial processes
4. CO4 – Analyse various functions of Energy Management System (EMS) functions.
### CO-PO/PSO Mapping Chart

(3/2/1 indicates strength of correlation)

3 – High; 2 – Medium; 1 - Low

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SIGNALS AND SYSTEMS

Pre-requisite: Nil

Course Objectives
1. To understand various fundamental characteristics of signals and systems.
2. To study the importance of transform domain.
3. To understand the characteristics of LTI systems.
4. To analyze and design various systems.
5. To study the effects of sampling.

Course Outcomes
1. Understand the various signals, systems and their operations.
2. Demonstrate arbitrary signals in time and frequency domain.
3. Analyze the characteristics of linear time invariant systems.
4. Apply the different transform techniques to the signals.

Module I
Unit 1: Representation of Signals
Introduction to signals, Elementary signals, basic operations on signals, classification of Signals, Operations on Signals. System and classification of systems

Unit 2: Signal Analysis
Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Closed or complete set of orthogonal functions.

Module II
Unit 1: Fourier series
Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet’s conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.

Unit 2: Fourier Transforms

Module III
Unit 1: Laplace Transforms
Laplace Transforms (L.T), Inverse Laplace Transform, and Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal.

Unit 2: Sampling Theorem
Graphical and analytical proof for Band Limited Signals, Reconstruction of signal from its samples, Effect of under sampling – Aliasing. Introduction to Band Pass Sampling.
Module IV
Unit 1: Signal Transmission through Linear Systems

Unit 2:
Signal bandwidth, System Bandwidth, Filter characteristic of Linear System, Ideal LPF, HPF, and BPF characteristics, Causality and Paley Wiener criterion for physical realization, Relationship between Bandwidth and rise time.

Module V
Unit 1: Convolution
Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Properties of Convolution.

Unit 2: Z–Transforms
Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

Text Books

Reference Books

Web Resources

E Books

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## CO-PO/PSO Mapping

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English For Employability
(Common to CSE/EEE/ECE/CSM/CSD/CSC/CSO/MECH)

Course Objective:
1. To introduce growing need of English Language Skills for Employability (ELSE).
2. To help the students understand the importance of inter-personal communication, team dynamics and role behaviour at the work place
3. To enhance their Behavioural skill and Entrepreneurship skills.

Module I - Wings of Fire
Unit 1: “Orientation” an excerpt from Wings of fire- An Autobiography of Abdul Kalam by Arun Tiwari.
Unit 2: Grammar
Vocabulary- Omission of Articles, Collective Nouns, Prepositions, Collocations.
Reading- Observation Passage, Survey Passage
Writing- Comprehension Passages based on graphs, charts & other illustrations.

Module II 5 Points Someone
Unit 1: The Gift an excerpt from 5 Points Someone by Chetan Bhagat
Unit 2: Grammar -
Vocabulary- Advanced Collocations, Proverbs, Idioms, One word Substitute
Reading – Complex passage, Reading Comparison,
Writing- Usage of Idioms and Proverbs in Passage

Module III – Wise Leaders Wanted & Shift Your Perspective: Connect to Your Noble Purpose
Unit 1: “Wise Leaders Wanted & Shift Your Perspective: Connect to Your Noble Purpose” an excerpt from From Smart to Wise: Acting and Leading with Wisdom Kaipa, Prasad, and Navi Radjou.
Unit 2: Grammar
Vocabulary- Technical vocabulary, Auxiliaries and Modals,
Reading- Technical Comprehension,
Writing- Creative Resume.

Module IV- Variation Under Nature
Unit 1: “Variation Under Nature” an excerpt from Origin of Species by Charles Darwin
Unit 2: Grammar
Vocabulary- Coherence-Cohesive devices, Figures of speech
Reading- Inferring Reading, Survey, Question, Read, Recite and Review (SQ3R)

Module V- Let’s Build a Company: A Start-up Story Minus the Bullshit
Unit 1: Let's Build a Company: A Start-up Story Minus the Bullshit by Harpreet Grover and Vibhore Goyal
Unit 2: **Grammar**  
**Vocabulary**- Topic/Situation based Vocabulary, Tongue Twisters.  
**Reading**- Critical Reading of known/unknown passages  
**Writing**- Common Errors in Tenses, Description of hobbies, Future plans, Reported Speech: Direct & Indirect Speech, Email Writing, Formal letter writing (Enquiry, Apology, Leave, Request) Notice Writing, Information Transfer, Technical report writing

**Textbooks**

**References**
5. Murphy, R. *Intermediate English Grammar*.  

**Course Outcomes:** After undergoing this course, the student will be able to;

**CO1:** Understand the concept and process of employability skills.  
**CO2:** Demonstrate the employability skills in both verbal and non-verbal communications.  
**CO3:** Apply skill identification strategies to bring out the results on social and industry demands.  
**CO4:** Recognize right professional, Entrepreneurship skills and social ethical values.

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Prerequisites:

1. Basic knowledge of interpersonal and communication skills.
2. Enriching the speaking and writing ability
3. Basic grammar rules of (LSRW)
4. Basic Spoken English skills

Course Objectives:

1. To improve the communication skills, body language, facial expression and gesture.
2. To be able to understand the concept of employability skills (Quantum dexterity) and enhancing ones’ behavior in the personal, professional and social forum.
3. To evaluate the LSRW (listening, speaking, reading and writing) through assessment.
4. To learn the basic grammar for improving spoken and written communication.
5. To become problem solver, analyze and apply critical and analytical skills.
6. To identify the Employability skills, assigning tasks (Group Discussion, JAM, Role play etc.,) for day today evaluation.

Activity 1- Narration (Historical places, events, Picture narration, Memorable incidents of life)
Self-Introduction, Daily Routine, Likes & Dislikes, Vocabulary, Triangular Activity (Person based- S-P), Imperatives & JAM
Targeted Skills- Listening- Speaking- Audio-Video clips

Activity 2: Quantum of Dexterity (QOD)-- Ability (Personal, Behavioural & Professional)
Request/Permission/Order, Survival kit, Career Objective Professional, Hidden Talents (Personal), Character Traits (Behavioural)
Targeted Skills- Reading-Writing – Concluding an open-ended Story, Creative Writing.

Activity 3: Critical & Analytical Skills
SWOC- (Social & Cultural, Political, Economic, Legal Impact, Technical, Nuances of Pronunciation, Voice Modulation, Neutralizing Mother Tongue Interference, Tongue Twisters for practice,
**Targeted Skills** - Writing SWOC, Self-Introduction, Exposure to a structured talk.

**Activity 4: Flick Flow/Extempore**

**Targeted Skills** - Speaking Skills

**Activity 5: On Job Training**
Formal & Informal communication, Resume E-mail Etiquette, Telephonic & Interview Etiquette, Situation based- Santa’s Bag, topic/case study-based Group Discussion (Job Consultancy/Role Play)

**Targeted Skills** - Listening-Writing- Speaking

**Course Outcomes:** After undergoing this course, the student will be able to;

**CO1:** Understand the explicit and implicit of importance of employability skills.

**CO2:** Demonstrate life skills like team work, learning skills, problem solving, attitude, adaptability and flexibility.

**CO3:** Apply critical and analytical skills to bring out the solution on problem/case study.

**CO4:** Recognize the need of appropriate words, Phrases & functional grammar and apply them in both spoken and written communication.

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