### II YEAR – I SEMESTER

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Subject Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>I</th>
<th>E</th>
<th>TM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UGEE3T01</td>
<td>Electrical Circuit Analysis-I</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>UGEE3T02</td>
<td>Electro Magnetic Fields</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>UGEE3T03</td>
<td>Electrical Machines-I</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>UGEC3T06</td>
<td>Basic Electronic Devices &amp; Circuits</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>UGME3T05</td>
<td>Thermal &amp; Hydro Prime Movers</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>UGBS3T02</td>
<td>Complex Variables and Statistical Methods</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>UGEC3P07</td>
<td>Electronic Devices &amp; Circuits Lab</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>8</td>
<td>UGME3P08</td>
<td>Thermal and Hydro Lab</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>18</td>
<td>8</td>
<td>6</td>
<td>24</td>
<td>290</td>
<td>460</td>
<td>750</td>
</tr>
</tbody>
</table>

### II YEAR – II SEMESTER

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Subject Code</th>
<th>Subject Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>I</th>
<th>E</th>
<th>TM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UGEE4T01</td>
<td>Electrical Circuit Analysis-II</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>UGEE4T02</td>
<td>Switching Theory and Logic Design</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>UGEE4T03</td>
<td>Power Systems-I</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>UGEE4T04</td>
<td>Electrical Machines-II</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>UGEE4T05</td>
<td>Electrical Measurements &amp; Instrumentation</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>UGEC4T02</td>
<td>Pulse &amp; Digital Circuits</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>UGEE4P06</td>
<td>DC Machines Lab</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>8</td>
<td>UGEE4P07</td>
<td>Electrical Circuits &amp; Measurements Lab</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>18</td>
<td>6</td>
<td>6</td>
<td>23</td>
<td>290</td>
<td>460</td>
<td>750</td>
</tr>
</tbody>
</table>
ELECTRICAL CIRCUIT ANALYSIS –I

II Year I Semester

Subject Code: UGEE3T01

Course objectives:
- To know the fundamental laws of electrical engineering
- To understand the concepts of active, reactive power & power factor
- To understand the concepts of Resonance, bandwidth & quality factor
- To analyze the Magnetic Circuits
- To know about Network topologies
- To apply various Network theorems

Course Outcomes:
CO1: Able to understand and apply mesh & nodal analysis
CO2: Able to analyze Single Phase A.C Circuits.
CO3: Able to draw locus Diagrams & calculate Resonance parameters
CO4: Able to analyze the magnetic circuits and hence calculate Inductance & Mutual inductance
CO5: Able to understand the Network topology.
CO6: Able to apply the Network theorems for AC & DC sources.

SYLLABUS

UNIT-I: Introduction to Electrical Circuits
Passive components and their V-I relations, Sources (Dependent and Independent)-Kirchoff’s laws, Network reduction techniques(Series, parallel, series-parallel, star-to-delta or delta-to-star transformation), Source transformation technique, Nodal analysis, mesh analysis.

UNIT-II: Single Phase A.C Circuits
Periodic wave forms (determination of RMS value, average value and form factor), Concept of Phase angle and Phase difference, Complex and polar forms of representations, Steady state analysis of R,L and C circuits, Power factor and its significance –Real, Reactive and apparent Power.

UNIT-III : Locus Diagrams & Resonance
Locus diagrams for various combinations of R, L and C, Resonance, concept of band width and Q factor.

UNIT-IV Magnetic Circuits
Basic definition of MMF, flux and reluctance, Analogy between electrical and magnet circuits, Faraday’s laws of electromagnetic induction-concept of self and mutual inductance-Coupled circuits, Analysis of circuits with mutual inductance,dot convention-coefficient of coupling-composite magnetic circuit-analysis of series and parallel magnetic circuits.

UNIT-V Network topology
Definitions – Graph – Tree, Basic cutset and Basic Tieset matrices for planar networks – Loop and Nodal methods of analysis of Networks with dependent & independent voltage and current sources – Duality & Dual networks.
UNIT-VI Network theorems (DC & AC Excitations)
Superposition theorem, Thevenin’s theorem, Norton’s theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman’s theorem and compensation theorem.

Text Books:

Reference Books:
1. Introduction to circuit analysis and Design by Tildon Glisson Jr, Springer Publications.
2. Electrical Circuits by K.S Suresh Kumar, Pearson Publications
3. Electrical Circuits by David A. Bell, Oxford Publications
ELECTRO MAGNETIC FIELDS

II Year I Semester
Subject Code: UGEE3T02

Course Objectives:
- To study the production of electric field and potentials due to different configurations of static charges.
- To study the properties of conductors and dielectrics, calculate the capacitance of different configurations- various and understand the concept of conduction and convection current densities.
- To study the magnetic fields produced by currents in different configurations, application of ampere's law and the Maxwell's second and third equations.
- To study the magnetic force and torque through Lorentz force equation in magnetic field environment like conductors and other current loops.
- To develop the concept of self and mutual inductances and the energy stored.
- To study time varying and Maxwell's equations in different forms and Maxwell's fourth equation for the induced emf.

Course Outcomes:

CO1: Able to calculate electric field and potentials using gauss’s law or solving Laplace's or Poisson’s equations.
CO2: Able to calculate capacitance, energy stored in dielectrics and get's the concept of conduction and convection currents.
CO3: Able to find magnetic field intensity due to current, the application of ampere's law and the Maxwell's second and third equations.
CO4: Able to calculate the magnetic forces and torque produced by currents in magnetic field.
CO5: Able to calculate self and mutual inductances and the energy stored in the magnetic field.
CO6: Able to gain knowledge on time varying fields and get ability to calculate induced emf Concepts of displacement current and Poynting vector and associated problems are solved.

SYLLABUS

UNIT – I Electrostatics:
Electrostatic Fields – Coulomb’s Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge – Work done in moving a point charge in an electrostatic field – Electric Potential – Properties of potential function – Potential gradient – Gauss’s law – Maxwell’s first law, div( D )=−ρε, Laplace’s and Poisson’s equations – Solution of Laplace’s equation in one variable.

UNIT – II Conductors - Dielectric & Capacitance:
Electric dipole – Dipole moment – potential and EFI due to an electric dipole – Torque on an Electric dipole in an electric field – Behavior of conductors in an electric field – Conductors and Insulators. Polarization - Boundary conditions between conduction to dielectric and dielectric to dielectrics.

Capacitance – Capacitance of parallel plate and spherical and co-axial cables with composite dielectrics – Energy stored and energy density in a static electric field – Current density – conduction and Convection current densities – Ohm’s law in point form – Equation of continuity
UNIT – III Magneto Statics & Ampere’s law:
Static magnetic fields – Biot-Savart’s law – Oesterd’s experiment - Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI – Maxwell’s second Equation, \( \text{div}(\mathbf{B})=0 \).
Ampere’s circuital law and its applications viz. MFI due to an infinite sheet of current and a long filament current carrying conductor - Point form of Ampere’s circuital law – Maxwell’s third equation, \( \text{Curl} \, (\mathbf{H})=\mathbf{J} \).

UNIT – IV Force in Magnetic fields:
Magnetic force - Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment – a differential current loop as a magnetic dipole – Torque on a current loop placed in a magnetic field.

UNIT – V Self and Mutual inductance:
Self and Mutual inductance – determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field.

UNIT – VI Time Varying Fields:
Time varying fields – Faraday’s laws of electromagnetic induction – Its integral and point forms – Maxwell’s fourth equation, \( \text{Curl} \, (\mathbf{E})=-\frac{\partial \mathbf{B}}{\partial t} \) – Statically and Dynamically induced EMFs – Simple problems -Modification of Maxwell’s equations for time varying fields – Displacement current – Poynting Theorem and Poynting vector.

Text Books:
2. “Electro magnetic Fields” by Sadiku, Oxford Publications

Reference books :
ELECTRICAL MACHINES-I

II Year I Semester

Subject Code: UGEE3T03

Course Objective:

- To understand the concept of electro mechanical energy conversion.
- Principle of operation of DC Generator and DC motor
- Speed control methods and parallel operation of DC machines and testing the performance of DC machines.

Course Outcomes

CO1: The student will be able to analyze the concepts of Electromechanical Energy Conversion
CO2: To calculate the electrical quantities, losses and efficiency of a DC Generator
CO3: Able to experimentally obtain the performance characteristics of DC generators
CO4: To calculate the torque, losses and efficiency of different DC Motors and operate the starters of DC motors.
CO5: Apply the speed control methods of DC shunt and series motors
CO6: Test the performance of D.C. Machines

SYLLABUS

UNIT – I Electromechanical Energy Conversion
Introduction to S.I Units - principles of Electromechanical Energy conversion – forces and torque in magnetic field systems – energy balance- energy and force in a singly excited magnetic field system, determination of magnetic force - co-energy – multi excited magnetic field systems- construction features of conventional and modern DC machines.

UNIT – II D.C. Generators-I

UNIT – III D.C. Generators-II

UNIT – IV D.C. Motors

UNIT – V Speed Control of D.C. Machines
Speed control of d.c. shunt Motors: Armature voltage and field flux control methods, Speed control of series motor, Methods of electrical braking: plugging, dynamic and regenerative.
UNIT-VI Parallel Operation and Testing of D.C. Machines
Parallel operation of DC shunt, Series and compound generators, Testing of d.c. machines: methods of testing:- Brake test, Load Test On DC series, DC shunt and DC Compound Generators, Indirect testing: Swinburne’s method-- Regenerative or Hopkinson’s method - Retardation test-- separation of losses.

TEXT BOOKS:
2. Electrical Machines – P.S. Bimbra., Khanna Publishers

REFERENCE BOOKS:
1. Performance and Design of D.C Machines – by Clayton & Hancock, BPB Publishers
BASIC ELECTRONIC DEVICES AND CIRCUITS

II Year I Semester
Code : UGEC3T06

Course Objective:

The objective of this course is to introduce the students about the fundamentals concepts of semiconductor diodes, Transistor and their applications. At the end of the course, the students are expected to know about the applications of the semi conductor devices.

Course Outcomes:

Upon completion of the course, students should be able to:

CO 1: Understand the concepts of various materials used in electronic devices.
CO 2: Analyze and design rectifier, filter circuits and measure their parameters.
CO 3: Select the Q point for the transistor biasing and stabilization
CO 4: Analyze the operation of Transistor as an amplifier and oscillator circuits.

Unit-I Semiconductor Physics
Insulators, semiconductors and Metals classification using Energy Band Diagrams, Mobility and Conductivity, electronics and holes in Intrinsic Semi Conductors, Extrinsic Semi Conductors, drift and diffusion, charge densities in Semi Conductors, Hall effect, Continuity Equation, Law of Junction, Fermi Dirac Function, Fermi level in Intrinsic and Extrinsic Semi Conductors

Unit-II Junction Diode Characteristics

Special Semiconductor Devices : Zener Diode, Breakdown mechanisms, Zener diode applications, LED, LCD, Photo Diode, Varacter Diode, Tunnel Diode, DIAC,TRIAC,SCR,UJT construction, operation and Characteristics of all the diodes is required to be considered.

Unit-III Rectifiers, Filters and Regulators
Basic Rectifier setup, Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, derivations of characteristics of rectifiers, Rectifier Circuit – operation, input and output wave forms, Filters; inductor filter, capacitor filter, L-section filter, π- section filter, Multiple L-section and multiple π- section filter, Comparison of Various Filters in terms of Ripple Factor; Simple circuit of a regulator using Zener diode. Types of regulators-series and shunt voltage regulators.

Unit-IV Transistors Characteristics

FET : FET types, Construction, operation, Characteristics, Parameters, MOSFET Types, Construction, operation, Characteristics, Comparison between JFET and MOSFET

Unit-V Transistor Biasing, Thermal Stabilization and Transistor Amplifier Models
Need for biasing, Operating Point, load line analysis, BJT Biasing – methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in V_{BE}, I_{C} and stability factors(S, S’, S”), Compensation, Thermal Runaway, Thermal Stability. FET Biasing-methods and stabilization. Transistor Hybrid Model, Generalized analysis of transistor amplifier model using h- parameters.
Unit-VI Amplifiers and Oscillators
Feedback Amplifiers - classification, feedback concept, transfer gain and general characteristics of negative feedback amplifiers, effect of feedback on input and output resistances; Methods of analysis of feedback amplifiers. Power Amplifiers - Classification, Push-full amplifiers, Introduction to harmonics (distortion factor).

Text Books
T2. Electronic Devices and Circuits- David A Bell, Oxford University Press, Fifth Edition.

References
THERMAL AND HYDRO PRIME MOVERS

II Year I Semester

Subject Code: UGME3T05

Course Objectives:

- To make the student learn about the constructional features, operational details of various types of internal combustion engines through the details of several engine systems and the basic air standard cycles, that govern the engines. Further, the student shall be able to calculate the performance of different types of internal combustion engines
- To train the student in the aspects of steam formation and its utilities through the standard steam data tables and charts. To make the student correlate between the air standard cycles and the actual cycles that govern the steam turbines. To train the Cycle-Analysis of simple Rankine Cycle and Re-heat cycle
- To impart the knowledge of gas turbine fundamentals, the governing cycles and the methods to improve the efficiency of gas turbines.
- To teach the student about the fundamental of fluid dynamic equations and its applications fluid jets. To impart the knowledge of various types of pumps, their constructional features, working and performance
- To make the student learn about the constructional features, operational details of various types of hydraulic turbines. Further, the student shall be able to calculate the performance of hydraulic turbines
- To train the student in the areas of types of hydro electric power plants, estimation and calculation of different loads by considering various factors.

Course Outcomes

CO1: The student will be able to understand the types of prime movers, which can be connected to generators for power production and obtain the skills of performing the necessary calculations with respect to the functioning of the prime movers.

CO2: The student gets knowledge about the constructional features, operational details of various types of internal combustion engines and the basic air standard cycles, that govern the engines. Further, the student will be able to calculate the performance of different types of internal combustion engines.

CO3: The student will be able to understand the steam formation and its utilities through the standard steam data tables and charts.

CO4: The student will be able to correlate between the air standard cycles and the actual cycles that govern the steam turbines.

CO5: The student will be able to calculate the performance of steam turbine using velocity diagrams.

CO6: The student gets the knowledge of gas turbine fundamentals, the governing cycles and the methods to improve the efficiency of gas turbines.

CO7: The student will be able to understand the fundamentals of fluid dynamic equations and its applications.

CO8: The student gets the knowledge of various types of pumps, their constructional features, working and performance.

CO9: The student gets the knowledge about the constructional features, operational details of various types of hydraulic turbines. Further, the student will be able to calculate the performance of hydraulic turbines.

CO10: The student gets the knowledge in the areas of types of hydro electric power plants, estimation and calculation of different loads by considering various factors.
SYLLABUS

UNIT-I

UNIT-II

UNIT-III

UNIT-IV

UNIT-V
HYDRAULIC TURBINES: classification of turbines; Working principle efficiency calculation and Design Principles for Pelton wheel, Francis turbine and Kaplan turbine; Governing of Turbine; performance and characteristics curves.

UNIT-VI
HYDRO POWER: Components of hydro electric power Plant: Pumped storage Systems, storage requirements, Estimation of water power potential; Estimation of load on turbine: load curve, load factor, capacity utilization factor, diversity factor, load- duration curve, firm power, secondary power, prediction of load.

Text Books:
1. Thermal Engineering by R.K. Rajput / Lakshmi Publications

Reference Books:
II Year I Semester

Subject Code: UGBS3T02

Course Objective:
- To present the theory and methods of ‘probability and statistics’ and complex functions, variables needed to support engineering decision making and engineering electric circuits.
- To motivate the students for use of probabilistic models in electric circuits or mechanical vibrating system engineering analysis and design
- To create an understanding on various types of sampling distributions and their applications in engineering and form complex analysis on various types of Cauchy’s theorem, Residue theorem and their applications in engineering
- To emphasize on basic principles of statistical inference and complex analytic functions.
- To provide an understanding of the processes by which real-life complex functions problems are analyzed

Course Outcomes:
After completion of the course the students are able to

CO1: Finding conjugate harmonic for a given function
CO2: Evaluate complex integrals using Cauchy’s integral theorem
CO3: Evaluation of real and complex integrals using residue theorems.
CO4: Find image of a curve from one region to another region in a conformal mapping.
CO5: Finding good estimators to various parameters
CO6: Apply the principles of statistical inference to practical problems.

SYLLABUS

UNIT – I:
Functions of a complex variable

UNIT – II:
Integration and Series Expansions

UNIT – III:
Integration using Residues
Types of Singularities: Isolated, pole of order m, essential singularity – Residues - Residue theorem(without proof ). Evaluation of real integrals of the type

(a) Improper real integrals $\int_{-\infty}^{\infty} f(x) \, dx$
(b) $\int_{\epsilon}^{\epsilon+2\pi} f(\cos \theta, \sin \theta) \, d\theta$
(c) $\int_{-\infty}^{\infty} f(x) \, dx$
UNIT – IV:  
Conformal Mapping  
Conformal mapping: Transformation by $e^z$, $\ln z$, $z^2$, $z^n$ (n positive integer), $\sin z$, $\cos z$, $z + a/z$. Translation, rotation, inversion and bilinear transformation – fixed point – cross ratio – properties – invariance of circles

UNIT – V:  
Sampling Distributions  

UNIT – VI:  
Tests of Hypothesis  
Type I and Type II errors - One tail, two-tail tests - Tests concerning one mean and proportion, two means-proportions and their differences using Z-test, Student’s t-test, F-test and $\chi^2$ test.

Text Books:  
2. Probability and statistics for engineers, Miller and John E.Freund, Prentice Hall of India  

Reference Books:  
3. Mathematical methods of Science and Engineering Aided with MATLAB, K B Datta, Cengage Publications
ELECTRONIC DEVICES AND CIRCUITS LAB
(Common to ECE & EEE)

II B. Tech-I Semester
Subject Code : UGEC3P07

L T P C
- - 3 1

Course Objective

The objective of this course is to introduce the students about to provide an overview of the principles, operation and application of the basic electronic components. And Understand the Characteristics of the active devices., and frequency response of different amplifiers.

Course Outcomes

After completion of the course the student will be able to
CO 1: Identify different electronic components like Resistors, Capacitors, Inductors Diodes, Transistors, SCR and UJT etc.
CO 2: understand the characteristics of the PN junction diode and zener diode
CO 3: understand the operation of rectifiers with and without filters.
CO 4: obtain the input and output characteristics of BJT,FET,UJT and SCR.
CO 5: obtain the frequency response of BJT and FETAmplifier.

PART A : ELECTRONIC WORKSHOP PRACTICE

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of Active Devices, Diodes, BJTs, JFETs,MOSFETs, Power Transistors, LEDs, LCDs, Optoelectronic Devices, SCR, UJT, DIACs,TRIACs.
4. Single layer and Multi layer PCBs (Identification and Utility).
5. Study and operation of Ammeters, Voltmeters, Transformer, Analog and Digital Multimeters, Function Generator, Regulated Power Supplies and CRO.

PART B : (For Laboratory examination – Minimum of 12 experiments)

1. PN Junction diode characteristics
   a. A. Forward bias B. Reverse bias.( cut-in voltage &Resistance calculations)
2. Zener diode characteristics and Zener as a regulator
3. Half wave Rectifier (with & without filters )
4. Full wave Rectifier with filters (with & without filters )
5. Transistor CB characteristics (Input and Output) & h Parameter calculations
6. Transistor CE characteristics (Input and Output) & h Parameter calculations
7. FET characteristics (Drain, Transfer characteristics) and calculate Drain Resistance ($r_d$), Trans
8. **Conductance (gm), Amplification factor (µ).**

9. SCR Characteristics

10. Emitter Characteristics of UJT

11. Design and verify Self Bias Circuit. (Q Point)

12. Frequency response of CE Amplifier (With and without Emitter bypass capacitor) and calculate Bandwidth, input and output impedances.

13. Frequency response of CC Amplifier (Emitter Follower) and calculate Bandwidth, input and output impedances.


15. Transistor as switch.

16. MOSFET characteristics
UNIT | TOPICS
---|---
I | I.C. Engines valve/port timing diagrams.
II | I.C. Engine performance test on 4-stroke Diesel engine
III | I.C. Engine performance test on 2-stroke petrol engine.
IV | Evaluation of engine friction by conducting Morse test on 4-stroke multi cylinder petrol engine.
V | Determination of FHP by retardation and motoring test on IC engines.
VI | I.C. Engines heat balance on petrol/Diesel engines.
VII | Economical speed test of an IC engine.
VIII | Study of boilers.
IX | Impact of jets on Vanes.
X | Performance Test on Pelton Wheel.
XI | Performance Test on Francis Turbine.
XII | Performance Test on Kaplan Turbine.
XIII | Performance Test on Single Stage Centrifugal Pump.
XIV | Performance Test on Reciprocating Pump.
XV | Calibration of Venturimeter.
XVI | Calibration of Orifice meter.
XVII | Determination of loss of head due to sudden contraction in a pipeline.

Text Book:
1. Thermal Engineering by R.K. Rajput / Lakshmi Publications

References:
4. “Fluid mechanics & Fluid Power Engineering”, Dr D.S. Kumar
5. “Water Power Engineering” M.M.Desumukh
ELECTRICAL CIRCUIT ANALYSIS-II

II Year II Semester

Subject Code: UGEE4T01

Course Objectives:

- To study the concepts of balanced three-phase circuits.
- To study the concepts of unbalanced three-phase circuits.
- To study the transient behavior of electrical networks with DC, pulse and AC excitations.
- To study the performance of a network based on input and output excitation/response.
- To understand the realization of electrical network, function into electrical equivalent passive elements.
- To understand the application of Fourier series and Fourier transforms for analysis of electrical circuits.

Course Outcomes:

CO1: Students are able to solve three-phase circuits under balanced condition.
CO2: Students are able to solve three-phase circuits under unbalanced condition.
CO3: Students are able find out transient response of electrical networks with different types of excitations.
CO4: Students are able to estimate the different types of two port network parameters.
CO5: Students are able to represent electrical equivalent network for a given network transfer function.
CO6: Students are able to extract different harmonics components from the response of a electrical network.

SYLLABUS

UNIT-I  Balanced Three phase circuits
Three phase circuits: Phase sequence- Star and delta connection-Relation between line and phase voltages and currents in balanced systems-Analysis of balanced three phase circuits- Measurement of Active and Reactive power in balanced Three phase systems.

UNIT-II  Unbalanced Three phase circuits
Analysis of Three Phase unbalanced circuits-Loop Method- Application of Millman’s Theorem- Star Delta Transformation Technique – Two Wattmeter Method of measurement of three phase power.

UNIT-III Transient Analysis in D.C and A.C Circuit
Transient response of R-L, R-C, R-L-C series circuits for D.C and A.C excitations, solution method using differential equation and laplace transforms,
UNIT-IV Two Port Networks
Two port network parameters – Z, Y, ABCD and hybrid parameters and their relations, Cascaded networks- Poles and zeros of Network functions

UNIT-V Network Synthesis
Positive real function-basic synthesis procedure-LC immitance functions-RC impedance functions and RL admittance function- RL impedance function and RC admittance function-Foster and Cauer methods.

UNIT-VI Fourier analysis and Transforms
Fourier theorem- Trigonometric form and exponential form of Fourier series – conditions of symmetry- line spectra and phase angle spectra- Analysis of Electrical Circuits to Non sinusoidal periodic waveforms. Fourier Integrals and Fourier Transforms – properties of Fourier Transforms and Application to Electrical Circuits.

Text Books:
2. Networksynthesis: Van Valkenburg; Prentice-Hall of India Pvt. Ltd.

Reference Books:
SWITCHING THEORY AND LOGIC DESIGN

II Year II Semester
Subject Code: UGEE4T02

Course Objectives:

- To learn different Number Systems.
- To study Combinational Logic Circuits.
- To study Sequential Logic Circuits.

Course Outcomes:

Upon completion of this course, students will:

CO1: Understand different number systems, its conversions and different types of logic gates.
CO2: Know the fundamentals of and Karnaugh maps.
CO3: Learn combinational logic circuits design.
CO4: Understand the logic design of programmable devices, such as PROM, PLA, PAL.
CO5: Learn the concepts of flip-flops and registers.
CO6: Know the concepts of state diagram, state table and realization of circuits using flip-flops.

SYLLABUS

UNIT I: Review of Number systems:

i) Representation of numbers of different radix, conversion of numbers from one radix to another radix, r-1’s complement and r’s complement of unsigned numbers subtraction, problem solving.
ii) 4-bit codes: BCD, EXCESS 3, 2421, 8421- 9’s complement, etc.
iii) Logic operations and error detection & correction codes; Basic logic operations-NOT, OR, AND, Universal building blocks, EX-OR, EX-NOR Gates, standard SOP and POS, Minimization of logic functions using theorems, Generation of self dual functions. Gray code, error detection and error correction codes(parity checking even parity, odd parity, Hamming code), NAND-NAND and NOR-NOR realizations.

UNIT II: Minimization Techniques:

Boolean theorems, principle of Complementation and duality, De-morgans theorems, Minimisation of logic functions using Boolean theorems, Minimisation of switching functions using K-Map up to 6-variables, Tabular minimization, Problem solving using K-map such as code converters binary multiplier etc.,

UNIT III: Combinational logic circuits design:

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders, 4-bit binary adder, 4-bit binary subtractor, adder-subtractor circuit, BCD adder circuit Excess3 adder circuit, look-a-head adder circuit. Design of decoder, Demultiplexer, 7 segment decoder, higher order demultiplexing, encoder,multiplexer, higher order multiplexer, realization of Boolean functions using decoders and multiplexers, priority encoder,4-bit digital comparator.
UNIT IV: Introduction to PLD’s:  
PROM, PLA-Basic structures, PAL, realization of Boolean functions using PLD’s, Programming tables of PLD’s, merits & demerits of PROM, comparison of PLA and PAL, realization of Boolean functions using PROM, PLA and PAL. Programming tables of PROM, PLA and PAL.

UNIT V: Sequential circuits I:  

UNIT VI: Sequential circuits II:  
Finite state machine, capabilities and limitations, analysis of clocked sequential circuits, design procedures, reduction of state tables and state assignment. Realization of circuits using various flip-flops. Meelay to Moore conversion and vice-versa.

TEXTBOOKS:


REFERENCES:

POWER SYSTEMS-1

II Year II Semester
Subject Code: UGEE4T03

Course Objectives:

- To study the principle of operation and function of difference components of thermal power station.
- To study the principle of operation and function of difference components of thermal power station and gas power station.
- To study the concepts of DC and AC distribution systems along with voltage drop calculations.
- To understand the constructional details, principle of operation and function of different components of air and Gas insulated substation.
- To understand the constructional details and classification of cables with necessary numeric calculations.
- To study the concepts of different type of load curves and type of tariffs applicable to consumers.

Course Outcomes

CO1: Students are able to understand the Thermal Power station and its components
CO2: Will be able to understand the Nuclear and Gas Power station principles
CO3: Able to understand the AC and DC Distribution systems and estimation of voltage drop calculations.
CO4: Will be able to understand the concepts of Air and Gas insulated substations
CO5: Students are able to know the concepts of underground cables
CO6: Will be able to understand the economic aspects of power generation and tariff.

SYLLABUS

UNIT-I Thermal Power Stations
Selection of site, general layout of a thermal power plant showing path of coal, steam, water, air, ash and flue gasses, ash handling system- Brief description of components: Boilers, Super heaters, Economizers, electrostatic precipitators, steam Turbines: Impulse and reaction turbines, Condensers, feed water circuit, Cooling towers, and Chimney.

UNIT-II Nuclear and Gas Power Stations
Location of nuclear power plant, Working principle, Nuclearfision, Nuclear fuels, nuclear chain reaction, Nuclear reactor Components: Moderators, Control roads, Reflectors and Coolants. Types of Nuclear reactors and brief description of PWR, BWR and FBR. Radiation: Radiation hazards and Shielding, nuclear waste disposal- Gas Power Stations: Principle of operation and components (Block diagram approach)
Unit-III Distribution Systems
Classification of distribution systems, design features of distribution systems, radial distribution, ring main distribution, voltage drop calculations: DC distributors for following cases: radial DC distributor fed at one end and at both ends (equal / unequal voltages), ring main distributor, stepped distributor and AC distribution. Comparison of DC and AC distribution.

Unit-IV Substations
Classification of substations: Air insulated substations - Indoor & Outdoor substations: Substations layout of 33/11KV showing the location of all the substation equipment. Bus bar arrangements in the Sub-Station: Simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers main and transfer bus bar system with relevant diagrams.
Gas insulated substations (GIS) – Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, bus bar, construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

Unit-V Underground Cables
Types of Cables, Construction, Types of insulating materials, Calculations of insulation resistance and stress in insulation, and power factor of cable, Numerical Problems Capacitance of single and 3-Core belted Cables, Numerical Problems Grading of Cables-Capacitance grading, Numerical Problems, Description of Intersheath –Grading

UNIT-VI Economic Aspects of Power Generation & Tariff
Economic Aspects: Load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, power capacity factor, plant use factor, Base and peak load plants - Numerical Problems.
Tariff Methods: Costs of Generation and their division into Fixed, Semi-fixed and Running Costs, Desirable Characteristics of a Tariff Method, Tariff Methods: Simple rate, Flat Rate, Block-Rate, two-part, three –part, and power factor tariff methods, numerical problems

Text Books:

Reference Books
1. Elements of Power Station design and practice by M.V. Deshpande, Wheeler Publishing.
ELECTRICAL MACHINES – II

II Year II Semester

Subject Code: UGEE4T04

Course Objectives:
- To learn the construction, operation and performance parameters of Single Phase Transformers
- Learn the testing methods of single phase transformer
- Distinguish between single phase and poly phase connections of a transformer and its application as a scott connection
- Understand the construction, characteristics, speed control, starting and testing methods of Induction Motors

Course Outcomes
CO1: Able to calculate the emf, losses and efficiency of Single Phase Transformers.
CO2: Able to perform the tests on Single Phase Transformers
CO3: Perform the SCOTT connection on three phase transformer
CO4: Able to analyze and calculate the inter relationships of power developed in a 3-phase Induction Motor.
CO5: Analyze the torque slip characteristics and calculate the torque developed.
CO6: Determine circle diagram by conducting No load and Blocked rotor tests on induction motor

SYLLABUS

UNIT-I Single Phase Transformers

UNIT-II Single Phase Transformers Testing
OC and SC tests - Sumpner’s test -separation of losses -parallel operation with equal and unequal voltage ratios - auto transformers-equivalent circuit - comparison with two winding transformers.

UNIT-III 3-phase Transformers
Polyphase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ andopen Δ -- Third harmonics in phase voltages-three winding transformers: tertiary windings-determination of Zp, Zs and Zt -- transients in switching - off load and on load tap changers -- Scott connection.

UNIT-IV 3-phase Induction Motors
construction details of cage and wound rotor machines-production of a rotating magnetic field - principle of operation - rotor emf and rotor frequency - rotor current and pf at standstill and during running conditions -Rotor power input, rotor copper loss and mechanical power developed and their inter relationship- equivalent circuit - phasor diagram.
UNIT-V Characteristics and speed control
Torque equation- expressions for maximum torque and starting torque –torque-slip characteristic - double cage and deep bar rotors - crawling and cogging-speed control methods -

UNIT-VI
Starting and testing methodsof Induction Motors
No load and blocked rotor tests- Circle diagram for predetermination of performance-methods of starting and starting current and torque calculations- induction generator-principle of operation.

TEXT BOOKS:
1. Electrical Machines – P.S. Bimbra., Khanna Publishers

REFERENCE BOOKS:
2. Electrical Machines by J.B.Guptha. S.K.Kataria& Sons
3. Performance and Design of AC Machines by MG.Say, BPB Publishers
ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

II Year II Semester

Subject Code: UGEE4T05

Course objectives:
- To understand different electrical measurements and instruments
- To learn the usage of bridges for the measurement of resistance, inductance and capacitance
- To learn the usage of digital meters and types of transducers

Course Outcomes

CO1: Understand and describe construction, principle of construction operation, errors, compensations and extension of ranges of different electrical measurement instruments and understanding of error analysis.

CO2: Able to perform test on CTs and calculate Ratio and phase angle errors and calibrate the PF meters.

CO3: To be acquainted with the knowledge of instruments that is useful for the measurement of power and energy.

CO4: Describe and demonstrate the usage of DC and AC bridges for the measurement of resistance, inductance and capacitance and able to calibrate different measuring instruments using potentiometers.

CO5: Determination of magnetic measurements including B-H curve, hysteresis loop and core losses and to understand usage of different digital meters for the measurement of voltage frequency and speed.

CO6: Acquire proper knowledge to use various types of Transducers and able to monitor and measure various parameters such as strain, velocity, temperature, pressure etc.

SYLLABUS

UNIT I Measuring Instruments


UNIT II Instrument transformers and Special Meters

Extension of range using shunts and series resistance -CT and PT: Ratio and phase angle errors – design considerations . Type of P.F. Meters – single phase and three phase dynamometer and moving iron type.

UNIT III Measurement of Power and Energy

UNIT – IV Potentiometers

Measurement of R-L-C
Method of measuring low, medium and high resistance – sensitivity of Wheatstone’s bridge - Kelvin’s double bridge for measuring low resistance– loss of charge method for measurement of high resistance and Earth Resistance.

A.C. Bridges:

UNIT – V
Magnetic and Electronic Measurements
Magnetic Measurements:

Electronic Measurements:
Digital Voltmeter-Successive approximation, ramp and integrating type-Digital frequency meter-Digital multimeter-Digital Tachometer

UNIT-VI Transducers

TEXT BOOK:

REFERENCE BOOKS:
1. Electrical Measurements – by Buckingham and Price, Prentice – Hall
2. Electrical Measurements by Harris.
3. Electronic Instrumentation-by H S Kalsi, Tata McGraw-Hill Education
4. Transducers & Instrumentation by D.V.S Murthy, Printice Hall of India
Course Objectives

This subject introduce about wave shaping concepts of both linear and non-linear circuits. Here we can study TIME BASE GENERATORS and also designing of multivibrators and sampling gates. We can also learn about the realization of different logic gates and their properties.

Course Outcomes

CO 1. Able to design linear and non-linear wave shaping circuits.
CO 2. To apply the fundamental concepts of wave shaping for various switching and signal generating circuits
CO 3. Know the basic operating principles of sampling gates and their types and their applications.
CO 4. To realize different logic gates and analyzing the outputs.

UNIT- I LINEAR WAVE SHAPING
Introduction to High pass and Low pass RC circuits, Response of High pass and Low pass RC circuits to sinusoidal, step, pulse, square, exponential and ramp inputs, High pass RC circuit as a differentiator, Low pass RC circuit as an integrator. Attenuators, Its applications in CRO probe, RL and RLC Circuits and their response for step input, Ringing Circuit.

UNIT- II NONLINEAR WAVE SHAPING
Clipping Circuits: Diode Clippers, Shunt Clippers, Series Clippers, Clipping at two independent levels, Transfer characteristics of clippers, Transistor Clipper, Emitter coupled clipper, Comparators, Applications of voltage comparators,clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, Practical Clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clammers.

UNIT- III TIME BASE GENERATORS
General features of a time-base signal, Methods of Generating time base waveform Exponential voltage sweep circuit, Generation of linear sweep using the CB configuration, A voltage Sweep Generator using a UJT, Basic principles of Miller and Bootstrap time-base generators, transistor Miller voltage sweep generator, transistor bootstrap voltage sweep generator.

UNIT- IV BISTABLE MULTIVIBRATORS
UNIT- V MONOSTABLE & ASTABLE MULTIVIBRATORS
Collector coupled Monostable multivibrator, Expression for the gate width, waveforms at bases and collectors; Collector coupled Astable multivibrator-expression for the frequency of operation, waveforms at bases and collectors, The Astable multivibrator as a voltage to frequency convertor; Design and analysis related problems on those circuits.

UNIT VI SYNCHRONIZATION AND FREQUENCY DIVISION
Principles of Synchronization, Frequency division in sweep circuit, Synchronization of a sweep circuit with symmetrical signals, Sine wave frequency division with a sweep circuit.

Sampling gates and Relation of Logic Gates Using Diodes and Transistors; Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Reduction of pedestal in gate circuits, Applications of sampling gates, Realization of AND, OR, NOT, NAND, NOR Gates by using Diodes, RTL, DTL.

Text Books

References
R1. Pulse and Digital Circuits, A. Anand Kumar, PHI, 2nd Edition, 2005
DC MACHINES LABORATORY

II Year II Semester
Subject Code: UGEE4P06

Course Objective:
- To obtain the characteristics of DC motors and generators by performing brake tests and load tests respectively.

Course Outcomes:
CO1: Able to determine the critical field resistance and critical speed of DC generator
CO2: To predetermine the efficiency of a given DC Shunt machine working as motor and generator.
CO3: Able to obtain performance characteristics of DC Motors and generators
CO4: To determine the efficiencies of DC series and Shunt generators

LIST OF EXPERIMENTS

Any ten of the experiments from the following are to be conducted.

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Magnetization characteristics of DC Shunt Generator. Determination of critical field resistance and critical speed</td>
</tr>
<tr>
<td>2</td>
<td>Load test on DC Shunt Generator. Determination of Characteristics</td>
</tr>
<tr>
<td>3</td>
<td>Load test on DC Series Generator. Determination of Characteristics</td>
</tr>
<tr>
<td>4</td>
<td>Load test on DC compound Generator. Determination of Characteristics</td>
</tr>
<tr>
<td>5</td>
<td>Hopkinson’s test on DC shunts machines. Predetermination of efficiency.</td>
</tr>
<tr>
<td>6</td>
<td>Field’s test on DC series machines. Determination of efficiency.</td>
</tr>
<tr>
<td>7</td>
<td>Swinburne’s Test and Predetermination of efficiencies as Generator and Motor</td>
</tr>
<tr>
<td>8</td>
<td>Brake Test on DC compound motor. Determination of performance curves.</td>
</tr>
<tr>
<td>9</td>
<td>Brake Test on DC shunt motor. Determination of Performance curves</td>
</tr>
<tr>
<td>10</td>
<td>Separation of losses in DC shunt motor</td>
</tr>
<tr>
<td>11</td>
<td>Speed Control of DC shunt Motor by Field and Armature control</td>
</tr>
<tr>
<td>12</td>
<td>Retardation Test on DC shunt Machine</td>
</tr>
</tbody>
</table>
Course Objective:

- This lab aims at experimentation of AC & DC networks for the future study and analysis of power systems.
- It also deals with accurate measurement of electrical parameters voltage, current, power, energy and electrical characteristics of resistance, inductance and capacitance.

Course Outcomes:

CO1: Apply the fundamentals of circuit theory in solving and verifying various Laws and Theorems.
CO2: To find the resonant Frequency, quality factor & bandwidth of the RLC circuits
CO3: To verify the working of different meters and bridges and measuring unknown R, L, C.
CO4: To calibrate and also to calculate the different errors of the equipment.
CO5: To calculate the active and reactive power of balanced and unbalanced loads

Any Five of the Experiments in each laboratory are to be conducted.

LIST OF EXPERIMENTS

<table>
<thead>
<tr>
<th>S. No.</th>
<th>CONTENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Verification of Thevenin’s and Norton’s Theorems</td>
</tr>
<tr>
<td>2</td>
<td>Superposition Theorem and Maximum Power Transfer Theorem</td>
</tr>
<tr>
<td>3</td>
<td>Reciprocity Theorem and Milliman’s Theorem</td>
</tr>
<tr>
<td>4</td>
<td>Series &amp; Parallel Resonance</td>
</tr>
<tr>
<td>5</td>
<td>Locus Diagrams of RL &amp; RC Series Circuits</td>
</tr>
<tr>
<td>6</td>
<td>Verification of Compensation Theorem</td>
</tr>
<tr>
<td>7</td>
<td>Z And Y Parameters</td>
</tr>
</tbody>
</table>

Electrical Measurements Laboratory
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Measurement of Active Power For Star and Delta Connected Balanced Loads</td>
</tr>
<tr>
<td>10</td>
<td>Kelvin's Double Bridge</td>
</tr>
<tr>
<td>11</td>
<td>Crompton D.C. Potentiometer - Calibration of Pmmc Ammeter &amp; Pmmc Voltmeter</td>
</tr>
<tr>
<td>12</td>
<td>Capacitance, Inductance Measurement Using Schering Bridge And Anderson Bridge</td>
</tr>
<tr>
<td>13</td>
<td>Calibration of 1-Ø LPF Wattmeter</td>
</tr>
<tr>
<td>14</td>
<td>Calibration and Testing of Single Phase Energy Meter</td>
</tr>
<tr>
<td>15</td>
<td>Calibration of Dynamo Meter Power Factor Meter</td>
</tr>
<tr>
<td>16</td>
<td>Measurement of 3-Ø Power with Single Wattmeter and 2 No’s of CTs</td>
</tr>
</tbody>
</table>