Course Name : Electronics Engineering Group.

Course Code : DE/ED/EI/EJ/EN/ET/EV/EX/IC/IE/IS/IU/MU

Semester   : Third

Subject Title : Electrical Engineering

Subject Code : 17318

Teaching and Examination Scheme

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

NOTE:

> ➢ **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
> ➢ **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**
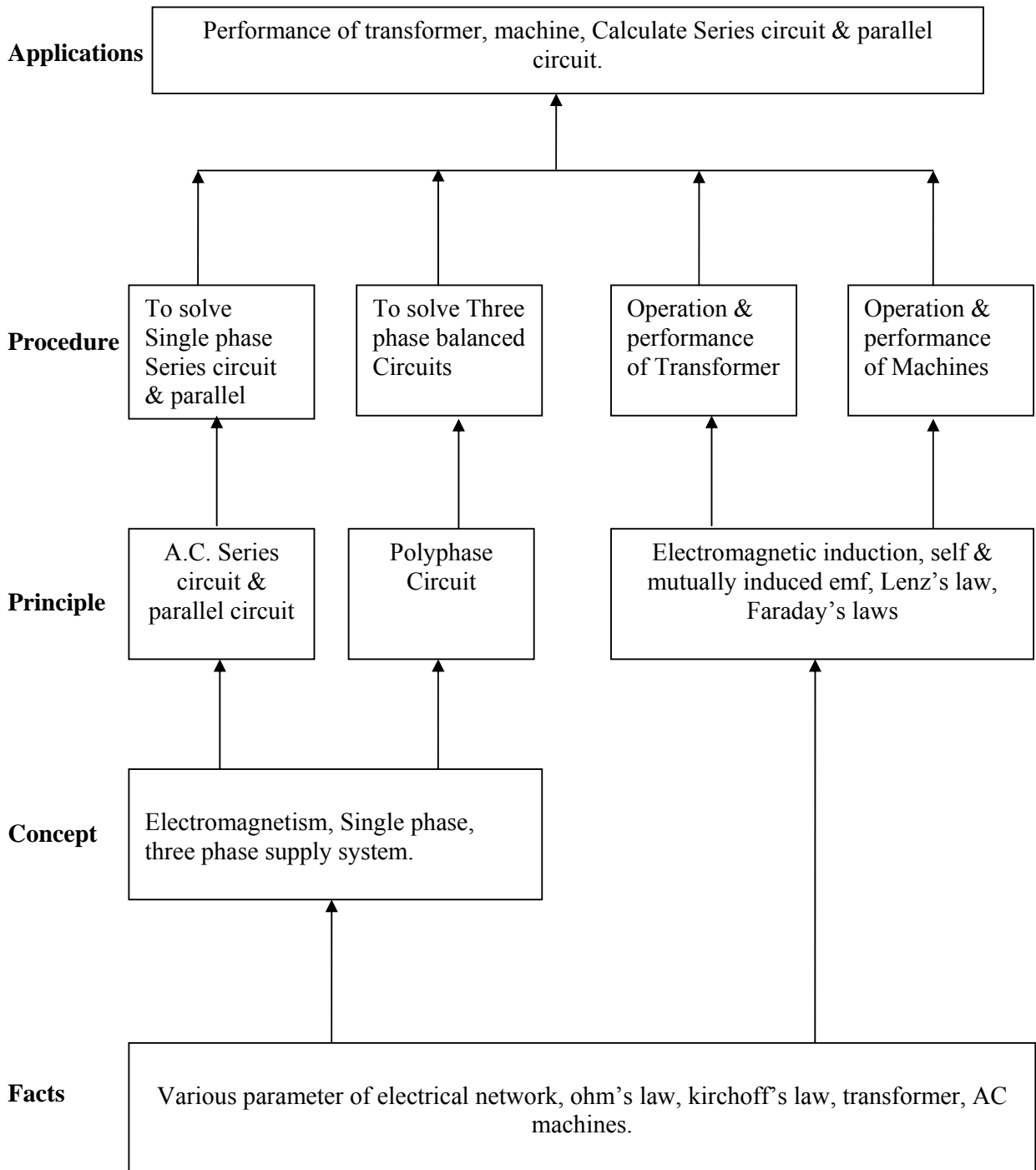
Rationale:

The basic concepts of electrical engineering are covered in the subject Elements of Electronics Engineering in the second semester. Electrical Engineering   subject is designed for second year diploma course in Electronics Engineering group. The subject covers analysis of ac networks, working principles and characteristics of various drives. The subject includes various safety rules, methods and equipments used for system and   operation. The basic concepts studied in this subject will be very useful for understanding of Power electronics and electronic drives of electronics course.

Objectives:

 The students will be able to

1. Understand single phase and three phase AC circuits.
2. Realize concept of electromagnetic induction and apply it to static and rotating machines.
3. Understand characteristics of rotating machines.
4. Know the importance of safety and various safety methods in electrical engineering**.**

Learning Structure:

Applications

> Performance of transformer, machine, Calculate Series circuit & parallel circuit.

Procedure

> | To solve Single phase Series circuit & parallel | To solve Three phase balanced Circuits | Operation & performance of Transformer | Operation & performance of Machines |

Principle

> | A.C. Series circuit & parallel circuit | Polyphase Circuit | Electromagnetic induction, self & mutually induced emf, Lenz's law, Faraday's laws |

Concept

> Electromagnetism, Single phase, three phase supply system.

Facts

> Various parameter of electrical network, ohm's law, kirchoff's law, transformer, AC machines.

Content Theory:

Topic	Hours	Marks

Topic 1 : AC Fundamentals
Specific Objectives :
  ➢ **Compare AC and DC system.**
  ➢ **Meaning of various terms related to AC system.**
  ➢ **Distinguish Various AC circuits and Understand rules and procedure to draw vector diagrams for the same.**
  ➢ **To realize concept of various resonance parameters and plot the graph.**
Contents :
  • Difference between A.C. and D.C. quantity
  • Advantages of A.C. over D.C.
  • waveform of sinusoidal A.C. cycle
  • Generation of single phase A.C. by elementary alternator
  • Definitions: instantaneous value, cycle, amplitude, time period, frequency, angular frequency, R.M.S. value, Average value for sinusoidal waveform, Form factor, Peak factor (no derivation , simple numerical on it)
  • Phasor representation of sinusoidal A.C. quantity, review of phasor algebra, representation of A.C. quantity in rectangular.
  • Phase angle, phase difference, concept of lagging and leading by waveforms, mathematical equations and phasors.
  • Pure resistance, inductance and capacitance in A.C. circuit – waveforms, equations and phasor diagram (no derivation)
  • Concept of impedance and impedance triangle.
  • Power – active, reactive and apparent, power triangle.
  • Power factor and its significance.
  • R-L, R-C and R-L-C series circuit – phasor diagram, voltage and current equations.
  • Simple numerical on R-L, R-C and R-L-C series circuit.
  • Resonance in R-L-C series circuit: Conditions for resonance, graphical representation of resonance curve, resonant frequency, bandwidth and Q factor of series resonant circuit.
  • Resonance in parallel circuit, resonant frequency and Q factor, nature of resonance curve (No derivation &no numerical)
	14	30

Topic 2: Polyphase Circuits
Specific Objectives :
  ➢ **Compare three phase and single phase system.**
  ➢ **Define various terms related to three phase system.**
  ➢ **Interpret relations between line & phase values of current, voltage, power& power factor of star & delta connected systems.**
Contents :
  • Advantages of 3 phase system over 1 phase system
  • Principle of 3-phase e.m.f. generation and its waveform
  • Concept of phase sequence
  • Balanced and unbalanced load
  • Relation between phase and line current, phase and line voltage in Star connected and Delta connected balanced system. (no derivation)
  • Calculation of current, power, power factor in a 3 phase balanced
	06	12

system (simple numerical)		

Topic 3 : Electromagnetic Induction
Specific Objective :
  ➢ **Realize the concept of self and mutually induced EMF.**
  ➢ **Interprete Faraday's laws of electromagnetic induction.**
Contents :
  • Relation between Magnetism and Electricity.
  • Production of Induced E.M.F. and Current.
  • Faraday's Laws of Electromagnetic Induction.
  • Fleming's Right Hand Rule
  • Lenz's Law
  • Induced E.M.F: Self Induced E.M.F., Mutually Induced E.M.F., direction of Induced E.M.F. and Currents.
  • Energy Stored in Magnetic Field
  • (No Derivation and No Numerical)
	04	08

Topic 4: Single Phase Transformer
Specific Objective :
  ➢ **Draw construction diagram and explain working principle of single phase transformer.**
  ➢ **Interpret the relationship between various parameters of transformers.**
  ➢ **Compare autotransformer & two winding transformer**
 Contents :
  • Construction and working of transformer, classification , brief description of each part, its function (power transformer, audio frequency transformer, radio frequency transformer, isolating transformer, pulse transformer, intermediate frequency transformer)
  • Significance of Emf equation (no derivation)
  • Voltage ratio, current ratio and transformation ratio.
  • KVA rating of a transformer
  • Losses in a transformer
  • % efficiency & % regulation
  • Auto transformer – comparison with two winding transformer,
  • Applications
  • Simple numerical on this topic
	06	16

Topic : 5 : Three Phase Induction Motor
Specific Objectives :
  ➢ **Realize construction principle of working & types of three phase induction motor.**
  ➢ **Identify speed torque characteristics.**
  ➢ **Use of variations in voltage, current and frequency for speed control of motors.**
Contents:
  • Construction and principle of working
  • Types – Squirrel cage and slip ring
  • Synchronous speed, slip speed, slip and rotor frequency (no numerical)
  • Torque – speed characteristics
  • Necessity of starter
  • Basic concepts of speed control method using thyristor.
	08	16

• Revesal of rotation of 3 phase induction motor.		

Topic : 6 Fractional Horse Power Motors
Specific Objectives :
  ➢ **Draw Schematic representation, Principle of working ,
    characteristics and applications of**
       i)   **Single Phase Induction Motor**
       ii)   **Universal Motor**
       iii)   **Stepper Motor**
       iv)   **Servo Motor**
Contents :
•   Schematic representation, principle of operation and applications of the Split phase single phase induction motors.
•   Universal motor - Schematic representation principle of operation, reversal of rotation and applications
•   Stepper motor - Schematic representation types, principle of working and applications
•   Servo motor - Schematic representation types, principle of working and applications
	08	12

Topic 7 : Electrical Safety **Specific Objectives :** ➢ **Understand and reproduce use of safety equipments** **Contents :** • Study of different accessories like MCCB, ELCB, cables and wires used in domestic and commercial electrical wiring. • Use of megger as earth tester.(front panel diagram & different control terminals) • Necessity of earthing and list its types. • Electrical safety	02	06
Total	**48**	**100**

Practical:

Skills to be developed:

Intellectual Skills:

1. Identify various types of Machines.
2. Select Instruments and their ranges.

Motor Skills:

1. Draw machine characteristics.
2. Make proper connection.
3. Accuracy in measurements.

List of Practicals:

1. Know your electrical laboratory.
2. Determine the resistance, inductance and impedance of choke coil by observing its response to A. C. and D. C supply.
3. Draw the phasor diagram and determine the power factor of R-L-C series circuit.

4. Verify the relationship between line and phase values of voltages and currents in three phase balanced star and delta connected load.
5. Identify the type of transformer based on the transformation ration of single phase transformer.
6. Determine Efficiency and single phase transformer at no load, half load and full load by conducting load test.
7. Determination of slip of three phase induction Motor by tachometer method and observation of variation in speed to change in supply voltage.
8. Reversal of direction of rotation of single phase induction motor.
9. Measurement of insulation resistance using megger.
10. Study of different types of Cables and switches.
11. Mini project which includes connection of switch, holder, plug socket, fuse and indicator.

Learning Resources:
Books:

Sr. No	Author	Title	Publisher
1	Hughes	Electrical & Electronics Technology	Pearson
2	Mittle & Mittal	Basic Electrical Engineering	Tata McGraw Hill, New Delhi
3	B.L. Theraja	Electrical Technology Vol- I & II	S.Chand Publications Delhi
4	V. K. Mehta, Rohit Mehta	Basic Electrical Engineering	S.Chand Publications Delhi

Websites: www.housestuff.com