COURSE TITLE : FUNDAMENTALS OF AC SYSTEMS

COURSE CODE : 3033
COURSE CATEGORY : B
PERIODS/WEEK : 4
PERIODS/SEMESTER : 60
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Principle of alternating voltage generation	15
2	Alternating current circuits	15
3	Polyphase circuits	15
4	Measurement of power in three phase circuits	15
	Total	**60**

Course Outcome:

Sl.	Sub	**On completion of this course the student will be able:**
1	1	To comprehend the method of generation of voltage.
2	1	To understand the parameters and its effect in alternating current system.
	2	To understand the different types of interconnection and its effects.
3	1	To comprehend the generation of poly phase voltages.
	2	To understand the interconnections of poly phase system.
4	1	To understand the power measurement in poly phase system.
	2	To understand the effect of power factor in system.

Specific Outcome

MODULE I Principle of alternating voltage generation

1.1.1 To describe the generation of alternating voltages.
1.1.2 To explain the advantage of AC supply system.
1.1.3 To derive the equations of alternating voltage and currents.
1.1.4 To identify term related to alternating current
   i. instantaneous value
   ii. maximum value
   iii. average value
   iv. RMS value
1.1.5 To explain the term form factor and crest factor.
1.1.6 To illustrate vector representation of alternating quantities.
1.1.7 To describe the addition of alternating quantities.
1.1.8 To describe the addition and substation of vectors.
1.1.9 To compute simple problems.

MODULE II Alternating current circuits

2.1.1 To illustrate AC through pure inductances.
2.1.2 To illustrate AC through pure capacitor.
2.1.3 To illustrate AC through resistance and inductor.
2.1.4 To illustrate AC through resistance, inductor and capacitor.
2.1.5 To compute simple problems.
2.1.6 To describe phasor algebra.
2.1.7 To describe series circuits
2.1.8 To describe parallel circuits
2.1.9 To describe resonance and Q factor.
2.1.10 To compute problems.

MODULE III Polyphase circuits

3.1.1 To describe the generation of poly phase voltages.
3.1.2 To illustrate phase sequence, numbering of phases, interconnection of phases.
3.1.3 To explain the advantages of poly phase system.
3.1.4 To distinguish star connection.
3.1.5 To distinguish delta connections.
3.1.6 To compare star and delta system.
3.1.7 To distinguish the balanced star/ delta and delta / star conversions.
3.1.8 To compare star and delta connected lighting load.

3.1.9 To differentiate single phase and three phase systems.
3.1.10 To compute simple problems.

MODULE IV Measurement of power in three phase circuits

4.1.1 To explain the power measurement in AC circuits.
4.1.2 To describe the various methods for power measurement in three phase circuits.
4.1.3 To describe three wattmeter method for power measurement.
4.1.4 To describe two wattmeter method for power measurement.
4.1.5 To describe single wattmeter method for power measurement.
4.1.6 To distinguish between balanced load and unbalanced load.
4.1.7 To illustrate power factor in leading and lagging.
4.1.8 To describe the method of finding reactive volt-ampere by using two wattcmeters.
4.1.9 To describe the method of finding reactive volt-ampere by using one wattmeter in balanced load
4.1.10 To describe the methods of improving power factor.
4.1.11 To identify various power correction equipment.

CONTENT DETAILS

MODULE – I

Single turn alternator - voltage equation - e=Blv sinθ -simple problems – Advantages of - system – instantaneous value, peak value - r.m.s ,average, form factor, peak factor, waveform – cycle - Time period – frequency - simple problems - Phasor representation of alternating quantities - vector diagrams using r.m.s. Values - Addition and subtraction of alternating quantities by vector method - simple problems in Vector.

MODULE – II

A.C through pure R, L,C-equation R ,X_L ,Xc, Impedance Z - Phasor Algebra - Mathematical representation of vectors - polar form, Rectangular form, Complex form and trigonometric forms -conversion from polar form to rectangular form and vice versa - Addition, subtraction, multiplication &division of alternating quantities in these forms - Series circuits - through R L, R C, and R, L C circuits – active, Reactive and Apparent power, Power factor, Resonance in R-L-C series circuits - problems in series circuits (In polar and rectangular form) - Parallel A.C circuits - phasor method - solving problems in RL and RC parallel circuit - Resonance in parallel circuit-conductance – susceptance.

MODULE – III

Generation of poly phase-Advantages of 3 Φ system over 1Φ system - phase sequence-interconnection - star/delta-advantages of star system – conversion from star/delta – problems in 3 phase – voltage & current relation in star/delta-power - problems

MODULE – IV

Power measurements in circuits - power factor - power measurements in balanced load by 1 wattmeter, 2 wattmeter, 3wattmeter – power, p.f, Reactive Volt-ampere- simple problems - Balanced and unbalanced load - Methods of improving p.f - vector diagram - p.f correction-simple problems

REFERENCES

1. B.L Thereja. Electrical Technology. Vol-I. S Chand & co.
2. Metha.V.K*, Rohit* Metha. Basic Electrical Engineering. S Chand & co.
3. Ashfaq Husain. Basic Electrical Engineering. Dhanapath Rai & co.