

INSTITUTE	DIPLOMA STUDIES
PROGRAM	DIPLOMA ENGINEERING (ELECTRICAL ENGINEERING)
SEMESTER	2
COURSE TITLE	AC CIRCUIT
COURSE CODE	09EE3104
COURSE CREDITS	5

Objective:

- 1 This is one of the important subjects of electrical engineering. After studying this student should be understand the basic concept of A.C. circuits for highly effectively working as a skilled electrical engineer. This subject teach to students apply the principle of A.C. circuit; solve the problem of electrical industry and electric network. Basically electrical engineering dividedly power generation, transmission, distribution and utilization in form of A.C. so every electrical engineer should know basic concept of A.C. system. To solve the problem by using the knowledge of fundamental concept of series-parallel circuit and poly-phase circuits. To analyse and measure various type of powers in terms of power factor using watt meters.

Course Outcomes: After completion of this course, student will be able to:

- 1 To understand & apply various parameters of AC circuit
- 2 To understand and troubleshoot problems related to single phase AC series and parallel circuits.
- 3 To analyse and understand single phase and three phase AC circuit.
- 4 To analyse and measure various type of powers and power factor.

Pre-requisite of course: Basic knowledge of physics and D.C. Circuits.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
2	2	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Fundamentals of AC circuit Introduction, Advantage of AC system over DC system, Definition related to AC system Generation of alternating EMF(Basic Alternator) Equation and waveform of alternating EMF, RMS value, Mean value or Average value Form factor, Peak factor or crest factor Different form of alternating voltage and current, Phasor representation of alternating quantity Phase of alternating quantity, Define: phase and phase difference, Addition and subtraction of alternating quantities, Mathematical representation of phasor Mathematical operation of vector	6
2	Analysis AC series circuit Introduction, Pure resistive, inductive and capacitive AC circuit and its voltage and current response., AC circuit with series elements, R-L, R-C, L-C , R-L-C combination of AC series circuit, Impedance triangle, power triangle, power factor Resonance circuit, bandwidth, quality factor in series circuit	8
3	Analysis AC parallel circuit Introduction, Method of solving parallel circuit, Phasor algebra method, Admittance method, Complex algebra method, AC circuit with parallel elements, Resonance, bandwidth, quality factor in parallel circuit, Series-parallel circuit, Comparison between series and parallel resonance circuit	5
4	Three phase AC circuits Introduction Advantages of three phase system over single phase system, Generation of three phase EMF and its waveform Phasor and complex representation of three phase supply, Term related to three phase AC system, Numbering of phase, phase sequence and polarity Balance and unbalance load Concept of line value and phase value, Types of three phase connection, phase and line quantity in three phase star and delta connection	5
5	AC power analysis Introduction, Power triangle, active power, reactive power, , apparent power and power factor. Causes of low power factor, Disadvantages of low power factor Advantages of power factor improvement, Various methods of improving power factor Measurement of single phase power and three phase power	4
Total Hours		28

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Experiment 1 Use DSO to determine basic terminology of AC waveform.	2
2	Experiment 2 Use electrical measuring instruments to measures various electrical parameters.	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
3	Experiment 3 Determine inductance and resistance of inductive load and find active power flow through resistor.	2
4	Experiment 4 Determine parameter of series R-L circuit, draw phasor diagram.	2
5	Experiment 5 Determine parameter of series R-C circuit, draw phasor diagram	2
6	Experiment 6 Determine parameter of series R-L-C circuit, draw phasor diagram.	2
7	Experiment 7 Use variable frequency supply to create resonance in given series R-L-C circuit.	2
8	Experiment 8 Determine parameter of parallel R-L-C circuit, draw phasor diagram.	2
9	Experiment 9 Use voltmeter, ammeter, wattmeter, power factor meter to determine voltage, current, power and power factor for RLC parallel circuit with series connection of resistor and inductor in parallel with capacitor.	2
10	Experiment 10 Use variable frequency supply to create resonance in given parallel R-L-C circuit.	2
11	Experiment 11 To measure phase and line quantity relationship in star and delta connection in a three phase system.	4
12	Experiment 12 Determination of power in three phase balanced circuit using two watt meter and three watt meter method.	2
13	Experiment 13 Determination of power in three phase unbalanced circuit using three watt meter method.	2
14	Tutorial 1 Tutorial on Fundamentals of AC circuit	6
15	Tutorial 2 Tutorial on Analysis AC series circuit	8
16	Tutorial 3 Tutorial on Analysis AC parallel circuit	5
17	Tutorial 4 Tutorial on Three phase AC circuits	5
18	Tutorial 5 Tutorial on AC power analysis	4
Total Hours		56

Textbook :

- 1 A Text Book of Electrical Technology Vol-I, B. L. Theraja, S. Chand & Co. Ltd, 2014
- 2 Fundamental of Electrical Engineering, Tarlok Singh, S. K. Kataria & Sons, 2012
- 3 Theory and Problem in Basic Electrical Engineering, D.P. Kothari and I.J. Nagrath, Prentice Hall India, 2012
- 4 Fundamentals of Electrical Engineering & Electronics, S.K. Sahdev, Dhanpat Rai & Co. LTD., 2014
- 5 Basic Electrical Engineering, U. A. Bakshi & V. U. Bakshi, Technical Publication Pune, 2012
- 6 Elements of Electrical Engineering, U. A. Patel, Atul Prakashan, 2016
- 7 Elements of Electrical Engineering, R. Jadeja, T. Trivedi & A.Ved., Tata-McGraw-Hill, 2018
- 8 Basic Electrical Engineering, V.N. Mittal, Tata-McGraw-Hill, 2006

References:

- 1 A Text Book of Electrical Technology Vol-I, A Text Book of Electrical Technology Vol-I, B. L. Theraja, S. Chand & Co. Ltd, 2014
- 2 Fundamental of Electrical Engineering, Fundamental of Electrical Engineering, Tarlok Singh, S. K. Kataria & Sons, 2012
- 3 Theory and Problem in Basic Electrical Engineering, Theory and Problem in Basic Electrical Engineering, D.P. Kothari and I.J. Nagrath, Prentice Hall India, 2012
- 4 Fundamentals of Electrical Engineering & Electronics, Fundamentals of Electrical Engineering & Electronics, S.K. Sahdev, Dhanpat Rai & Co. LTD., 2014
- 5 Basic Electrical Engineering, Basic Electrical Engineering, U. A. Bakshi & V. U. Bakshi, Technical Publication Pune, 2012
- 6 Elements of Electrical Engineering, Elements of Electrical Engineering, U. A. Patel, Atul Prakashan, 2016
- 7 Elements of Electrical Engineering, Elements of Electrical Engineering, R. Jadeja, T. Trivedi & A.Ved., Tata-McGraw-Hill, 2018
- 8 Basic Electrical Engineering, Basic Electrical Engineering, V.N. Mittal, Tata-McGraw-Hill, 2006

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
40.00	40.00	10.00	10.00		

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- 4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

- 1 <http://nptel.ac.in/courses/108108076/>
- 2 <http://nptel.ac.in/downloads/108105053/>
- 3 <http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/>
- 4 <https://www.facstaff.bucknell.edu/mastascu/eLessonsHTML/EEIndex.html>
- 5 <http://www.electrical4u.com/nature-of-electricity/>
- 6 <http://vlab.amrita.edu/index.php>