



Course Syllabus
Gyanmanjari Diploma Engineering
Semester – 2 (Diploma)

Subject: AC Circuit – DETEE12202

Type of course: Major

Prerequisite: Basic knowledge of electrical engineering

Rationale:

The course is designed mainly for electrical power generation, transmission, distribution and utilization are in the form of alternating current. Therefore it is essential for every electrical engineer to know the behavior of resistance, capacitance, inductance and related concepts in AC systems. This course is not only a prerequisite to learn the advanced electrical courses and develop the skills but also enable the students to apply the principle of ac circuits to troubleshoot electrical circuits in industries/Power System. This is one of the most important core engineering courses for electrical engineers and hence students should try to develop mastery over concepts of AC circuits for effective working as an electrical engineer.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P		C	Theory Marks		Practical Marks		
			ESE		MSE	V	P	ALA	
4	0	2	5	60	30	10	20	30	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment;



Course Content:

Sr. No.	Content	Total Hrs	% Weightage
1	<p>AC Fundamentals</p> <ul style="list-style-type: none"> • Generation of alternating EMF Principle of generating an alternating voltage • Various electrical parameters Cycle, Time period, Frequency, Amplitude, Phase and Phase • Equation for RMS and average value of sinusoidal wave. Average value, R.M.S. value, Form factor, Peak Factor and Power Factor. • Vector representation and mathematical operations of alternating vector quantities Solve numerical based on AC fundamentals. Vector Representation of Alternating quantities, Addition, subtraction, multiplication and division. 	15	25%
2	<p>AC Series Circuits</p> <ul style="list-style-type: none"> • Behavior of AC voltage, current and power through pure resistance, pure inductance and pure capacitance with sketches. Waveforms, Phasor diagram and expression of voltage, current and power in pure: Resistance, Inductance and Capacitance. • Behavior of AC voltage, current and power through RL, RC and RLC series circuit with sketches. AC through RL, RC, LC, RLC series circuit. • Resonance in RLC series circuit with sketches. Resonant frequency and Resonance condition in RLC series circuit. • Numerical based on AC series circuits and series resonance. • Numerical Practice 	15	25%
3	<p>AC Parallel Circuit</p> <ul style="list-style-type: none"> • Behavior of AC voltage, current and power through RL, RC and RLC parallel circuit. Solution of RL, RC, LC and RLC parallel circuits using Phasor method. Solution of RL, RC, LC and RLC parallel circuits using admittance method. • Resonance in RLC parallel circuit. Resonant frequency and resonance condition in parallel AC circuits. • Numerical based on AC parallel circuit and parallel resonance. • Numerical Practice 	12	20%



4	<p>Poly Phase Circuits</p> <ul style="list-style-type: none"> • Generation of three phase alternating voltage. Principle of generation of three phase alternating voltage. • Distinguish between line and phase voltage, line and phase currents in 3- phase AC circuits. Line and phase voltage, line and phase current. • Star and delta connection with Phasor diagrams. Three Phase Star Connection. Three phase Delta connection. 	12	20%
5	<p>Power Measurement & Improvement</p> <ul style="list-style-type: none"> • Single phase ac circuit power measurement using wattmeter. • Three phase ac circuit power measurement using three wattmeter method. • Power factor improvement using capacitor. 	06	10%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	<p>Plugged In Faculty will assign question regarding subject and recent trend and students have to find solution and upload on gmiu portal.</p>	10
2	<p>Micro Project Students will be assigned one domain for doing work. After completion of work students need to upload photo/video on the gmiu portal. (Number of students per group 3 or 4)</p>	10
3	<p>Electrical Appliances Study Faculty will assign one component of electrical and students have to study about it and submit the report.</p>	10
Total		30

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	50%	20%	-	-	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.



Course Outcomes:

After learning the course the students should be able to:	
CO1	Interpret various terminologies, waveform and vector representation of alternating quantities.
CO2	Evaluate electrical circuits using principles of A.C. series circuits.
CO3	Pertaining principles of A.C. parallel circuits to solve electrical circuits.
CO4	Apply the principles of three phase circuits to solve electrical circuits

List of Practicals:

Sr. No.	Descriptions	Unit. No	Hrs
1	Demonstrate waveforms of alternating quantities using CRO and function generator	1	2
2	Use CRO to measure Peak value, RMS value, Time period and frequency of alternating quantity	1	2
4	Measurement of Power using multi meter method for single phase ac circuit.	2	2
5	Measure voltage, current, and power through pure resistor	2	2
6	Measure inductance and internal resistance of choke coil	2	2
7	Verify Kirchhoff's voltage law.	2	2
8	To study about inductive reactance	3	2
9	To study about capacitive reactance	3	2
3	Measurement of Current, Voltage and Power for three phase ac circuit.	4	2
10	Verify Kirchhoff's current law.	4	2
11	Test relation between power consumption in three phase star and delta connected load.	4	2
12	Measurement power Factor in single phase ac circuit.	5	2
13	Measurement of power in single phase AC Circuit Using following methods Volt Ammeter method and watt meter method.	5	2
14	To study about power quality improvement	5	2
15	To study about power factor improvement of 3 ϕ or 1 ϕ circuit	5	2
	TOTAL		30



Instructional Method:

- 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 and may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- From the content 10% topics are suggested for flipped mode instruction.
- Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory
- The internal evaluation will be done on the basis of Active Learning Assignment
- Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

- [1] B. L. Theraja, "A Text Book of Electrical Technology Vol-I", S. Chand & Co. Ltd.
- [2] Tarlok Singh, "Fundamental of Electrical Engineering", S. K. Kataria & Sons
- [3] J. B. Gupta, "A Course of Electrical Technology Vol-I", Kataria & Sons,
- [4] S.K. Sahdev, "Fundamentals of Electrical Engineering & Electronics", Dhanpat Rai & Co.
- [5] K Uma. Rao, "Basic Electrical Engineering", Pearson Education, India

