Program : **Diploma in Electronics / Electronics & Communication Engineering**	
Course Code : **3041**	Course Title: **Electric Circuits & Networks**
Semester :**3**	Credits: **3**
Course Category: **Program Core**	
Periods per week: **3 (L:2, T:1, P:0)**	Periods per semester: **45**

CourseObjectives:

- To develop the skill to diagnose and rectify the electric circuit networks and understand the operations of electrical machines.

Course Prerequisites:

Topic	Course code	Course name	Semester
Basic Engineering Mathematics principles		Mathematics I & II	1 & 2
Magnetism		Applied Physics I &II	1 & 2

Course Outcomes:

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive Level
CO1	Solve a given AC circuit to find various parameters using the concept of AC signals and the behavior of AC through various components.	9	Applying
CO2	Apply various network theorems for simplifying electric circuits and networks and illustrate the operations of transformers	14	Applying
CO3	Illustrate the principles and operations of DC machines	10	Understanding
CO4	Illustrate the principles and operations of AC machines	10	Understanding
	Series test	2	

CO - PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3						
CO2	3						
CO3	2						
CO4	2						

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Solve a given AC circuit to find various parameters using the concept of AC signals and the behavior of AC through various components.**		
M1.01	Illustrate the concept of AC signals	1	Understanding
M1.02	Explain the behavior of AC through R-L-C components	2	Understanding
M1.03	Solve the power in given AC circuits by keeping the concept of phasor diagram.	3	Applying
M1.04	Solve given series and parallel RLC circuits and find the various parameters.	3	Applying
Contents: Concept of alternating voltage and current - Different waveforms (Sine, Square, Triangular and Sawtooth) - representation of alternating quantities - define the terms cycle, time period, frequency, amplitude, phase, maximum value, rms value, average value form factor AC through resistance, inductance, and capacitance (Solve simple problems) - Phasor diagrams- power factor definition - calculation of active, reactive and apparent power, Resonance and Q factor in an RLC circuit - series and parallel AC circuits (simple problems).			
CO2	**Apply various network theorems for simplifying electric circuits and networks and illustrate the operations of transformers.**		
M2.01	Illustrate various network theorems	3	Understanding
M2.02	Apply various network theorems for solving electrical and electronics circuits.	6	Applying
M2.03	Explain principle and operations of transformers	3	Understanding

M2.04	List the types and applications of Transformers.	2	Remembering
	Series Test - I	1	

Contents:

Network Theorems and Transformers

Ohm's law - Kirchhoff's law – Mesh analysis – Node analysis- Superposition theorem - Thevenin's theorem - Maximum power transfer theorem (Solve simple problems)

Transformers: working principle of transformer - construction of transformer - elementary theory of an ideal transformer - voltage transformation ratio and rating of a transformer - emf equation derivation - losses in transformers - types, applications of transformers

CO3	**Illustrate the principle and operations of DC machines**		
M3.01	Explain the principle and operation of a DC generator.	3	Understanding
M3.02	Explain the principle and operation of a DC motor.	2	Understanding
M3.03	Illustrate the use of starter in DC Motors.	3	Understanding
M3.04	Compare different DC motors	2	Understanding

Contents:

DC Machines

Working principle of DC generator - different types of DC generators - emf equation of a DC generator - armature reaction - no load characteristics - types.

DC motors - working principle of DC motor - significance of back emf in DC motor - starters - Types of starters -necessity of starter in DC motor - 3 point starter - comparison of DC motors with characteristics and speed

CO4	**Illustrate the principle and operations of AC machines.**		
M4.01	Explain the principles and operations of alternator	3	Understanding
M4.02	Explain the principle and operations of AC motor	3	Understanding
M4.03	List the applications of various AC motors.	1	Understanding
M4.04	Explain the principle of three phase motors.	3	Understanding
	Series Test - II	1	

Contents:

AC Machines

Alternators - working principle of an alternator- emf equation of an alternator - synchronous speed and frequency - the open circuit characteristics of an alternator

AC motors - working principle and classification of AC motors - working principle and applications of stepper motor, universal motor, servo motor - working principle and applications of single phase and three phase induction motor

Text / Reference:

T/R	Book Title/Author
T1	B. L. Thereja and A. K. Thereja, "Textbook of Electrical Technology: Part 1 - Basic Electrical Engineering in S. I. Units", S. Chand Publication, 2012
R1	B. L. Thereja and A. K. Thereja, "Textbook of Electrical Technology: Part 2-AC and DC machines", S. Chand Publication, 2012
R2	Dr Ganesh Rao& R Sreenivasa, "Network Analysis: A simplified approach", Cengage
R3	J.B Guptha, "Fundamentals of Electrical Engineering& Electronics", S. K. Kataria& Sons, 2009

Online Resources:

Sl.No	Website Link
1	https://www.khanacadamy.org/electrical/
2	https://ocw.mit.edu/electrical
3	www.electrical4u.com