Program : **Diploma inMechanical Engineering/Manufacturing Technology**	
Course Code :**3024**	Course Title: **Fundamentals of Electrical Engineering**
Semester : **3 / 3**	Credits: **4**
Course Category: **Program Core**	
Periods per week: **4 (L:3,T:1,P:0)**	Periods per semester:**60**

Course Objectives:

- To familiarize the fundamental concepts of electrical engineering
- To identify the fundamental principles and applications of electric motors, electric power and electronics in mechanical engineering
- To identify various electric heating and welding equipment used for mechanical manufacturing process

Course Pre-requisites:

Topic	Course Code	Course Name	Semester
Basic knowledge in Physics		Applied Physics I & II	1&2
Basic knowledge in Mathematics		Mathematics 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 simple electrical circuits using the fundamental concept of circuit parameters and basic laws	15	Applying
CO2	Explain the working principle of electric motors and their applications in mechanical engineering	15	Understanding
CO3	Illustrate various electric heating and welding equipment used for mechanical manufacturing process	14	Understanding

CO4	Summarize the applications of electronics in mechanical engineering.	14	Understanding
	Series Test	2	

CO – PO Mapping:

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

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

Course Outline

Module Outcomes	Description	Duration (Hours)	Cognitive level
CO1	**Solve simple electrical circuits using the fundamental concept of circuit parameters and basic laws**		
M1.01	Summarize the basic elements of an electrical circuit and their characteristics	3	Understanding
M1.02	Solve simple dc circuits using basic laws	4	Applying
M1.03	Explain the fundamentals of AC and its behavior in passive components	4	Understanding
M1.04	Solve simple problems related to electrical power and energy	4	Applying

Contents:
Basic terms in electricity - current,emf, resistance. Dc circuits- equivalent resistance - series, parallel, combination of series & parallel - simple problems.
Ohm's law- problems, Kirchhoff's laws –problems
Faraday's laws of electromagnetic induction, Lenz's law; Dynamically induced emf; Statically induced emf.
Generation of AC voltage- waveforms of emf - definitions-Cycle, Frequency, Period, Amplitude, Angular velocity, RMS value, Average value, Form Factor, Peak Factor.
Resistance- reactance-impedance, phase angle- power factor.

Three phase connections -star and delta - Relation between line and phase values (equations only)
Electric power-dc and ac powers-equations- unit-problems.
Electrical energy -equations - basic and commercial unit -problems. Calculation of monthly electricity bill.

CO2	**Explain the working principle of electric motors and their applications in mechanical engineering**		
M2.01	Describe the working principle and classification of DC motors	4	Understanding
M2.02	Explain the construction and working principle of three phase induction motors and their applications.	4	Understanding
M2.03	Explain the construction and working principle of single-phase induction motors and their applications.	4	Understanding
M2.04	Explain the working of AC and DC motor starters	3	Understanding
	Series Test I	1	

Contents:
DC Motors- Principle of operation - classification based on field connection- applications of dc motors.
Three Phase AC Motors -three phase induction motors- working principle - constructional details - applications
Single Phase AC motors-single phase induction motor - working principle - constructional details -applications
Starters - necessity for a starter-dc motor starters-connection and working of 3 Point starter -ac motor starters-connections and working of DOL,star-delta starters.

CO3	**Illustrate various electric heating and welding equipment used for mechanical manufacturing process**		
M3.01	Explain the construction and working principle of single-phase transformer	4	Understanding
M3.02	Describe the working of special purpose transformer	4	Understanding
M3.03	Summarize different methods of electric heating used for industrial applications	4	Understanding
M3.04	Illustrate the working of induction and arc furnaces	2	Understanding

Contents:
Single phase transformers - working principle -classification based on core- emf equation - transformation ratio
Special purpose transformers- auto transformer- working- welding transformer – construction - working
Electric heating-Basic principle -modes of heat transfer- methods of electric heating - induction heating-dielectric heating (principle of operation only).

Electric furnaces- working- induction and arc furnaces-applications			
CO4	**Summarize the applications of electronics in mechanical engineering**		
M 4.01	Distinguish various active and passive electronic components.	4	Understanding
M 4.02	Describe the working of various diode rectifiers.	4	Understanding
M 4.03	Illustrate the working of BJT and SCR based circuits	4	Understanding
M 4.04	Identify the elements of electric drives.	2	Understanding
	Series Test II	1	
Contents: Electronic components- Active and Passive Components-Different types of resistors and capacitors used in electronics. PN junction diode - working-rectifier circuits using diodes Transistor- working – transistor as a switch Power electronic components- SCR- working-SCR based circuits- basic diagram and working-rectifier-chopper Introduction to electric drives (block diagram approach only)- basic block diagram of EV charging system			

Text /Reference:

T/R	Book Title/Author
R1	Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House
R2	Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN : 978-0-07-0088572-5
R3	Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN : 9781107464353
R4	Theraja, B. L., Electrical Technology Vol – I, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924405
R5	Theraja, B. L., Electrical Technology Vol – II, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924375
R6	Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN : 97881236529513
R7	Sedha, R.S., A text book of Applied Electronics, S.Chand, New Delhi, 2008, ISBN-13: 9788121927833

Online Resources

Sl.No	Website Link
1	www.electrical4u.com
2	https://nptel.ac.in/course.html
3	www.swayam.gov.in