Program : **Diploma in Electrical and Electronics Engineering**	
Course Code : **2032**	Course Title: **Elementary Concepts of Electrical Systems**
Semester : **2**	Credits: **3**
Course Category: **Engineering Science**	
Periods per week: **3 (L:3 T:0 P:0)**	Periods per semester: **45**

Course Objectives:

- To familiarize the electrical safety measures and standards.
- To recognize lighting, heating and chemical effects of electric current.
- To provide knowledge of static and magnetic effects of electric current.
- To comprehend the concepts of electromagnetic effect.

Course Prerequisites:

Topic	Course code	Course name	Semester
Basic knowledge in Physics		Applied Physics I	1
Basic knowledge in Mathematics		Mathematics I	1

Course Outcomes :

On completion of the course, the students will be able to:-

COn	Description	Duration (Hours)	Cognitive Level
CO1	Choose various residential electrical appliances for energy conservation.	10	Applying
CO2	Summarize the luminous, heating and chemical effects of electric current.	11	Understanding
CO3	Classify the storage batteries and electrical engineering materials.	11	Understanding
CO4	Identify the basic concepts of electromagnetism and electrostatics.	11	Applying
	Series Test	2	

CO – PO Mapping

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

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

Course Outline

Module Outcome	Description	Duration (Hours)	Cognitive Level
CO1	**Choose various residential electrical appliances for energy conservation.**		
M1.01	Summarize the effects of electric shocks and its precautions.	2	Understanding
M1.02	Classify various electrical safety devices and safety precautions used in residential installations.	3	Understanding
M1.03	Identify the specifications of various domestic electrical appliances and calculate power and energy consumption.	3	Applying
M1.04	Illustrate the star rating of electrical equipment as per BEE standards.	2	Understanding

Contents:

Electric hazards -phenomenon of electric shock and its effects- precautions against shock-procedure to be taken when an accident due to electric shock occurs.

Electrical safety -safety precautions-electrical safety devices in residential installations (Fuse, ELCB, MCCB, RCCB).

Household electrical appliances- specifications of various appliances (Lamp, Ceiling fan, Iron box, Mixer Grinder, Heater, Induction cooker, Refrigerator, Air conditioner, domestic pump, Washing machine, TV, Microwave oven, Computer ,UPS ,Inverter) - calculation of power and energy consumption of the listed equipment.

Energy conservation- importance -energy conservation tips for domestic building/ appliances - refrigerator - television - lightings - selecting energy efficient appliances in domestic sector -criteria for selection of home appliances --BEE (Bureau of Energy Efficiency) star rating.

CO2	Summarize the luminous, heating and chemical effects of electric current.		
M2.01	Explain the basic concepts of various lamps for residential and commercial purposes.	4	Understanding
M2.02	Summarize the basic principle of electric heating and modes of heat transfer.	2	Understanding
M2.03	Classify various methods of electric heating.	3	Understanding
M2.04	Summarize the basic principle of electrolysis and familiarize the applications of electrolysis.	2	Understanding
	Series Test – I	1	

Contents:

Electrical Lamps -types -basic diagram-working-incandescent -fluorescent - high pressure & low pressure sodium vapour - -LED -compact fluorescent - induction lamp

Electric Heating- Basic principle - advantages - requirements of good heating element- modes of heat transfer- methods of electric heating -principle-operation - resistance heating - direct - indirect - induction - direct core –dielectric (principle of operation only).

Electrolysis- basic principle- Faraday's laws- brief idea of applications of electrolysis.

CO3	Classify the storage batteries and electrical engineering materials		
M3.01	Classify Storage batteries and summarize various terms related.	3	Understanding
M3.02	Identify the parts of lead acid batteries and its care and maintenance.	3	Understanding
M3.03	Illustrate the concept of series and parallel connection of battery.	2	Understanding
M3.04	Classify the electric and magnetic materials	3	Understanding

Contents:

Storage battery- cell-battery-primary and secondary batteries -battery ratings -efficiency- ampere hour efficiency- watt hour efficiency- lead acid batteries-identification of parts (brief idea only)- electrical Specifications -voltage-capacity-factors affecting capacity- indications of a fully charged cell -applications -care and maintenance - lithium ion battery-basic idea – applications-series and parallel connections of batteries -list the methods of charging.

Electric materials -classification-properties - examples -conducting materials-insulating materials-List the classification of insulator based on physical structure and temperature

Magnetic materials-Ferromagnetic - Diamagnetic- Paramagnetic(properties & examples only)

CO4	Identify the basic concepts of electromagnetism and electrostatics		
M4.01	Explain the laws of magnetism and related basic terms.	3	Understanding
M4.02	Explain the fundamental concepts of electromagnetism.	3	Understanding
M4.03	Explain the fundamental concepts of electrostatics.	2	Understanding
M4.04	Identify the capacitor connections and solve simple problems for equivalent capacitance.	3	Applying
	Series Test – II	1	

Contents:

Magnetism- laws of magnetism- absolute and relative permeability- elementary concepts of magnetic flux, flux density and field strength. B-H curve and its importance.

Electromagnetism- Statement-explanation-Faraday's laws- Lenz's law - self-inductance-mutual inductance (basic idea only)-Energy stored in an inductor (equation only) - comparison of electric and magnetic circuit.

Static electricity- Laws of electrostatics- Absolute and relative permittivity- basic concepts of electric flux- flux density- electric field- electric field intensity- electric potential.

Capacitors- Charging and discharging - Energy stored (equation only)- Capacitors in series and parallel-derivation of equivalent capacitance - simple problems- applications

Text / Reference

T/R	Book Title/Author
T1	Theraja, B. L., Electrical Technology Vol – I, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924405
T2	Theraja, B. L. ;Theraja, A. K., A Text Book of Electrical Technology Vol-III, S. Chand and Co. Ramnagar, New Delhi, ISBN :9788121924900
R1	J.B. Gupta,A Course In Electrical Technology-I,S.K. Kataria & Sons ISBN 978-81-85749-29-7
R2	Guide Books No. 1 and 3 for National Certification Examination for Energy Managers and Energy Auditors, Bureau of Energy Efficiency (BEE), Bureau of Energy Efficiency (A Statutory body under Ministry of Power, Government of India) (Fourth Edition 2015).
R3	V.K.Mehta,Rohit Mehta Basic Electrical Engineering S. Chand Publications, New Delhi,

R4	Ashfaq Husain,Basic Electrical Engineering, Khanna Book Publishing, New Delhi
R5	Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN : 978-0-07-0088572-5
R6	Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN : 9781107464353
R7	Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House
R8	Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN : 97881236529513
R9	Sedha, R.S., A text book of Applied Electronics, S.Chand, New Delhi, 2008, ISBN-13: 9788121927833
R10	CEA (Measures Relating to Safety & Electric Supply) Regulations, 2010 https://ceigap.apcfss.in/resources/new/docs/CEA_Safety_Regulations_2010.pdf

Online Resources

Sl.No	Website Link
1	https://www.electrical4u.com/electrical-engineering-articles/basic-electrical/
2	https://nptel.ac.in/courses
3	https://electrical-engineering-portal.com
4	https://www.allaboutcircuits.com
5	https://nptel.ac.in/courses/108105112/
6	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/