

Course Code	Course Name	Credits
26PH004	ELECTRICITY AND MAGNETISM	04

### Course Objectives

- Investigation of the properties of magnets.
- Finding the relationships between magnetism and electricity.
- Determine practical applications of electricity and magnetism.

### Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Fundamental laws and concepts in electricity and magnetism, especially with regard to Maxwell's laws
- Electrical circuits and the most common components in such: resistors, capacitors, and inductors- The properties of static electric and magnetic fields.
- The properties of simple, time-dependent electric and magnetic fields and what kind of physical phenomena.
- Electromagnetic waves and their properties- Important historical experiments in the field of electricity and magnetism.

### Unit 1 - Electrostatics (12 Hrs.)

Gauss law and its applications- Electric field due to uniformly charged sphere-Electric field due to uniform cylindrical charge-Electric field due to infinite plane sheet of charge-Coulomb's theorem-Deduction of Coulomb's law of Gauss law-Principle of a capacitor – Capacity of a spherical and cylindrical capacitors – Energy stored in a capacitor – Loss of energy due to sharing of charge-Types of capacitors.

### Unit 2 – Current Electricity (12 Hrs.)

Kirchoff's law- Wheatstone condition for bridge balance – Carey Foster's Bridge Potentiometer principle- Calibration of ammeter and voltmeter- Seebeck effect- Law of thermos emf- Measurement of thermos emf using potentiometer – Theory of moving coil ballistic galvanometer- Correction for damping- Figure of merit.

### Unit 3 - Magnetism And Magnetic Effect (12 Hrs.)

Basic definitions - Susceptibility – Properties of para, dia and ferro magnetic materials Experiment to draw B-H curve by ballistic method–Energy loss due to hysteresis-Importance of hysteresis – Maxwell's screw rule-Fleming's left hand rule-Biot-Savart law-Magnetic induction at a point due to a straight conductor- Magnetic induction at a point on the axis of circular coil- Force on a current carrying conductor in a magnetic field-Force between two parallel current carrying conductors.

### Unit 4 – Electromagnetic Induction (12 Hrs.)

Faradays Law, Lenz's Law, Self-Inductance and Mutual Inductance, Reciprocity Theorem, Energy stored in a Magnetic Field, Introduction to Maxwell's Equations - Mutual inductance between two co-axial solenoids – Experimental determination of mutual inductance- Coefficient of coupling –Earth inductor-Determination of BH.

### Unit 5 - Alternating Current Circuits (12 Hrs.)

EMF induced in a coil- Impedance, admittance and reactance- Power in A. C. circuits - Peak value and r.m.s value of an AC – AC circuit containing L, C and R in series– Q factor – Comparison of Series and parallel resonance circuits – Sharpness of resonance– Power factor – Growth decay of current in circuit containing L and R- Charging and discharging of capacitor through R- High resistance by leakage - Choke coil.

### Reference Books:

1. Sehgal D L, Chopra K L, Sehgal N K – Electricity and Magnetism, Sultan Chand & Sons, New Delhi.
2. Brijlal and Subramanian, Electricity and Magnetism, 6th Edn., Ratan&Prakash, Agra.
3. David J Griffiths, Introduction to Electrodynamics, 2nd Edn. 1997, Prentice Hall of India pvt. Ltd., New Delhi.
4. Electricity & Magnetism by K KTewari, S Chand & Co., 3rd Edition, 2001

### Websites and eLearning Sources:

1. <https://nptel.ac.in/courses/108105479>
2. <https://youtube.com/watch?v=3HyORmBip-w&feature=shared>
3. <https://youtu.be/xKNv2gXYzlk?si=1GhcJtatt-OObEpJ>

**COs and Bloom's Taxonomy Mapping – 26PH004**

<b>Course Outcomes</b>	<b>On completing U.G. program the students will be able to</b>	<b>BTL</b>
<b>CO1</b>	Recall and explain the fundamental laws of electrostatics, magnetism, and electromagnetic fields.	K1, K2
<b>CO2</b>	Apply circuit laws and electromagnetic principles to solve problems in electrical systems.	K3
<b>CO3</b>	Analyze magnetic and electromagnetic phenomena using theoretical and mathematical approaches.	K4
<b>CO4</b>	Evaluate the behavior of electrical and magnetic systems in practical applications.	K5
<b>CO5</b>	Design and analyze circuits and electromagnetic systems for real-world applications.	K6

**BTL K1 and K2 – remembering and understanding, K3- Applying, K4 – Analyse, K5- Evaluate and K6- Create**

**Relationship Matrix – 26PH004**

<b>Course Outcomes</b>	<b>Programme Outcomes (POs)</b>						<b>Programme Specific Outcomes (PSOs)</b>						<b>Mean Score of Cos</b>
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>	
<b>CO1</b>	3	2	1	1	1	1	3	2	2	1	1	1	1.58
<b>CO2</b>	3	3	2	1	1	1	2	3	3	2	2	1	2.00
<b>CO3</b>	3	2	2	1	1	1	2	2	2	2	2	1	1.75
<b>CO4</b>	3	3	3	2	2	1	2	3	3	3	3	2	2.50
<b>CO5</b>	2	2	3	1	2	2	2	2	3	2	3	3	2.17
<b>Total</b>													2.00

Mean Score: 3- High, 2- Medium/Moderate, 1-Low

