School of Science
B.Sc. (Zoology) Programme

Subject Code & Name: - BS01MIZOO2 Basics of Electromagnetism

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	0	1	4	37.5%	12.5%	37.5%	12.5%

Programme Name	B.Sc. (Zoology)
Semester	I
Course Code	BS01MIZOO2
Course Title	Basics of Electromagnetism
Course Content Type (Th./Pr.)	Theory & Practical
Course Credit	3+1
Sessions+ Lab. Per Week	3+2
Total Teaching/Lab. Hours	45 Theory Hours+ 30 Practical Hours
* 2 Laboratory = 1 Session	

Learning Objectives

Students will able to study

1. Difference between vector and scalar quantity, scalar and vector product, Differential Calculus & Integral Calculus and its application.
2. The basic mathematical tools to solve the various electromagnetic problems also able to learn vector and scalar fields and various functions & operators.
3. To realize the importance of electricity and magnetism in real world.
4. Learn and revise the concept of electrostatics- Coulomb's law, Gauss's law and its application, Electric Potential and its relation with electric field etc.
5. Revise and study the basics of magnetostatics, Orestead's observation, magnetism and matter (Diamagnetism, Paramagnetism, Ferromagnetism), Ampere's law, Faraday's Law and its applications, Lenz law etc.

Prerequisites (if any)

12th Science passed with Physics subject.

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Learning Outcomes

On the Completion of this course, students will able to:

1. The Student will get the overview of core concepts in the field of electricity and magnetism.
2. Able to apply the theoretical knowledge of these fields to analyze and solve the problems of day to day life.
3. Learn the basic necessary mathematics tools to solve electromagnetism problems.

Detailed Contents

UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	**Basic Vector Calculus:** ➢ Types of Vectors, Vector addition, Vector subtraction, Unit vector, Dot or Scalar Products, Cross or Vector Products, Triple Product, reciprocal sets of vectors. ➢ Partial differentiation of Vectors, Differentiability and Continuity ➢ The vector differential operator del., the gradient, the divergence and curl, Formulae involving del. Invariance, Line integral, Surface integral, Volume Integral ➢ The divergence theorem of Gauss, Stokes' theorem, Green's theorem, integral operator form del (Theorem statements only) (Discussion on Related Problems)	15
II	**Electrostatics:** ➢ Coulomb's law, What is field, The Electric Field, Electric field of point charges, Electric Field of a point charges, Electric field due to continuous charge distributions, Electric field lines, A point charge in an electric field. ➢ What is Gauss's la all about?, The flux of a vector field, The flux of electric field, Gauss law, Applications of Gauss law, Gauss la and conductors, Experimental tests of Gauss's law and Coulomb's Law ➢ Potential energy, Electrical Potential energy, Electrical potential, Calculating potential from Field, Potential due to point charges, Equi-potential Surfaces ➢ Analysis off circuits , RC Circuits ➢ Electric Field Strength, Electric Polarisation, Electric Displacement Vector, Three Electric Vectors D and P in terms of E, Concept of Capacitance (Discussion on Related Problems)	15

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III	**Magnetism** ➢ Lorentz force, Biot Savart Law, Magnetic field on the axis of a circular current loop, Ampere's Circuital law, The Solenoid, Magnetic Force between two current carrying conductors, Torque on current loop, magnetic dipole, circular loop as a magnetic dipole, moving coil galvanometer, conversion of galvanometer into ammeter and voltmeter ➢ Analogy between Biot Savart's law and Coulomb's law, Magnetization and Magnetic intensity, Magnetic properties of matter (Diamagnetism, Paramagnetism, Ferromagnetism including Curie law and Hysteresis) ➢ Orestead's Observation, Faraday's Experiments on electromagnetic induction, Faraday's Law of induction, Lenz Law (Discussion on Related Problems)	15

Unit-IV-Practical(s) **(30)**

1. Study the measurements and error analysis using Vernier Callipers and Micrometer Screw gauge.
2. Study the various types of graph Plotting.
3. Least square fitting using given linear data.
4. Conversion of galvanometer into ammeter.
5. Conversion of galvanometer into voltmeter.
6. To determine the decay constant and time constant using RC circuit.
7. Verification of Stefan's Fourth power law.
8. Calibration of Spectrometer using Schuster's method.

Text Book(s)

1. Unit 1: Vector analysis by Murray Spiegel, Schaum's Outline 2nd Edition.
2. Unit 2: (i) Physics by Halliday, Resnick and Krane, Volume-2, 5th Edition, Willey Publication.
   (ii) Essentials of Electromagnetism by Matthew N. O. Sadiku, 7th Edition, Oxford Press.
3. Unit 3: B.Sc. First Year -Electricity and Magnetism, BSCPH-102, Uttarakhand Open Uni.

Reference Books

1. Electricity and Magnetism by D.C.Tayal, Himalaya Publishing House
2. Introduction to Electromagnetism by David J. Griffiths, Pearson Publication
3. Electricity and Magnetism by Satyapraksah, Meerut Publication
4. Electricity and Magnetism by Sehgal, Chopra, S.Chand Publication, New Delhi

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Web Resources
1. https://phys.libretexts.org
2. https://www.youtube.com/watch?v=5JZjEmJqtus
3. https://www.youtube.com/watch?v=8zKTFwIzXhM
4. https://archive.nptel.ac.in/courses/115/104/115104088/
5. https://archive.nptel.ac.in/courses/115/101/115101005/

L:: Lecture, **T::** Tutorial , **P::**Practical
CCE:: Continuous and Comprehensive Evaluation
(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, slip tests (announced/ surprised), attendance etc. or any combination of these)
PWE:: Practical Work Examination
(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)
SEE:: Semester End Evaluation