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Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
ING117-A	Physics II	2	3	0	2	4	5

Prerequisites

Admission Requirements

Language of Instruction French

Course Type Compulsory

Course Level Bachelor Degree

Objective

- 1. Electrostatics

Concept of charge (Point, linear, surface, and volume charge distributions)

Coulomb's Law

Electric Field and electric field lines

Electric Potential and potential energy

Gauss's Law and applications to symmetric charge distributions

Capacitance, Capacitors, and Dielectric materials

2. Magnetostatics

Concept of magnetic field and magnetic force (Lorentz Force)

Magnetic effect of current (Magnetic field of moving charges)

Biot-Savart Law

Ampere's Law and applications

3. Electrodynamics: Induction

Concept of magnetic flux

Faraday's Law of Induction

Lenz's Law (Direction of induced current and conservation of energy)

Motional emf

Self-inductance and Mutual inductance

Magnetic field energy

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4. Electric Circuits: Direct Current (DC) Circuits

Current, current density, and resistance (Ohm's Law)

Electromotive force (emf) and voltage

Kirchhoff's Laws (Junction and Loop rules)

Thevenin and Norton theorems

5. Maxwell's Equations

Displacement current and Ampere-Maxwell Law (Creation of magnetic field by a time-varying electric field)

Integral and differential forms of Maxwell's equations:

Gauss's Law for electricity

Gauss's Law for magnetism (Absence of magnetic monopoles)

Faraday's Law

Ampere-Maxwell Law

6. Electromagnetic Waves

Derivation of the electromagnetic wave equation from Maxwell's equations

Properties of plane electromagnetic waves (Orthogonality of E and B fields to each other and to the direction of propagation)

Relationship between the speed of light (c), electric permittivity (ϵ_0), and magnetic permeability (μ_0) of free space

Poynting Vector: Energy transport and momentum in electromagnetic waves

Electromagnetic spectrum

References

Theory Topics

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