Course Title: General Physics II
Course Code: PHYS 102
Credit Hours: 3

Course Description:
This course is prepared to help undergraduate students in developing physical intuition through a comprehensive understanding of fundamental concepts, emphasizing physical concept rather than complicated mathematical treatments. The contents of the course include fundamentals of electricity, magnetism and modern physics and address the need of engineering and applied sciences.

Course Contents:

ELECTRICITY AND MAGNETISM

Unit 1: Vector Analysis
Scalar and vector product; Gradient of a scalar; Divergence and curl of a vector; Product rules and second derivatives; Line, surface and volume integrals of a vector; Fundamental theorem of gradients, divergences and curls; Spherical coordinate system

Unit 2: Electrostatic Field
Electric charge; Coulomb's law; Electric field due to point and continuous charge distribution (line, ring and disc); Electric flux; Gauss's law and its differential form; Applications of Gauss's law for spherically symmetric charge distribution; Line integral and curl of an electric field; potential and potential difference; Relation between electric field and potential; Equation of electrostatic potentials (Poisson's equation, Laplace's equation); Energy of point and continuous charge distribution; Energy density in electric field

Unit 3: Electrostatic Field in Matter
The electric field of dipole; Force and torque on a dipole; Fnergy of dipole in electric field; Atomic polarizability; Polar and nonpolar molecules; Po- larization; Bound charges; Gauss's law in medium; Electric susceptibility; Electric field at the center of spherical cavity; Clausius-Mossotti relation

Unit 4: Magnetostatics
Magnetic field B; Lorentz's force,cyclotron and cycloid motion; Surface and volume current densities; Equation of continuity; Biot-Savart law and its application for line current, circular & square loop and solenoid; Magnetic flux; Divergence of B; Amperes law and curl of B; Application of Ampere's law (line, solenoid and cylindrical current); Magnetic vector potential and its expressions

Unit 5: Magnetostatic Field in Matter
Magnetic dipole; Force and torque on magnetic dipole; Energy of magnetic dipole in magnetic field; Magnetization; Bound current; Ampere's law in magnetized materials; Magnetic susceptibility; Magnetic materials: diamagnetism, paramag- neitsm and ferromagnetism; Hysteresis curve and losses

Unit 6: Electromagnetic Induction
Flux rule for motional emf in rectangular and arbitrary loops; Faraday's law of induction; Difference between static and induced electric field; Lenz's law; Mutual and Self inductions; Neumann formula; Energy stored in magnetic field

Unit 7: Electromagnetic Wave Propagation
Electrodynamics before Maxwell; Maxwell's correction; Maxwell's equations in vacuum; Maxwell's equations in material medium; Poynting's theorem and Poynting vector; Electromagnetic wave equation in vacuum

MODERN PHYSICS

Unit 8: Physics of Atoms and Molecules
Molecular bonds, Energy states and spectra of molecules, Raman Effect and its quantum treatment, Superconductivity: Meissner Effect, critical field and temperature

Unit 9: Nuclear Physics
Nuclear binding energy; Radioactivity, half life, the decay processes; Nuclear reactions, Q-value and threshold energy in nuclear reaction; Nuclear fusion and fission

Experiments:
As defined by Department of Physics, SoS, Kathmandu University

References:
1. David J. Griffith, *Introduction to Electrodynamics*, PHI
2. R. Resnick and H. Halliday, *Physics part II*, John Wiley and Sons.
3. Edward M Purcell, *Electricity and Magnetism*, Berkeley Physics Series Tata Mc-Graw Hill.
4. R. A. Serway and J. W. Jewett, *Physics for Engineers and Scientists*, Cengage Publications.