**Title:** Electromagnetic Field Theory

**Code Number:** EE3101

**Credit Hours:** 3 (3+0)

**Prerequisites:** NS1105 Calculus & Analytical Geometry, NS1106 Applied Physics,

**Semester:** 5th

**Course Objectives**

The course will enable students to:

1. Outline the vector calculus, orthonormal coordinate systems like rectangular, cylindrical and spherical coordinate system
2. Illustrate the theory of electrostatics and magnetic Field in various situations.
3. Apply the principles of time-varying fields, including the fundamental laws and equations governing their behavior, to solve complex electromagnetic problems

**Contents**

**Unit 1: Review of Vectors and Coordinate Systems**

1. Vector algebra
2. Coordinate systems and Transformations
3. Vector calculus

**Unit 2: Static Electric Field**

1. Coulomb's law and Electric Field
2. Gauss' law and Divergence of Electric Flux Density
3. Work, Potential, Potential Gradient and Energy in Electrostatic Field.
4. Current and Current Density, Conductor, Dielectrics, Boundary Conditions, Capacitance
5. Laplace's and Poisson's Equations

**Unit 3: Steady-State Magnetic Field**

1. Steady Magnetic Field
2. Biot-Savart Law
3. Ampere's Law
4. Curl of H, Stoke's Theorem
5. Magnetic Boundary Conditions
6. Magnetic Material and Boundary Conditions
7. Magnetic Flux Density
8. Vector Magnetic Potential
9. Inductance
10. Magneto-static fields and materials

**Unit 4: Time varying fields**

1. Faraday's Law
2. Displacement Current Density
3. Maxwell's Equations in Differential and Integral Form
4. Retarded Potential

**Unit 5: Reflection**

1. Reflection from perfect conductors
2. Refection from perfect dielectrics

**Assignments/Types and Number with calendar:**
A minimum of four assignments to be submitted before the written exams for each term.

**Assessment and Examinations:**

| Sr. No. | Elements | Weightage | Details |
|---|---|---|---|
| 1. | Midterm Assessment | 35% | It takes place at the mid-point of the semester. |
| 2. | Sessional Assessment | 25% | It is continuous assessment. It includes: classroom participation, attendance, assignments and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc. |
| 3. | Final Assessment | 40% | It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc. |

**Recommended Books:**


1. J. D. Kraus and Carver, "Electromagnetics", McGraw Hill
2. David K. Cheng, "Fundamentals of Engineering Electromagnetics", Addison Wesley.
3. William Hayt and John A. Buck, "Engineering Electromagnetics", McGraw Hill, ISBN: 0073104639, Latest Edition.
4. Sadiku, Matthew N, "Elements of Electromagnetics", Oxford University Press, ISBN: 0195103688, Latest Edition.
5. J. D. Kraus, "Electromagnetics", John Wiley & Sons, Latest edition.