# Electromagnetic Field Theory

| Code | Credit Hours |
|---|---|
| EE 241 | 3-0 |

## Course Description

The successful completion of the course should lay down the required foundation for all subsequent courses in Telecommunication, especially in RF & Microwave engineering domain. It will also prepare students to understand the fundamental principles and laws of electromagnetism and the phenomenon of Wave propagation.

## Text Book:

1. Elements of Electromagnetics by Matthew N.O.Sadiku, 7th Edition

## Reference Book:

1. Engineering Electromagnetics by William H. Hayt, JR and John A. Buck, 7th Edition
2. Introduction to Electrodynamics by Griffiths
3. Engineering Electromagnetics by Nathan Ida,2nd Edition
4. Engineering Electromagnetics by Kenneth and Demarest

**Prerequisites**

## ASSESSMENT SYSTEM FOR THEORY

| | |
|---|---|
| Quizzes | 15% |
| Assignments | 5% |
| Mid Terms | 30% |
| ESE | 50% |

## ASSESSMENT SYSTEM FOR LAB

| | |
|---|---|
| **Assignments** | n/a |
| **Lab Work and Report** | n/a |
| **Lab ESE/Viva** | n/a |

**Teaching Plan**

| Week No | Topics | Learning Outcomes |
|---|---|---|
| 1-2 | Review of Vectors and Coordinate Systems | • Course Introduction, **Vector Algebra**<br>• **Coordinate Systems and Transformations:** Cartesian and Cylindrical Coordinates, Spherical Coordinates, Vector Calculus - Integral of a Vector, Del, Gradient<br>• **Vector Calculus –** Divergence, Curl, Stokes' Theorem, Laplacian |
| 3-8 | Static Electric Field | • Coulomb's Law and Electric Field<br>• Gauss's Law and Divergence of Electric Flux Density<br>• Work, Potential, Potential Gradient and Energy in Electrostatic Field<br>• Current and Current Density, Conductor, Dielectrics, Boundary Conditions, Capacitance<br>• Laplace's and Poisson's Equation |
| 9 | MID Term Exam | |
| 10-13 | Steady-State Magnetic Field | • Steady Magnetic Field<br>• Biot-Savart's Law<br>• Ampere's Law<br>• Curl of H, Stoke's Theorem<br>• Magnetic Material and Boundary Conditions<br>• Magnetic Flux Density<br>• Vector Magnetic Potential<br>• Inductance |
| 14-15 | Time Varying Fields | • Faraday's Law<br>• Displacement Current Density<br>• Maxwell's Equations in Differential and Integral Form<br>• Retarded Potential |
| 16-17 | Reflection | • Reflection from perfect Conductors<br>• Reflection from perfect dielectrics |
| 18 | **End Semester Exam** | |

**Practical:**

| Experiment No | Description |
|---|---|
| 1 | n/a |
| 2 | n/a |
| 3 | n/a |
| 4 | n/a |
| 5 | n/a |
| 6 | n/a |
| 7 | n/a |
| 8 | n/a |
| 9 | n/a |
| 10 | n/a |
| 11 | n/a |
| 12 | n/a |
| 13 | n/a |
| 14 | n/a |
| 15 | n/a |
| 16 | n/a |