



ELECTROMAGNETIC THEORY

PROF. PRADEEP KUMAR K

Department of Electrical and
Electronic Engineering

TYPE OF COURSE : Rerun | Core/Elective | UG

COURSE DURATION : 12 weeks (26-Jul' 21 - 15-Oct' 21)

EXAM DATE : 23 Oct 2021

INTENDED AUDIENCE : The course is an integral part of EE curriculum. Students after completing this course can take up courses in Microwave Engg, Optics, Antennas

INDUSTRIES APPLICABLE TO : This is a undergraduate core course required as a foundation to other courses in Microwave, Optical, and Antenna engineering.

COURSE OUTLINE :

Electromagnetic theory is a core course in Electrical Engineering curriculum. The course covers static and dynamic electric and magnetic fields and their interaction. Major topics include Electromagnetic Waves, Transmission Lines, Waveguides, and Antenna fundamentals. In addition, quasi-static analysis and numerical methods are also discussed. Successful completion of the course will allow students to take up Microwave Engg, Antennas, and Optics for future studies.

ABOUT INSTRUCTOR :

Dr. Pradeep Kumar K obtained his PhD from the Department of Electrical Engineering, IIT Madras working on Quantum Key Distribution in 2009. He has since been at the Department of Electrical Engineering, IIT Kanpur. His research interests include Quantum key distribution, optical communications, and nonlinear fiber optics.

COURSE PLAN :

- Week 1** : Coulomb's law and electric fields
- Week 2** : Gauss's law, potential and energy, conductors and dielectrics
- Week 3** : Laplace and Poisson equations, solution methods, and capacitance
- Week 4** : Biot-Savart and Ampere's laws, inductance calculation
- Week 5** : Magnetic materials, Faraday's law and quasi-static analysis
- Week 6** : Maxwell equations and uniform plane waves
- Week 7** : Wave propagation in dielectrics and conductors, skin effect, normal incidence
- Week 8** : Oblique incidence, Snell's law, and total internal reflection
- Week 9** : Transmission lines, Smith chart, impedance matching
- Week 10** : Transients and pulse propagation on transmission line
- Week 11** : Waveguides: Metallic and Dielectric
- Week 12** : Antenna fundamentals