

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE – PILANI, HYDERABAD CAMPUS
FIRST SEMESTER 2022 - 2023
COURSE HANDOUT

Date:01-08-2022

In addition to part I (General handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

Course Number : PHY F212, ECE F212, EEE F212, INSTR F212
Course Title : Electromagnetic Theory I
Instructor-in-Charge : Subhash Karbelkar
Instructors : Sarmistha Banik , Sankar Davuluri , Aranya Bhuti
Bhattacharjee, Prasant Samantray

Scope & Objective of the course:

Electromagnetic theory forms an important ingredient, along with the quantum theory, of the physics behind the technology we use and design today. Building on the electromagnetic theory, studied in the XII standard, this course augments students' understanding of electromagnetic fields to a level from where they can take up advanced learning in this field. Students are strongly advised to revise what they have learnt in XII using the textbook as it may lead to deeper/newer insights.

Text Book: *Introduction to Electrodynamics*, David J. Griffiths, Third Edition, Pearson Education Inc., 1999.

Reference Books:

1. *The Feynman Lectures on Physics: Volume II*, Richard P. Feynman, Robert B. Leighton, Matthew Sands, The New Millennium Edition, Pearson Education Inc. 2013.

Learning Outcomes:

1. Ability to evaluate the Gradient, Curl and Divergence of Scalar and Vector Fields in Cartesian Coordinates, Cylindrical Polar Coordinates and Spherical Polar Coordinates.
2. Ability to deal with the Electric and Magnetic fields in space as well as in matter in static as well as time variable situations.
3. Ability to apply Maxwell's equations to a given problem.

COURSE HANDOUT

| Lecture Number | Learning Objectives | Topics to be covered | Reference Chapter/ Section |
|----------------|--|---|----------------------------|
| 1 | Relation of Electromagnetism to other areas of Physics | Introduction: The scope of EMT 1 | CLASS LECTURE |
| 2-11 | Vector Analysis | Vector differential and integral calculus; Gradient, Curvilinear co-ordinates | 1.2-1.6 |

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|-------|--------------------------------------|--|------------------------------|
| | | (cylindrical, spherical and cartesian), Theorem of curl, divergence and gradient, Dirac Delta Function, Helmholtz theorem and potentials | |
| 12-16 | Electrostatics | Divergence and curl of electrostatic fields; electric potential, work and energy in electrostatics | 2.2-2.5 |
| 17-20 | Some special mathematical techniques | Method of images, Multipole expansion | 3.2 and 3.4 (Exclude 3.3) |
| 21-24 | Electric Fields in Matter | Polarization, bound charges, electric displacement, Linear dielectrics. | 4.1 - 4.4 |
| 25-29 | Magneto statics | Divergence and curl of B Magnetic vector potential. | 5.1 - 5.4 |
| 30-36 | Electrodynamics | Maxwell's equations | 7.3.1 to 7.3.5 exclude 7.3.4 |
| 37-40 | Electromagnetic Waves | EM waves in vacuum | 9.2 |

Evaluation Scheme:

| EC No. | Evaluation Component | Duration | Weightage (%) | Date, Time | Remarks |
|--------|----------------------|----------|---------------|------------|-------------|
| 1 | Mid Sem Test | 90 Min. | 35 | TBA | Closed Book |
| 2 | Quiz-1 | 50 Min. | 12.5 | TBA | Open Book |
| 3 | Quiz-2 | 50 min | 12.5 | TBA | Open Book |
| 3 | Comprehensive Exam | 180 Min. | 40 | TBA | Closed Book |

Chamber Consultation Hour: To be announced later

Notices: Notices and solutions of Quizzes, Mid-Semester & Final Comprehensive Examination will be displayed on CMS.

Make-up Policy: In case of all pre-compre evaluation components, make up will be granted only on production of evidential documents with prior permission from the IC.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-Charge