BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE -PILANI, K K BIRLA GOA CAMPUS

Second Semester 2024–2025

Course Handout

Date: 07.01.2025

Course No. : PHY F243
Course Title : Mathematical Methods of Physics
Instructor : Chandradew Sharma

Course Description:

This course will cover some of the mathematical techniques that are routinely used to understand most of the topics in undergraduate physics. It is essential that the students practice problems relevant to the topics covered in the class. It is assumed that students are familiar with the concepts covered in mathematics courses and the previous physics courses.

Text Books:

T1. Mathematical Methods for Physicists, Arfken, and Weber, Elsevier

Reference Books:

R1. Mathematical Physics: A Modern Introduction to Its Foundations by Sadri Hassani
R2. Methods of Mathematical Physics: Courant and Hilbert
R3. Mathematical Methods in the Physical Sciences. Mary L Boas.

Evaluation Scheme:

Sr. No.	Evaluation Component	Duration Weightage (%)	Date & time	Nature
1	Midsem	(30%)	3/3/25 (Mon, 9:30-11:00 am)	Closed Book
2	Comprehensive Exam	(40%)	1/5/25 (FN)	Closed Book
3	4 Quizzes (best 3 out of 4)	(21%)	(29/1/25,28/2/25, 19/3/25, 21/4/25)	Open Book
4	Presentation	(3%)	(23/4/25, 25/4/25 and 28/4/25)	Open Book
5	Attendance (lecture + tutorial)	(6%) 1-20 0%		

		20-29 1% 30-39 3% 40 or more 6%	

General Information: References for the specific topics will be announced in class.

Course Plan: (C306, Lecture: M, W, F 12-12:50 pm (5), Tutorial M 8-8:50 am (1))

No. of Lectures + Tutorials	Topics	References
1-6	**Vector Space:** Vector Spaces, Linearly Independence, Orthogonalization, Linear Operators, Eigenvalues, Eigenvectors, Linear Transformations, Diagonalization,...	T1 Chap 5
7-13	**Complex Analysis:** Argand Plane, Branch Points, Cauchy-Riemann Theorem, Integral Theorem, Laurent Expansion, Singularities, Residue Theorem, Conformal Mapping, Methods of Steepest Descent, etc	T1 Chap 11
14-19	**Ordinary Differential Equation (ODE):** Singular Points, Series Solution (Frobenius's method), Linear Independence of Solutions, Sturm-Liouville Theory, Nonlinear differential Equation, IVP, BVP	T1 Chap 7 & 8
20-25	**Special Functions:** Bessel Functions, Legendre Functions, Spherical Harmonics, Hermite Functions, Laguerre Functions	T1 Chap 11, 12, 13
26-32	**Integral Transform:** Laplace Transform, Fourier Transform	T1 Chap 14, 15
33-42	**Green Functions:** Nonhomogenous Equations, Eigenfunction Expansion, Integral Equation, IVP, BVP	T1 Chap 8, 9, 16
43-56	**Partial Differential Equation (PDE):** Classification, Separation of Variables, Spectral Methods, Pseudo Spectral Methods, Converting PDE into system of coupled ODE, Laplace Equation, Poisson Equation, Wave Equation, Heat Equation, IVP, BVP	**Lecture Notes**

Quiz/Assignment Information: Instructions for the quizzes will be announced in class.

Consultation Hours: TBA

Notices: Quanta.

Make-up Policy: Consideration of make-up will be made as and when necessary

Chandradew Sharma
Instructor-in-charge