

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI-HYDERABAD CAMPUS
SECOND SEMESTER 2019–2020
COURSE HANDOUT

Date : 06.01.2020

In addition to Part I (General Handout for all courses appended to the Time Table), this portion gives further specific details regarding the course.

Course No. : PHY F243
Course Title : Methods of Mathematical Physics I
Instructor-in-charge : **Rahul Nigam**
Instructor : **Rahul Nigam**

Course Description :

This course deals with some of the mathematical methods which are used in many branches of theoretical physics.

Scope and Objective :

MMP I is a course on mathematical methods used in physics. The emphasis will be on understanding the general principles and on methods which have not been covered in the various core Mathematics courses which the student has already undergone. Applications cover a wide range of physical problems.

Text Books:

Mathematical Methods for Physicists: Arfken, Weber, Harris, 7th edition, Academic Press, 2012.

Reference Books:

- R1. Mathematical Methods in Classical and Quantum Physics, Tulsı Dass and Satish K Sharma, Universities Press, 1998
- R2. Tensor Analysis, Schaum's outline on theory and problems of tensor calculus. Tata McGraw Hill.
- R3. Introduction to Vector Spaces in Physics, K.A.I.L. Wijewardena Gamalath, Cambridge University Press

Course Plan:

Sections referred to are from the text book unless stated otherwise.

Lecture No.	Learning Objectives	Topics to be Covered	Chapter in the Text Book
1	Introduction		
2-7	Complex Analysis	Stereographic projection, Analytic functions, Cauchy's theorem, Jordan's lemma, Evaluation of integrals, gamma function	Chapter 11, R1 chapter 4
8-12	Fourier Transform	Definition and Properties of Fourier Transform, Convolution Theorem and Applications	Chapter 20, R1 chapter 9.

13-17	Partial Differential equations	Examples of PDEs: Continuity equation, diffusion equation, Wave equation, Poisson and Laplace equation, Separation of Variables, Boundary conditions.	Chapter 9.
18-21	Green's functions	One dimensional and multi dimensional inhomogeneous solutions	Chapter 10
22-30	Matrices, Vector Spaces, Linear Operators.	Matrix Properties, Levi Civita symbol, Hermitian, Orthogonal Matrices, Vector spaces, Norms and Inner products, Gram Schmidt Orthogonalisation, Similarity transformations, diagonalisation	Chapter 1,2,3,4 of R3
31-35	Tensors and Differential Geometry	Covariant, contravariant tensors, invariants, tensors and relativity	R2: Chapter 1,2,3,4
36-40	Group Theory	Discrete Groups and Lie Groups	Chapter 15 R1

Evaluation Scheme:

EC No.	Component	Duration	Weightage (%)	Date & time	Nature of Component
1	Mid Sem Exam	1.5 hrs	30	7/3 9.00 - 10.30AM	Close Book
2	Assignments		30		Open Book
3	Comprehensive exam	3 hours	40	14/05 FN	Close Book

Chamber Consultation Hours: To be announced in the class.

Notices: Will be displayed on the Physics department notice board and announced in class only.

Make-up Policy: Make-up will be given only in genuine cases, that is, illness leading to hospitalization or going out of station with prior permission. No make-ups for the surprise tests.

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
PHY C332**