

SYLLABUS

M.Sc. in Physics

FIRST YEAR & FIRST SEMESTER

Course-I: MATHEMATICAL METHODS OF PHYSICS

Block -1

Linear dependence and independence of vectors, Isomorphism of vector spaces and linear operators, Eigenvalues and eigenvectors. Characteristic equation and diagonalisation of a normal matrix, Fourier integral and Fourier transforms

Block-2

Introduction to tensor analysis, Tensor algebra, Covariant and contravariant components of the metric tensor, Christoffel symbols, Grad, divergence, curl and Laplacian in arbitrary curvilinear coordinates

Block-3

Partial differential equations, Regular and irregular singular points of a second order ordinary differential equation, Integral equations; Fredholm and Volterra types, Method of the Neumann series, Transformation of a linear second order differential equation into an integral equation

Block-4

Laguerre functions, Legendre functions, Bessel functions, The gamma function and beta function

References:

1. Arfken G.B. and Weber H.J, - Mathematical Methods for Physicists; 7th Edition, Academic Press, New York (Prism Books, Bangalore, India), 2012.
2. Riley, Hobson and Bence, - Mathematical Methods for Physics and Engineering; 3rd Edition, Cambridge University Press, New York, 2009.
3. Gupta B.D, - Mathematical Physics; 4th edition, Vikas Publishing House Pvt. Ltd., Bangalore, 2009.
4. Spiegel M.R, - Vector Analysis and an Introduction to Tensor Analysis; 2nd edition, Tata McGraw-Hill (Schaum's Outline Series), New Delhi, 2015.

5. Chattopadhyay P.K, - Mathematical Physics; 2nd edition, Wiley Eastern Publications, New Delhi, 2013.

6. Boas M.L, - Mathematical Methods in the Physical Sciences; 3rd Edition, Wiley, New York, 2006.