

Semester II

Mathematical Physics -II

Course No: PHY17201CR

No. of credits: 04

Max. Marks: 100

External Examination: 80

Internal Assessment: 20

UNIT-I

Green's Functions in One Dimension: Calculation of Green's Functions for simple differential operators, Green's Functions for Second order Linear Differential Operators (SOLDOs), Self Adjoint SOLDOs, Generalized Green's identity.

Multidimensional Green's Functions: Second-Order PDEs in m Dimensions, Multidimensional GFs and Delta Functions, Spherical Coordinates in m Dimensions, Green's Function for the Laplacian.

UNIT-II

Probability: Definition and simple properties, Discret and Continous Random variables, Binomial distribution, Poisson and Gaussian distributions, Central limit theorem.

Statistics: Error propagation, Fitting curves to data, The Chi-square distribution. Students t distribution.

UNIT-III

Fourier Series, Properties and Applications. Fourier transform, Sine, Cosine and Complex transforms with examples, Definition, Properties and Representations of Dirac Delta Function, Properties of Fourier Transforms, Transforms of derivatives, Applications to Partial differential equations. Laplace transform, Properties and examples of Laplace Transform, Laplace transform method of solving differential equations.

UNIT-IV

Numerical analysis: interpolation, Finite difference, Forward, Backward and Central differences, Symbolic relations and separation of symbols, detection of errors by using difference tables, Newon's formula, Gauss central difference interpolation, Lagrange interpolation formulation, Integration by tapezoid and

Simpson's rule, solve first order differential equations using Taylor, Euler and Runge-Kutta methods .

Text Books:

1. Mathematical Methods for Physicists (6th Ed.), G. B. Arfken and H. J. Weber, Academic Press
2. Mathematical Physics: A Modern Introduction to Its Foundations, Sadri Hassani, Springer (2002)
3. Introductory methods of numerical analysis (5th Ed.) S. S. Shastri, PHI Learning Pvt. Ltd. (2010)

Reference Books:

1. Numerical Mathematical Analysis (6th Ed.) J. B. Scarborough, Oxford
2. Elements of Group Theory for Physicists (2nd Ed.) A. W> Joshi, Wiley
3. Group theory and its applications to physical problems, Morton Hammermesh, Addison-Wiley Publishing Co. (1962)
4. Probability in Physics by Y. Ben-Menahem and M. Hemmo, Springer-Verlag, berlin-Heidelberg (2012).
5. Mathematical Methods For Students of Physics and Related Fields, Sadri Hassani, Springer (2009)
6. Advanced Engineering Mathematics by Michel D, Greenberg
7. Mathematical Methods for Physics and Engineering (3rd Ed.), Riley, Hobson and Bence, Cambridge
8. Advanced Engineering Mathematics, E Kreyzig (8th Ed.), Wiley