Mathematical Physics

Course Code: PAS 8103
Course Credits: 02
Course Type: IDC ~~Major~~ Courses
Minor

Course Objectives: The course aims to familiarize students to, Matrices, determinants and linear systems, Vector differential calculus, Complex numbers and functions, Complex integration

Course Outcome: This gives details about the Mathematical Techniques offered for Master in Science (M Sc) course in the department of Physics and Astronomical Sciences. After getting this course the student will be acquainted with the basic principles Mathematical Techniques.

Unit1: Matrices and their applications-I (4hours)

Matrices and their operations, linear trans-formations, specialmatrices, orthogonal and Unitarymatrices. System of linear equations, augmented matrix, rank of matrix, Gauss elimination and Gauss Jordan methods. Linear dependence of vectors and n-dimensional space, orthonormal basis and Garm Schmidt method.

Unit2: Matrices and their applications-II (4hours)

Matrix eigenvalues, eigenvectors of a matrix, Cayley-Hamilton theorem. Theorems about eigen values and applications. Coordinate transformations and matrices. Linear and similarity transformations. Diagonalization of matrices.

Unit3: Complex numbers and functions (4hours)

Complex numbers and complex plane, Polar form of complex number, roots, Derivative and analyticity, Cauchy-Riemann equations, Analyticity and Laplace's equations. Complex form of exponential, trigonometric, hyperbolic and logarithmic functions.

Unit4: Complex integration-I (4hours)

The line integral in a complex plane, ML inequality, Cauchy's integral theorem, Cauchy's integral formula, n-th order derivatives of analytical function, Cauchy's inequality Power, Taylor, Maclaurin and Laurent series, Radius of convergence Singularities and zeros, Zeros of an analyticalfunction.

Unit 5: Complex integration-II (4hours)

Laurent series and Residue integration method, Calculating residues, Residue theorem, Applications of Residue theorem to solve integrals in complex plane.

Prescribed Text books (Key texts):

1. Mathematical Methods for Physicists by G. B. Arfken and H.J. Weber, Elsevir Academic Press.
2. Mathematical Methods in Physical Sciences by W. L. Boas, John Wiley and sons.
3. Advanced Engineering Mathematics by E. Kreyszic, John Wiley and sons.
4. Introduction to Mathematical Physics by C. Harper, Prentice Hall.
5. Complex variables and applications by R. V. Churchil, McGraw Hill.
6. Mathematical Physics, H. K. Dass, S Chand.
7. Mathematical Physics, M. Das, P. K. Jena and B. K. Dash, Shree Krisna Prakashan.
8. Mathematical Physics, Satya Prakash, Sultan Chand and Sons.
9. Mathematical Physics, B. D. Gupta, S. Chand.