Subject Code : CCN2F5

CC--V : MATHEMATICAL PHYSICS – II

Unit 1: Complex Analysis

Functions of complex variables – Differentiability -- Cauchy-Riemann conditions – Complex integration – Cauchy's integral theorem and integral formula – Taylor's and Laurent's series – Residues and singularities - Cauchy's residue theorem – Evaluation of definite integrals.

Unit 2: Integral Transforms

Fourier Series -- Dirichlet's conditions - Determination of Fourier coefficients – Fourier integrals -- Fourier transforms -- Faltung theorem -- Application to heat and wave equations – Laplace transform -- Convolution theorem -- Solution of ordinary differential equations.

Unit 3: Green's Function Techniques and Integral Equations

Green's Functions – Properties – Methods of solutions in one dimension – Applications – Linear integral equations – Fredholm and Volterra type – Neumann series – Eigenfunction expansion – Applications.

Unit 4: Special Functions

Gamma and Beta functions – Sturm-Liouville problem – Legendre, Associated Legendre, Bessel, Laugerre and Hermite differential equations : series solution – Rodriguez formula – Generating functions – Orthogonality relations – Important recurrence relations.

Unit 5: Group Theory

Basic definitions – Multiplication table – Subgroups, Cosets and Classes – Direct Product groups – Point groups -- Space groups – Representation theory – Homomorphism and isomorphism– Reducible and irreducible representations – Schur's lemma – The great Orthogonality theorem – Character table -- C3v and D3h as examples – Elementary ideas of rotation groups.

Books for Study and Reference :

Relevant Chapters in

1. L.A.Pipes and L. R. Harvill, *Applied Mathematics for Engineers and Physicists* (McGraw Hill, Singapore, 1970)
2. E. Kreyszig, *Advanced Engineering Mathematics* (Wiley Eastern, New Delhi, 1983).
3. G. Arfken and H.J. Weber, *Mathematical Methods for Physicists* (Prism Books, Banagalore, 1995).
4. A.K. Ghatak, I.C. Goyal and A.J. Chua, *Mathematical Physics* (McMillan, New Delhi, 1995).
5. P.K. Chattopadhyay, *Mathematical Physics* (Wiley, Eastern, New Delhi, 1990).
6. W.W.Bell, *Special Functions for Scientists and Engineers* (Van Nostrand, New York, 1968) .
7. A.W. Joshi, *Elements of Group Theory for Physicists* (Wiley Eastern, New Delhi, 1971).
8. F.A. Cotton, *Chemical Applications of Group Theory* (Wiley Eastern, New Delhi, 1987).