MATHEMATICAL PHYSICS II

(For students admitted from June 2008)

Semester: II	Hours/week: 6	Credits: 4

UNIT 1: FUNCTIONS OF COMPLEX VARIABLES:

Complex numbers - Analytic functions - Elementary functions – Integrals - Cauchy Goursat theorem and Cauchy integral - Power series - Taylor series and Laurent's series- Residue and poles - Residue theorem - Applications of residue theorem - Evaluation of definite integrals and summation of series.

Representation of functions of contour integrals- Gamma, Bessel and Legendre functions.

UNIT 2: CONFORMAL MAPPING

Mapping of elementary functions - Conformal mapping - Applications of conformal mapping- Boundary value problems - Dirchlet and Neumann problems – Poisson's formula- Applications to fluid flow and electrostatic.

UNIT 3: STURM-LIOUVILLE THEORY

Orthonormal functions set and expansion - Second order linear differential operators- Sturm Liouville problem - Self-adjoint operators – Orthonormality of Eigen functions – Expansion of function in terms of orthonormal basis- Completeness.

Concepts of theory of distributions - Dirac delta function – Delta calculus - Representation of delta functions - Applications of the delta calculus.

UNIT 4: GROUP THEORY:

Elements of group theory: Groups - Definitions and examples - Sub groups - Cayley's theorem – Cosets - Lagrange's theorem – Conjugate classes - Invariant subgroups - Factor groups – Homomorphism - Direct product group – Symmetry groups: Symmetry elements- point groups and space groups - Group representation: Reducible and irreducible representation - Schur's Lemmas - The great orthogonality theorem - Criteria for irreducibility - Character of a representation- Character tables.

UNIT 5: INTEGRAL TRANSFORMS:

Laplace transform and inverse Laplace transforms - Faltung theorem - Application to solution of differential equations, partial differential equations, integral and integro-differential equations.

Fourier series - Analysis of periodic waveforms - Discrete frequency spectra - Fourier integral - Fourier transform - Applications to boundary value problems.

UNIT 6: LINEAR VECTOR SPACE AND PROBABILITY:

Vectors in n – dimensions - Linear dependence and independence of Vectors - Basis – Representation of vectors and linear operators with respect to a basis - Transformation under change of basis - Schmidt orthogonalisation process- Bessel's inequality- Schwarz inequality-Unitary transformations.

Definition of probability - Independent events - Mutually exclusive events - Repeated and independent trials - Compound events – Binomial, Poisson and normal (Gaussian) distributions - Standard deviations mean, variance, moments of the distributions - Theory of errors- Principle of least squares - Application of least squares to solution of linear equations - Curve fitting – Linear regression.

Books For Study:

1. B.D Gupta, *Mathematical physics*, 2nd revised edition, Vikas pub.co.Ltd (1997) NewDelhi.
2. R.V.Churchill, *Complex variables and Applications*,Mc Graw Hill, Kogakushs.
3. M.R Speigal, *Complex variables (schaum's outline series),* Mc Graw Hill.
4. Sneddon.I.N, *Fourier series, (Reutledge and kegan paul*).
5. M.K Venkatraman *Engineering mathematics vol III A* , The National Publishing Company, Madras.
6. R.V Churchill,*Fourier series and boundary value problems*
7. Frank Ayres. M. *Matrices (schaum's series)* (chapters 1-14)
8. M.R Speigel, *Laplace transforms (schaum's series*).
9. A.W Joshi, *Elements of group theory for physicists*,3rd edition ,Wiley Eastern Ltd.
10. Hammermesh,*Group theory*
11. David M. Bishop,*Group theory*

Books For Reference:

1. Eugene Butkov,*Mathematical physics*
2. Sokolnikoff and Redheffer, *Mathematics for physicists*
3. M.Tinkham,*Group theory and quantum mechanical applications of group theory*