**PH 402: Mathematical Physics-II (3-1-0:4)**

**Complex Analysis**

Analytic functions, Cauchy-Riemann equation, classification of singularities, Cauchy’s theorem, Taylor and Laurent expansions, analytic continuation, residue theorem, evaluation of definite integrals. **[9L+3T]**

**Integral Transforms**

Fourier and Laplace transform, inverse transforms, convolution theorem. Application of solving ODEs and PDEs by transform methods. **[9L+3T]**

**Tensors**

Tensors in index notation, Kronecker and Levi Civita tensors, inner and outer products, contraction, symmetric and antisymmetric tensors, quotient law, covariant and contravariant tensors, metric tensors, simple applications to general theory of relativity and Klein-Gordon and Dirac equations in relativistic quantum mechanics. **[9L+3T]**

**Group Theory**

Groups, finite groups, non-Abelian groups, permutation groups, Mapping between groups, subgroups, representation of a group, unitary representations, orthogonality theorem, character table, simple applications to symmetry groups and molecular vibrations. **[9L+3T]**

**Textbooks and References**

1. S. D. Joglekar, “Mathematical Physics: Advanced Topics”, Universities Press.

2. A. W. Joshi, “Matrices and Tensors in Physics”, New Age International Private Limited.

3. A. W. Joshi,”Elements of Group Theory for Physicists”, New Age International Publishers.

4. Arfken, Weber and Harris, “Mathematical Methods for Physicists”, Academic Press.

5. Riley, Hobson and Bence, “Mathematical Methods for Physics and Engineering’’, Cambridge University Press.

6. A. Zee, “Group Theory in a Nutshell for Physicists”, Princeton University Press.

7. R. J. Beerends, H. G. Ter Morsche, J. C. Van Den Berg, and E. M. Van De Vrie, “Fourier and Laplace Transforms”, Cambridge University Press.