

Third year of Five Years integrated M.Sc (Physics)  
M.Sc. - III, Semester –VI

	L	T	P	C
MP 302 : Mathematical Physics	3	2	0	5

- **REVIEW OF VECTOR SPACES** (10 Hours)  
Coordinate transformation, Operators, Matrices.
- **TENSORS** (04 Hours)  
Tensor analysis, Contraction, Direct product, Quotient rule, Pseudo tensors, Dual tensors, Non-cartesian tensors.
- **DIFFERENTIAL EQUATIONS** (06 Hours)  
 $2^{\text{nd}}$  order linear homogeneous differential equations with variable coefficients, Laplace's equation and method of separation of variables,
- **SOLUTIONS TO THE BESSEL, HERMITE, LEGENDRE, HYPER-GEOMETRIC AND CONFLUENT HYPER-GEOMETRIC EQUATIONS** (04 Hours)
- **BESSEL FUNCTIONS AND THEIR APPLICATIONS** (04 Hours)  
Bessel Function of the first kind, Orthogonality, Neumann functions, Modified Bessel's functions, Asymptotic Expansions, Spherical Bessel function.
- **LEGENDRE POLYNOMIALS AND SPHERICAL HARMONICS** (06 Hours)  
Generating Function, Recurrence relations, Orthogonality, Associate legendre functions, Spherical harmonics, Integral of three Ys, Legendre functions of the second kind, Vector spherical harmonics.
- **ELEMENTS OF GROUP THEORY** (08 Hours)

(Total Contact Time (Theory) : 42 Hours)

**BOOKS RECOMMENDED :**

- |                                   |   |  |      |
|-----------------------------------|---|--|------|
| 1. Dennery, P. and Krzywicki, A.  | <i>Mathematics for Physicists</i>   | Dover Publ.                                      | 1996 |
| 2. Arfken, G. B. and Weber, H. J. | <i>Mathematical Methods For Physicists., 3<sup>rd</sup> Edition</i>                                 | Academic Press.                                  | 2005 |
| 3. Joglekar, S.D.                 | <i>Mathematical Physics The Basics and Advance Topics</i>   | CRC Press  | 2007 |
| 4. Das T. & Sharma S.             | <i>Mathematical Methods in Classical and Quantum Physics</i>  | Sangam books Lts, Universities Press(India) Ltd, | 1998 |
| 5. Spiegel M.R.                   | <i>Schaum's Outline of Theory and Problems of Advanced Mathematics for Engineers and Scientists</i> | Mcgraw-Hill                                      | 2002 |