ADVANCE PHYSICS 1(MATHEMATICAL METHOD OF PHYSICS-1)

PRE-REQUISITE: Undergraduate level Mechanics and Mathematics

INTRODUCTION: CREDITE HOURS: 4

A Course in Mathematical Methods for Physicists helps students understand the mathematical techniques needed for their future studies in physics. It provides an accessible account of most of the current, important mathematical tools required in physics these days. It is assumed that the reader has an adequate preparation in general physics and calculus. The course contents bridge the gap between an introductory physics course and more advanced courses in classical mechanics, electricity and magnetism, quantum mechanics, and thermal and statistical physics. It contains a large number of worked examples to illustrate the mathematical techniques developed and to show their relevance to physics.

COURSE OBJECTIVE:

To give the understanding of Differential equations and their uses in Physics, Introduction to special functions, tensors, Legendre Polynomials and solution of Boundary value problems and their uses.

COURSE OUTLINE:

Vector Analysis:
Divergence theorem, Stokes' theorem, cylinderical, spherical and curvilinear coordinates. orthogonal curvilinear coordinates, gradient in orthogonal curvilinear coordinates, divergence and curl in orthogonal curvilinear coordinates, Laplacian, spherical polar coordinates.

Tensor Analysis:
Cartesian tensors, coordinate transformation, covariant and contravariant tensor, tensor algebra, metric tensor. Christoffel symbols

Special Functions:
Legendere polynomials, Bessel functions, associated Legendre functions and spherical harmonics spherical spherical Bessel functions, Neumann functions.

Boundary Value Problem:
Boundary value problem in physics, the Sturm-Liouville problem.

Evaluation Criteria

Examination	Type	Marks
Internal Examination	Sessional Work	15%
	Mid-Semester	25%
External Examination	Final Semester	60%

REFERENCE BOOKS:

1.   Mathematical Methods for Physics and Engineering, F. Riley, M. P. Hobson and S. J. Bence, Cambridge University Press, (1997).
2.   Mathematical Physics by E. Butkov, Addison-Wesley Publishing Company, (1968).
3.   Mathematical Methods for Physicists by G. Arfken and H. J. Weber, Academic Press, (1995).
4.   Applied Mathematics for Engineers and Physicists by L.A. Pipes and L.R. Harvill, McGraw-Hill Book Company, (1970).
5.   Mathematics of Classical and Quantum Physics Volume II, By F.W. Byron Jr. and R.W Fuller Addison-Wesley Publishing Company, (1970).
6.   Complex Variable by M. R. Spiegel, Schaum Publishing Company, (1970)