PPH104: MATHEMATICAL PHYSICS

L	T	P	Cr
3	1	0	3.5

Course Objectives: To impart knowledge about various mathematical tools employed to study physics problems.

Complex Variables: Introduction, Cauchy-Riemann conditions, Cauchy's Integral formula, Laurent expansion, Singularities, Calculus of residues.

Differential Equations: Ordinary Differential Equations, First order homogeneous and non-homogeneous equation with variable coefficients, Second order homogeneous and non-homogeneous equation with constant coefficients, Second order homogeneous and non-homogeneous equation with variable coefficients, Partial differential equations of theoretical physics, Separation of variables, Series solutions.

Special Function: Bessel functions of first and second kind, generating function, orthogonality; Legendre functions: generating function, Recurrence relations and special properties, Orthogonality; Hermite functions, Laguerre functions.

Fourier Series and Fourier Transforms: Fourier series, Dirichlet conditions, applications, Gibbs phenomenon, Fourier transforms, Development of the Fourier integral, Fourier transforms of derivatives.

Tensors: Scalar, Vector and tensor quantities, Contravariant and covariant tensors, Addition, multiplication and contraction of tensors, Application of tensors in coordinate transformations.

Group Theory: Concept of group, Character tables of discrete groups, Lie groups, generators, U (1), SU (2), SU (3).

Course Learning Outcomes (CLO):
Students will have understanding of

1. various techniques to solve differential equations
2. how to use special functions in various physics problems?

Recommended Books:

1. *Arfken G. and Weber H.J., Mathematical Methods for Physicists, Academic Press (2005).*
2. *Rajput B. S., Mathematical Physics, Pragati Prakashan (2002).*
3. *Boas M.L. Mathematical Methods in the Physical Sciences, John Wiley & Sons, New York (1983).*
4. *Harper C. Analytical Mathematics in Physics, Prentice Hall (1999).*

.