Course Title	**MATHEMATICAL METHODS OF PHYSICS-I**
Course Code	**APHY-352**
Credit Hours	**CH3**
Pre- requisites	**MPHY-101, MPHY-102, MPHY-203**
Learning outcomes	To understand the working knowledge of mathematical methods used in physics.
Contents	**Series Solutions:** Solutions about ordinary, points, Solutions about singular points, **Sturm-Liouville theory**: Introduction, Hermitian operators, Self-Adjoint ordinary differential equations, making an ordinary differential equation Self-Adjoint Ordinary differential equation eigenvalue problems, completeness of eigenfunctions, **Green's functions:** Green's function for one-dimensional problem, eigenfunction expansion of Green's function, special functions, **Gamma and Beta function**: Definitions and properties (Infinite Limit, Euler integral Infinite product), Functional relation, Analytical properties, Factorial notation Digamma and polygamma functions, Beta function, **Special functions:** Bessel functions of first kind, orthogonality, Neumann functions, Bessel functions of the second kind, Hankel functions, modified Bessel functions, asymptotic expansions, spherical Bessel functions, Legendre functions, Legendre polynomials, orthogonality, generating function, recurrence relation, associated Legendre equation, spherical harmonics, orbital angular momentum operator, addition theorem for spherical harmonics, Legendre functions of the second kind, Hermite functions, Hermite equation as Schrodinger equation of quantum harmonic oscillator, Laguerre functions and associated Laguerre functions, **Fourier series and integral transform:** Fourier series, Fourier transform, properties of Fourier transforms, Fourier convolution theorem, Fourier transform, discrete Fourier transform, Laplace transforms, properties of Laplace transforms, Laplace transform of derivatives, Laplace Convolution theorem, inverse Laplace transform.
Teaching-learning Strategies	Classroom teaching / Lecturing
Assignments- Types and Number	Problem sheet: 3-4
Assessment and Examinations	Mid-Term Assessment: 35% Formative Assessment: (25%): It includes classroom participation, attendance, assignments and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc. Final Term Assessment: 40%
Text Books	1. Mathematical Methods for Physicists (7^{th} Edition) by G. B. Arfken, H. J. Weber and F. E. Harris, Academic Press (2012) 2. A Guide to Mathematical Methods for Physicists by M. Petrini, G. Pradisi and A. Zaffaroni, World Scientific Press (2017) 3. Mathematical physics: A modern introduction to its foundations by S. Hassani, Sadri, Springer (2013) 4. Dennery, Philippe, and André Krzywicki, Mathematics for physicists, Dover Publications (2012) 5. Mathematical methods for physics and engineering by K. F. Riley, M. P. Hobson, and S. J. Bence (3^{rd} Edition), Cambridge (1999) 6. Mathematical Methods for Physicists: A Concise Introduction by T. L. Chow, Cambridge (2000)