



<b>Phys 3501</b>	<b>MATHEMATICAL METHODS OF PHYSICS-I</b>	<b>(CR3)</b>
<b>Preq.</b>	<b>Math 1001, 1002, 2003, 2004</b>	

### Objectives

To understand the working knowledge of mathematical methods used in physics.

### Syllabus

Series solutions about an ordinary point and regular singular point, Sturm-Liouville theory, self-adjoint ODEs, orthogonal functions, Hermitian operators, eigenvalue problems, completeness of eigenfunctions, Green's Functions, Green's function for one-dimensional problem, eigenfunction expansion of Green's function, special functions, Gamma Function, digamma and polygamma functions, Stirling's series, Beta function, 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, properties of 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.

### Recommended Books

1. *Mathematical Methods for Physicists (7<sup>th</sup> 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 (3rd Edition), Cambridge (1999)
6. *Mathematical Methods for Physicists: A Concise Introduction* by T. L. Chow, Cambridge (2000)