Course Type	Course Code	Name of Course	L	T	P	Credit
DC	PHC202	MATHEMATICAL PHYSICS	3	0	0	9

Course Objective
To sketch the ideas and emphasize the relations which are essential to the study of physics and related fields.
Learning Outcomes
The approach incorporate contents required for the basic & advanced level of understanding and active learning on problem solving skills of engineering students. The mathematical methods given herewith are not quoted under most general assumptions, but are customized to the more restricted applications required in almost all engineering courses.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Associated Legendre, Hermite and Laguerre polynomials; Generating functions and Differential equations; Recurrence relation; Physical applications; Green's function and its applications, Properties and representations of Dirac-delta function.	16	This will help students to solve varieties of problems in Spectroscopy, multipole expansion, quantum mechanics, time dependent and independent problems in physics.
2	Fourier transform: Development of complex Fourier transform, Sine, Cosine and complex transforms with examples, definition, properties of Fourier transforms, transforms of derivatives, Parseval's theorem, Convolution theorem, Momentum representation, Application of Fourier transformation to partial differential equations, discrete Fourier transforms, introduction to Fast Fourier Transforms.	10	This will help students to understand spectroscopic outcomes, quantum mechanics, signal processing, etc.
3	Group theory: Concept of group, examples of group: SU(2), O(3), abelian group, generators of finite group, cyclic group, group multiplication table, subgroup, conjugate elements and classes, isomorphism and homomorphism.	9	This is useful in the classification of molecules and crystals, understanding unification of different forces.
4	Tensors: Transformation properties, Metric tensor, Raising and lowering of indices, Contraction, Symmetric and anti-symmetric tensors.	7	To understand the theory of relativity, high energy physics, non-linear optics, quantum mechanics, etc.
	Total	**42**	

Textbooks:

1. Advanced Engineering Mathematics, 10th Edition, Erwin Kreyszig, Wiley, 2011.
2. Mathematical Methods for Physicists, Arfken & Weber, Academic Press, 2010.
3. Introduction to Mathematical Physics, Harper, PHI Learning; 2009

Reference Books:

1. Mathematical Methods in Physical Sciences; Boas; Wiley India Pvt Ltd; 2006.
2. Mathematical Physics; B.D. Gupta, Vikas Publishing House, 1986.

Mathematical Physics: Advanced Topics; Joglekar, Universities Press, 2006.