SEMESTER - II			
Core VIII	Mathematical Physics II		
Code : 19PPHC22	Hrs/Week: 5	Hrs/Semester: 75	Credits: 4

Vision:

To introduce students to methods of mathematical physics and to develop required mathematical skills to solve problems in quantum mechanics, electrodynamics and other fields of theoretical physics.

Mission:

To enhance the knowledge in probability, integral transforms special functions, tensors and numerical methods.

Course Outcome

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO - 1	analyse the experimental data with the aid of Fourier transform	4	An
CO - 2	understand the basic of tensor calculus and to describe motion and deformation of body	1	Un
CO - 3	recall the basic notations of generating functions and special functions	1	Re
CO - 4	apply computational techniques to solve a wide range of numerical problems arising in physics	2	Ap
CO - 5	explain the concepts of Laplace Integral	1	Un
CO - 6	solve mathematical problems arising in physics by a variety of mathematical techniques.	2	Cr
CO - 7	employ the knowledge of critical thinking and problem solving	5	Ap
CO - 8	employ correct method to solve a particular problem	2	Ap

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Unit I: Probability and Fourier's Integral Transforms

Probability: Probability– definitions - Binomial distribution, Poisson distribution, normal distribution.

Fourier Integral Transforms: Fourier transform- properties of FT-FT of a derivative-Finite FT

Unit II: Tensors

Notations and conventions–contravariant vector-covariant vector- tensors of second rank – equality and null tensor– addition and substraction – outer product of tensors– inner product of tensors– symmetric and antisymmetric tensor– metric tensor– Cartesian tensor– isotropic tensor– stress, strain and Hooke's law-Moment of inertia tensor.

Unit III: Special Functions II

Hermite functions: Hermite Differential Equation– Hermite Polynomials– Recurrence Formulae– Rodrigue's Formula-Laguerre function: Differential equation– Laguerre polynomial – Generating Function– Rodrigue's Formula– Recurrence Relation.

Unit IV: Numerical methods

Solution of non - linear equation: Newton – Raphson's method - Solution of Linear Algebraic Equations: Gauss elimination, Interpolation: Lagrange's interpolation– Inverse interpolation – Finite differences– Newton's forward and backward interpolation - Numerical Integration: Trapezoidal rule - Simpson's $1/3^{rd}$ and $3/8^{th}$ rule - Runge-Kutta method(Fourth order).

Unit V: Laplace's Integral Transforms

Laplace transform–properties of Laplace transform-Laplace transforms of derivative of a function– Laplace transform of integral - inverse Laplace transform–properties of inverse Laplace transform- Evaluation of ILT by convolution theorem- Method of partial fractions for evaluation of ILT

Unit	Book No.	Pages/sections
I	1	11.2,11.20,11.21,9.2,9.3,9.4,9.7
II	2	15.2,15.3,15.4,15.5,16.1,16.2,16.3,16.4,16.6,18.1,19.3,19.4,19.5,19.7
III	1	6.29,6.30,6.31,6.32,6.34,6.35,6.36,6.37
IV	3	1.1, 1.16, 1.53, 2.1, 2.13, 2.59, 2.61, 2.75, 3.27, 3.31
V	1	9.9,9.10,9.11,9.15,9.17,9.18,9.19,9.20

Text Books:

1. Satya Prakash, Mathematical Physics, Fourth revised Edition 2004, Sultan Chand &Sons.
2. Matrices and tensors in Physics, A.W. Joshi, New Age International Publishers, Revised Third Edition (1995), Reprint 2010.
3. Numerical Methods - A. Singaravelu, Meenakshi Agency, Chennai
4. P.K. Chattopadhyay, Mathematical Physics, New Age International Publishers, Reprint (2001) and
5. H.K.Dass ,Mathematical Physics, S.Chand & Company LTD, Fourth Revised Edition 2004.