PHYSICS

Mathematical Methods in Physics-I

Type of Course : New
Course Snapshot : Core /PG
Pre-requisites : Basic calculus,Algebra and Basic complex numbers
Course Duration : 30 Hours / 12 weeks

COURSE OUTLINE:

Mathematical Methods in Physics- I is a basic course in physics for M.Sc (and/or B.Sc 3rd year) students which provides an overview of the essential mathematical methods used in different branches of physics. This course is mainly divided into two parts. Students in 3rd year B. Sc or 1st year M. Sc are encouraged to take this course. All the assignments and the final examination will be of objective type.

INSTRUCTOR:

Prof. Samudra Roy
Department of Physics
IIT Kharagpur

ABOUT INSTRUCTOR:

Prof. Samudra Roy completed PhD from CGCRI (a CSIR Lab) in 2009 and carried out my post-doctoral research from Hokkaido University, Japan and Max Planck Institute, Germany during 2009-2013. In 2013, He joined in the Physics Department of IIT-KGP as an assistant professor. His research interest includes nonlinear photonics and optical soliton dynamics.

COURSE PLAN:

Week 1: Concept of Set, Binary composition, Group, Ring, Field, Vector Space, Metric Space
Week 2: Linearly dependent & independent vectors, Dual/Normed Space, Schwarz inequality
Week 3: Matrix – representation/decomposition, axis/Unitary/Similarity transformation
Week 4: The Cayley-Hamilton theorem, Function mapping/space, Linearly dependent/ independent function
Week 5: Orthogonal functions, Delta function, Gram-Schmidt orthogonalization, Legendre polynomials
Week 6: Fourier coefficients/transform/series, Parseval's relation, Convolution theorem
Week 7: Complex numbers, variables, functions and differentiability
Week 8: Cauchy-Riemann equation, Analytic function, Harmonic conjugate function
Week 9: Complex integration, Simply and multiply connected regions, Cauchy-Goursat theorem
Week 10: Series & Sequence, Convergence test, Taylor's series, Maclaurin Series
Week 11: Laurent Series, Zeros and poles, Residue - Classification and calculations
Week 12: Cauchy's residue theorem and Application to calculate the definite integrals