Phys 3504	COMPUTATIONAL PHYSICS-II	(CR3)
Preq.	Phys 3502	

Objectives

To make students understand how to program with MATLAB or PYTHON or MATHEMATICA in solving physical problems with numerical methods.

Syllabus

Advanced simulation techniques, problem solving using simulation, projectile motion, simple pendulum, motion of falling objects, motion in single and multi dimensions, programming techniques in quantum mechanics, statistical mechanics and nuclear physics, numerical solutions to Schrodinger's equations, normalization of wave function, orthogonality of eigenfunctions, certain calculations quantum mechanics, interpolation and extrapolation, Numerical integration, Monte Carlo methods, metropolis algorithm, some finite element methods, applications in statistical physics, Laplace transformation, solution of linear algebraic equations, sorting and curve fitting, special functions, Hermite polynomials and quantum harmonic oscillator etc. Stochastic methods, random number generation and Monte Carlo integration, random walk, Fourier transform spectral methods, orthogonal functions, wavelet analysis, Gaussian quadrature, problems in electrodynamics, solution of Laplace equation.

Recommended Books

1. *Introduction to Computational Physics, by T. Pang, Cambridge (2010)*
2. *Numerical methods for Physics, A. L.Garcia,Createspace,(2017)*
3. *Computational Methods in Physics, Chemistry and Biology by P. Harrison, Wiley, (2001).*
4. *More Physics with MATLAB, by D. Green, World Scientific, (2015)*
5. *Computational Physics by H. J. Gardner, World Scientific, Singapore (1997).*
6. *Numerical Recipes: The Art of Scientific Computing by W. H. Press, B. P. Flannery, Saul A. Teukolsky, and William T. Vetterling Cambridge University Press, (1988).*
7. *Mathematica for Physics: R. L. Zimmerman Addison Wesley Publishing Company, (1994.)*