Phys 3502	COMPUTATIONAL PHYSICS-I	(CR3)
Preq.	Gen 2005	

Objectives

To give students an understanding of various computational and numerical techniques used in physics.

Syllabus

Physics problems solving using numerical methods, basics of numerical analysis, Euler-Newton method for solving differential equations, Simpson method, Taylor expansion method, Runge-Kutta method, the trapezoidal rule for numerical quadrature, Newton-Cotes rule, Gauss-Legendre quadrature, numerical solution of problems in mechanics such as Kepler problem, numerical solution of double pendulum, applications of random number, brownian motion, solution of integral equations, linear algebra, solution of linear algebraic equations, matrix algebra, matrix inverse, sorting and curve fitting and best fit using linear and nonlinear least square fits, interpolation, splines and analysis of experimental and simulation data. Programming techniques in practical applications to advanced physics problems. Introduction to simulation techniques and computer graphics**,** use of computation and computer graphics to simulate the behavior of complex physical systems, computational techniques in investigating and visualizing fundamental physics, scientific packages, introduction to scientific work bench for problem solving in electronics and other branches of physics.

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.)*