

ICTP DIPLOMA PROGRAMME IN EARTH SYSTEM PHYSICS 2012-2013
Numerical methods I (ESP-NUM I)
(15 lectures : 22.5 hrs)

1. Introduction to Linux and FORTRAN90.
2. Fortran 90 Language Concepts.
3. Arrays and Array Sections. Concept of precision.
4. Simple programs to solve a classical analytical problem with a numerical method.
5. Advance FORTRAN90: subroutine, functions and module
6. Finding roots of equations: bisection, regula falsi, secant and Newton's methods
7. Numerical integration: trapezoid and Simpson's rule.
8. Numerical differentiation: forward- and centred-difference methods.
9. First order ordinary differential equations (ODE), initial value problems (IVP).
10. Random numbers: definition and properties of pseudo-random numbers, classes of uniform random number generators, non-uniform random numbers.
11. Applications of random numbers: Monte Carlo (MC) integration, percolation, random walks.

Book:

1) Numerical recipes : the art of scientific computing / William H. Cambridge : Cambridge University Press, 2007