

## PHY 473: COMPUTATIONAL METHODS IN PHYSICS

**Instructor:** Sudeep Bhattacharjee, Department of Physics, sudeepb@iitk.ac.in (7602)

### (a) Course contents: The course may be broadly divided into two parts

- (i) **Introduction to computers and programming (FORTRAN)** : Fundamentals of computer programming, Introduction to Fortran 90, Control constructs and intrinsics, arrays, procedures, modules and derived types.
- (ii) **Numerical methods with application to problems in physics:** Finite difference calculus, interpolation and extrapolation, roots of equations, solution of simultaneous linear algebraic equation, least squares curve fitting, numerical integration, numerical differentiation, numerical solution of ordinary differential equations, matrix eigenvalue problems. *Typical case studies and examples will be taken covering areas such as oscillatory motion, Waves and wave phenomena, electromagnetic fields, Random walk problems and solution of Schrödinger's equation. .*

### (b) Evaluation (out of 150 marks)

- (i) Attendance : 10
- (ii) Weekly Lab evaluation : 20
- (iii) Quiz I : 10
- (iv) Mid sem 1 : 30
- (v) Quiz II : 10
- (vi) Mid sem 2 : 30
- (vii) End sem : 40

### (c) Lecture Plan

During the week there will be two lectures (**Monday** and **Wednesday**) and one tutorial (**Thursday**). The laboratory will be held on **Fridays**.

*Venue and timings:*

Monday, Wednesday and Thursday (L-12) : 11:00 – 12:00

Friday (laboratory, CC) : 10:00 – 13:00

### (d) Resources for consultation

1. Fortran 90 for scientists and engineers, B. D. Hahn
2. Fortran 90/95 for scientists and engineers, Stephen J. Chapman
3. Fortran 90/95 explained, Michael Metcalf and John Reid
4. Numerical methods, E. Balagurusamy
5. Numerical methods, S. Balachandra Rao, C. K. Shantha
6. Numerical methods, S. C. Chapra, R. P. Canale
7. Computational Physics, An Introduction, R. C. Verma, P. K. Ahluwalia, K. C. Sharma
8. Computational physics, J. M. Thijssen

**(e) Office Hours:** Monday: 4:00 – 5:00