Course Code: **JF211**
Course Title: **Basic Computational Science**
Instructors: **Diwakar S. V. and Vidhyadhiraja N. S**
Credits: **3.0**
Duration: **48 Hours**

Module 1 – Introduction to Programming (18 hours)

1.i. Introduction to procedural programming using C++ (3 hours)
1.ii. Object Oriented and Template Programming using C++ (6 hours)
1.iii. Introduction to Python: Plotting, Linear Algebra, PDE solution (6 hours)
1.iv. Introduction to Parallel Programming (3 hours)

Module 2 - Introduction to Numerical Methods (12 hours)

2.i. Root Finding (3 hours)
2.ii. Numerical Integration (3 hours)
2.iii. Approximation Methods; Interpolation and Curve fitting (3 hours)
2.iv. Advanced Linear Algebra (3 hours)

Module 3 - Solutions of Ordinary and Partial Differential Equations (18 Hours)

3.i. Ordinary Differential Equations (9 hours)
   a. Forward and Backward Euler method
   b. Multi-Step methods, Runge-Kutta Method
   c. Stability and accuracy, Stiffness

3.ii. Finite Difference and Volume Method (9 hours)
   a. Basic Finite Difference Method,
   b. Von-Neumann Analysis,
   c. Crank-Nicholson Method
   d. Basics of Finite Volume Methods