# PMRF-ISSS Teaching Programme

Prime Minister Research Fellowship students' teaching requirement facilitated by the Institute of Smart Structures and Systems

## Module PMRF-ISSS014/2023

# Computational Methods and Algorithms

**Name of the PMRF student**

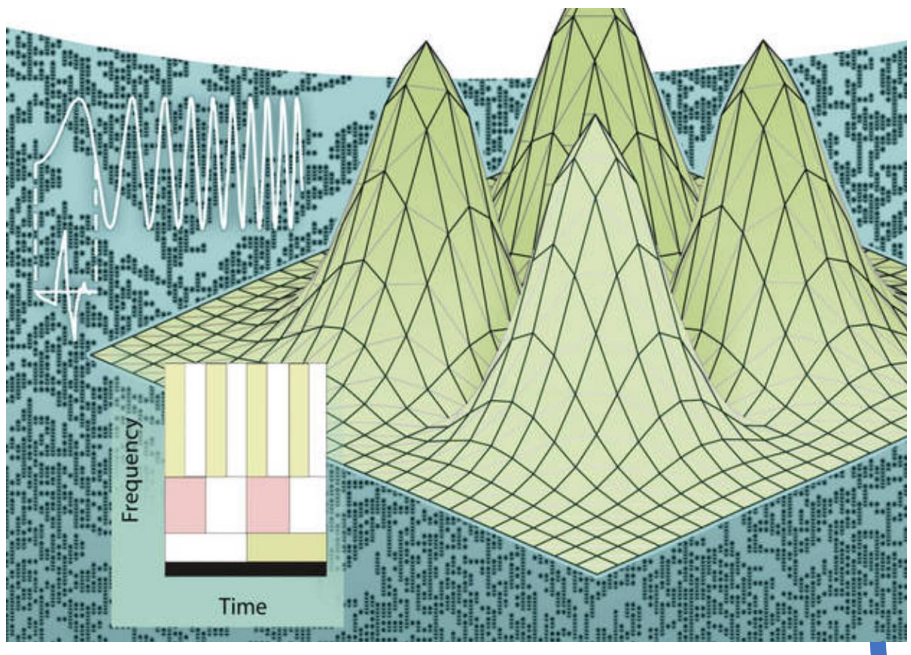
Robin Bajaj

**Required background of the students taught**

Physics, Chemistry, Mathematic, Biology (Undergrad B.Sc level)
B.Tech in Engineering (All streams requiring computation and Numerical methods)

**Online session coordinator**

Will be chosen from the list of registrants




**Details of the content of the module**

**TOPICS TO BE COVERED:**

**This course aims to teach the basic algorithms and enhance problem-solving skills and the imaginative capacity to innovate in coding.**

**Content:**

1. **Brief Introduction to Computational Physics, Machine Representation, Precisions and Errors**
2. **Integration, Root solving, numerical derivatives, Differential equations: Initial value problems and Boundary value problems, Leapfrog and Verlet algorithms, Partial Differential equations: Gauss Seidal method**
3. **Numerical linear algebra: System of equations, Relaxation method, Gaussian Elimination, LU factorisation, Inverse of a matrix, Eigenvalues and eigenvectors: QR factorisation, Gram-Schmidt orthogonalization**
4. **Fourier methods: Discrete Fourier Transform, Fast Fourier transform, Applications**
5. **Random numbers: Random number generation, Monte Carlo integration, uniform sampling, importance sampling, Metropolis algorithm**

**PROBLEM SOLVING SESSIONS AND DISCUSSION:**

Will be held every week covering the doubts and problems related to the topics taught in that week

**Schedule of the module**

**Tentative timings:**
**Start date**: 18 August 2023 (Friday)
**End date**: 21 October 2023 (Saturday)
**Fridays** and **Saturdays** every week (6:00-7:30 PM)

Meeting link : Will be shared later

Contact email ID: isss.forum@gmail.com

Registration link: https://docs.google.com/forms/d/e/1FAIpQLScHXh8ypou67-V-he3H7zQNCWIq-cPNKxVFiNnXThfUJezvIQ/viewform?usp=sf_link