PMRF-ISSS Teaching Programme

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

Module PMRF-ISSS038/2025

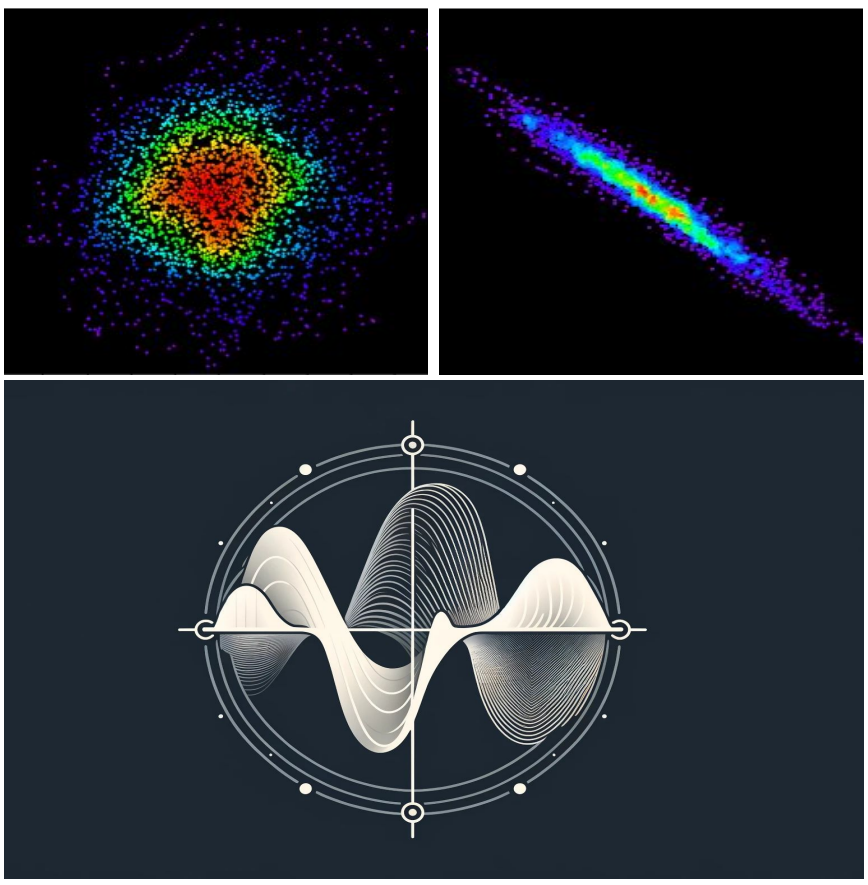
MATLAB-Based Modeling of Nonlinear, Parametric, and Stochastic Oscillator Systems

Name of the PMRF student

Javed Akhter Mondal

Required background of the students taught

Undergraduate students with a basic background in calculus, differential equations, and classical mechanics. Prior exposure to basic coding in any language will be advantageous, but is not mandatory.



Details of the content of the module

Module 1: MATLAB basics & ODE solving: Conditional statements, loops, functions, plotting, Euler and RK4 approaches for harmonic oscillator

Module 2: Nonlinear Oscillators: Simulating Duffing and Van der Pol systems, phase-space analysis

Module 3: Frequency & System Analysis: FFT for spectral analysis, extraction of physical parameters, Duffing hysteresis phenomena

Module 4: Parametric Excitation: Mathieu equation, drive-induced instability, Arnold tongue

Module 5: Stochastic Systems: noise-driven dynamics; quadrature detection

The course comprises structured recorded video lectures, including live MATLAB coding and analysis.

Schedule of the module

Start Date: 16 April 2025
End Date: 25 April 2025 (Tentative)
Schedule: Recorded videos of 2 hours everyday
Number of lectures: 10
Duration: Total ~20 hours

Meeting link : - Will be shared after registration via email

Contact email ID: akhterj933@gmail.com

Registration link: https://forms.gle/ssxM3wznGcH5RrZt6