PMRF-ISSS Teaching Programme

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

Module PMRF- ISSS011/III/2026

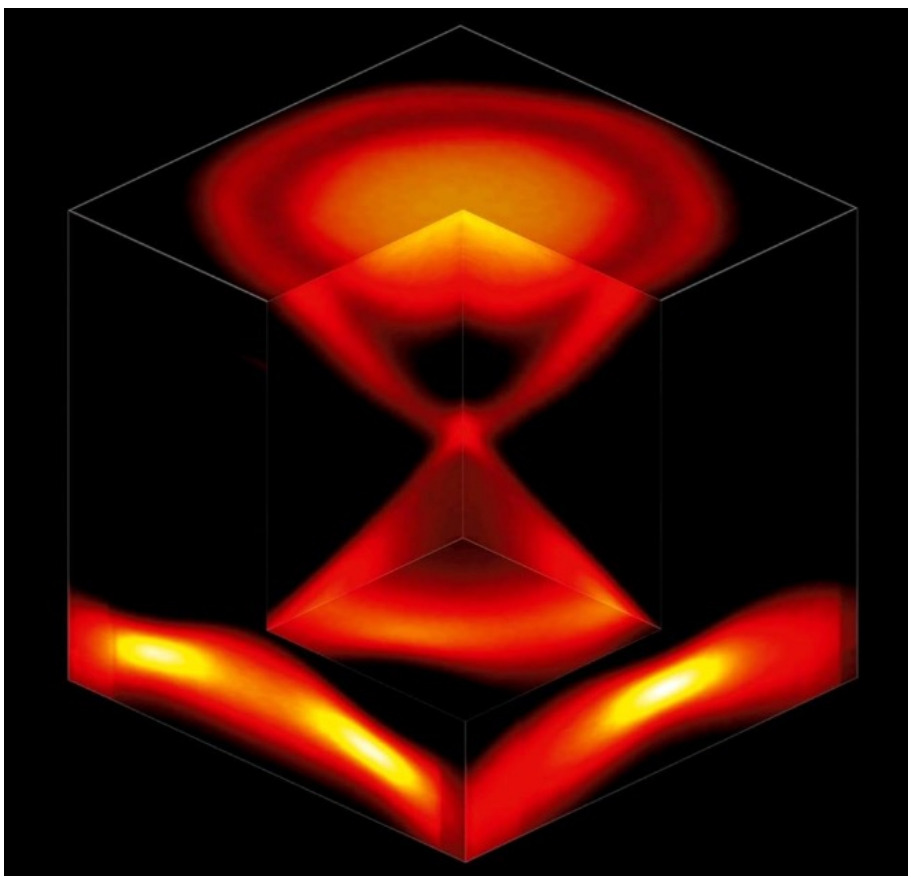
Basic Theory of Electronic Structure

Name of the PMRF student

Robin Bajaj

Required background of the students taught

B.Sc, B.Sc in Physics, M.Sc.,B.Tech, Disciplines in Materials Science, Chemistry, PhD in Physics, Chemistry and Materials Science



Details of the content of the module

This course introduces the fundamental theoretical framework underlying modern electronic structure theory of solids and materials. Emphasis is placed on the quantum mechanical description of interacting electrons and nuclei, independent-electron approximations, periodic solids, band theory, and the uniform electron gas. The topics are:

1. Foundations of Electronic Structure Theory
2. The Many-Electron Hamiltonian
3. Independent-Electron Approximations
4. Exchange and Correlation
5. Crystal Structure and Periodicity
6. Reciprocal Lattice and Brillouin Zone
7. Bloch Theorem and Band Formation
8. Symmetry in Electronic Bands
9. Density of States and Electronic Properties
10. The Uniform Electron Gas
11. Response Functions and Screening
12. Phonons and Structural Stability
13. Electronic Excitations and Modern Topics

Full Details of course content can be found in the google form link.

Schedule of the module

Tentative Schedule

- Start Date: 13 March 2026
- End Date: 19 April 2026
- Lectures will be held every Saturday and Sunday 3-5 PM, each lasting 1.5-2 hours, for a total course duration of approximately 25 hours. Any additional lectures, if required, will be announced on the portal.

Meeting link : Will be shared later

Contact email ID: robinbajaj@iisc.ac.in

Registration link: https://docs.google.com/forms/d/e/1FAIpQLSecFhSwLCc6lvepKJn89GIOggykcnlpTzOnE2YMhiDVZSGSHw/viewform?usp=header