

Module PMRF-ISSS044/2024

Nonlinear dynamics and Chaos

With Applications to Turbulence and its statistical properties

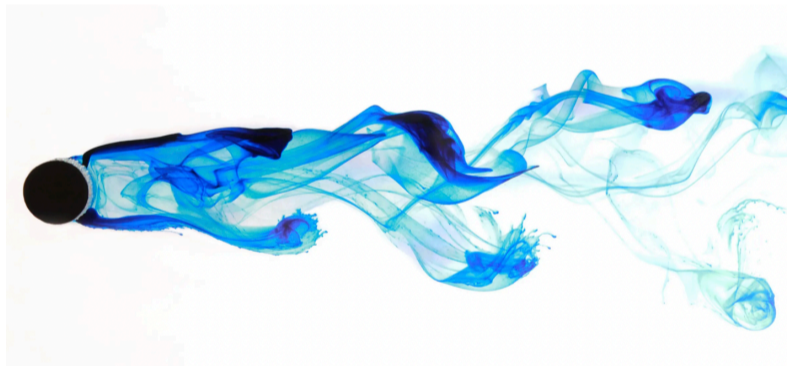
Name of the PMRF student

Sadhitro De

Required background of the students taught

Any discipline of science and engineering.

Knowledge of calculus (mainly differential equations) and basic probability theory is essential. Programming skills are desirable.



Schedule of the module

Start Date: April 01, 2024

End Date: May 13, 2024 (tentative)

Days of lectures: Monday and Friday every week (5 pm to 7 pm on both days); in case of unforeseen circumstances recorded lectures will be uploaded prior to the starting times of the respective classes.

Details of the content of the module

This course seeks to provide basic insights into the analysis of complex systems, which have applications across multiple fields of science and engineering. The second part of this course deals with turbulence, one of the most ubiquitous examples of a highly chaotic system.

Part 1

- Introduction to flows, fixed points, stability analysis, bifurcations, perturbative methods
- Introduction to maps, period-doubling route to chaos, renormalisation, universality
- Lyapunov exponents, fractals, strange attractors (*chaotic synchronisation and complex networks, if time permits*)

Part 2

- Basic phenomenology of turbulence, symmetries, scaling analysis
- Turbulent flow topology from concepts of stability analysis
- Multifractal description of turbulence

Meeting link : Will be shared later

[Link](#)

Contact email ID: issf.forum@gmail.com

Registration link:

<https://forms.gle/LWowjLZZcYU4Zia1A>