UNIVERSITÀ DI TORINO

ID

VP082_MAT

Visiting Professor Program
Academic Year 2024/2025

TEACHING COMMITMENT: 12 hours

COURSE TITLE
Dynamical Systems and Chaos Theory

TEACHING PERIOD
2nd term

SCIENTIFIC AREA
Mathematical Physics

LANGUAGE USED TO TEACH
Italian

COURSE SUMMARY
General aspects of the theory of continuous and discrete dynamical systems, expanding the topics already encountered at undergraduate level (ODE theory, Lyapunov stability theory) and introducing bifurcation theory and chaotic systems, with emphasis on general strategies for applications in physics (e.g. celestial mechanics), biology (e.g. population dynamics) and social sciences.

LEARNING OBJECTIVES
Understanding and interpreting, from both the mathematical and the modeling viewpoint, equations and maps describing a (continuous or discrete) dynamical system. Drawing phase portraits and performing qualitative analysis of the solution behavior in dependence of initial data and system parameters. Comparing theoretical qualitative analysis with numerical simulation. Understanding universality of qualitative behavior, structural stability and bifurcation types.

Understanding the notion of deterministic chaotic system and its applications, with focus on hamiltonian integrable systems and their perturbations (KAM and Nekhoroshev theorems, Chirikov regime, frequency analysis for continuous chaotic systems, Lyapunov indicators).

VISITING PROFESSOR PROFILE

Previous teaching experience in postgraduate mathematics corses; established expertise in the application of chaos and perturbation theory in physics.

CONTACT REFERENT

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