

Winter Term 2025/26.

Advanced Topics in Analysis and PDE (V5B3).

Dynamical Systems.

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In this course the classical theory of Dynamical Systems will be considered. Some of the topics discussed include Bifurcation Theory, the dynamics of the solutions of difference and ordinary differential equations, Renormalization group methods in dynamical systems, periodic solutions, the Lindstedt-Poincaré method, the theory of forced oscillations, chaos and the Melnikov's method to analyze the behaviour near a homoclinic trajectory.

Applications of the theory of Dynamical Systems both to finite dimensional problems as well as Partial Differential Equations will be discussed.

Prerequisites for this course are a basic knowledge of Real Analysis and the Theory of Ordinary Differential equations.

## References

- [1] R. de la Llave, A tutorial on KAM Theory. Preprint.
- [2] P. G. Drazin, Nonlinear Systems, Cambridge University Press.
- [3] S. H. Strogatz, Nonlinear Dynamics and Chaos. Perseus Books.