SG2126 Non-linear Oscillations and Dynamical Systems in Mechanics 7.5 credits

Non-linear Oscillations and Dynamical Systems in Mechanics

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus valid from Fall 2022

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Specific prerequisites

English B / English 6

Linear algebra, multivariable calculus, ordinary differential equations, basic mechanics, numerical methods.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After the course the student should be able to:

- Explain how ordinary differential equations (ODE) and iterated maps give rise to dynamical system.
- Be able to define the state space, its limit sets and attractors.
- Explain how the state space dimension limits the possible dynamics.
- Sketch the limit set and starting from this characterize the main features in the flow of a dynamical system given by ODEs in the plane.
- Recognize and describe the result of a simulation using the concept of Poincare mapping.
- Know about and be able to calculate the fractal dimension in a few simple cases.
- Know about the concept of chaos in dynamical systems and state some properties of a chaotic dynamical system.

Course contents

Flows and mappings, state space formulations, geometrical methods, limit sets, bifurcations, Poincaré mappings, chaos.

Examination

- INL1 - Hand in Assignments, 4.5 credits, grading scale: P, F
- TENA - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.