



Course syllabus

Faculty of Technology
Department of Mathematics

4MA425 Dynamiska system, 7,5 högskolepoäng
Dynamical Systems, 7.5 credits

Main field of study

Mathematics

Subject Group

Mathematics

Level of classification

Second Level

Progression

A1N

Date of Ratification

Approved by Faculty of Technology 2014-10-03
The course syllabus is valid from autumn semester 2015

Prerequisites

60 credits in mathematics inclusive 2MA401 Ordinary Differential equations 7.5 credits or equivalent.

Objectives

Upon completion of the course, the student should be able to:

- explain and prove basic results in the field of dynamical systems
- use methods within the theory of dynamical systems for solving problems with theoretical and applied character
- analyze dynamical systems and list properties that are left invariant with respect to coordinate changes and smaller perturbations
- derive consequences of Sharkovsky's Theorem for one-dimensional maps
- be able to analyze maps that give rise to horseshoe phenomena
- use symbolic dynamics
- construct unstable and stable manifolds for simple nonlinear systems
- understand the hyperbolicity concept and its consequences
- show ability to penetrate and understand sections that belong to the course in an independent and safe manner and report results in a written form
- show the ability to referee work of other students within this field and evaluate those

Content

The course comprises:

- Examples of dynamical systems

- Homeomorphisms and diffeomorphisms
- Topological classification and structural stability
- Sharkovsky's Theorem
- Hyperbolic sets and horseshoe maps
- Unstable and stable manifolds
- Symbolic dynamics
- Writing an essay about some smaller part within the field of dynamical systems

Type of Instruction

Lectures and seminars. Group assignments and mandatory assignments may be given during the course.

Examination

The course is assessed with the grades A, B, C, D, E, Fx or F.

The grade A constitutes the highest grade on the scale and the remaining grades follow in descending order where the grade E is the lowest grade on the scale that will result in a pass. The grade F means that the student's performance is assessed as fail (i.e. received the grade F).

The student's knowledge is assessed in the form of oral and/or written examinations. Continuous examination through written and/or oral presentations occurs. The principal assessment method is decided at the beginning of the course.

Course Evaluation

A course evaluation will be carried out and compiled after the course is completed. The compilation will be presented to the current board as well as to the students and filed.

Credit Overlap

This course cannot be part of a degree in combination with another course in which the content fully or partly correspond to the content of this course: 4MA125 Dynamical Systems, 7.5 credits

Other

Grade criteria for the A–F scale are communicated to the student through a special document. The student is to be informed about the grade criteria for the course by the start of the course at the latest.

An essay is a short written presentation of about 3-4 pages containing the solutions of some exercises within a relevant context. Associated theory must be introduced and explained. Seminars containing presentations of the essay are arranged during the course.

Required Reading and Additional Study Material

Required reading

- Devaney, RL // An Introduction to Chaotic Dynamical Systems, Second Edition, Westview Press, 2003, ISBN 978-0-8133-4085-2, 335 pages

Supplementary literature

- Barreira L, Valls C // Dynamical Systems - An Introduction, Springer, 2012, ISBN 978-1-4471-0, 209 pages