SF1676 Differential Equations with Applications 7.5 credits

Differentialekvationer med tillämpningar

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 for SF1676 valid from Spring 2017

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Basic knowledge of linear algebra and calculus, as presented in

- SF1624 Algebra and Geometry
- SF1625 Calculus in One Variable
- SF1626 Calculus in Several Variables

Language of instruction

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

Intended learning outcomes

To give the students

- acquaintance with the fundamental theory of ordinary differential equations.
- ability to solve certain types of (systems of) ordinary differential equations using standard methods.
- ability to analyze (systems of) ordinary differential equations using geometric and qualitative methods.
- ability to compute Laplace transforms.
- ability to compute Fourier series.
- ability to solve separable partial differential equations and to find solutions to boundary value problems using Fourier methods.
- the possibility to gain deeper insights into areas relevant for their education.
- ability to use suitable computer software for symbolic as well as graphic investigations of the problems mentioned above.
- ability to attack modeling problems.
- carry out a group project in the applied urban management area. For other students, a project with other applications is offered.

Course contents

- First order ordinary differential equations: Fundamental theory and concepts. Modeling. Directional fields and solution curves. Autonomous equations. Stationary solutions. Stability. Separable equations. Linear equations.
- Linear ordinary differential equations of higher order: Fundamental theory. Methods of solution for constant coefficient equations. Vibrational phenomena.
- Systems of linear ordinary differential equations: Fundamental theory and concepts. Solving linear systems with constant coefficients using eigenvalue methods and variation of parameters.
- Autonomous systems of ordinary differential equations: Fundamental concepts. Stationary solutions and their stability. Global phase portraits. Modeling.
- The Laplace transform and its applications.
- Fourier series with applications.
- Linear partial differential equations: Separation of variables. Solution of classical boundary value problems (wave equation, heat equation, Laplace's equation) using Fourier methods.

Course literature

Zill-Wright, Differential Equations with Boundary-Value Problems, 8th edition.

Råde-Westergren, Mathematics Handbook for Science and Engineering.

Examination

- PRO1 - Project, 1.5 credits, grading scale: P, F
- TEN1 - Exam, 6.0 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.

Other requirements for final grade

Written exam, possibly with continuous examination (TEN1; 6 hp). A project with presentation (PRO1; 1.5 hp).

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.