



Faculty of Health, Science and Technology
Mathematics

Syllabus

Ordinary Differential Equations

Course Code:	MAGB01
Course Title:	Ordinary Differential Equations <i>Ordinära differentialekvationer</i>
Credits:	6
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has less than 60 credits in first-cycle course/s as entry requirements (G1F)

Major Field of Study:
MAA (Mathematics)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2018-02-06, and is valid from the Autumn semester 2018 at Karlstad University.

Prerequisites

Mathematics 30 ECTS credits, including Linear Algebra 7.5 ECTS credits and Calculus and Geometry 7.5 ECTS credits completed and attended course Introduction to Analysis 7.5 ECTS credits, or equivalent.

Learning Outcomes

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

- identify the type and solution method (exact and/or approximative) for ordinary differential equations,
- apply solution methods for classical types of ordinary differential equations and systems of ordinary linear differential equations,
- use systems of first order coupled differential equations to model, for example, chemical reaction kinetics and population dynamics,
- formulate and use the theorems of the course and prove a given selection of theorems,
- distinguish between well-posed and ill-posed problems,
- determine stability of solutions to systems of ordinary differential equations,
- use Euler's discretization method to approximate classical solutions to ordinary differential equations and systems of ordinary differential equations, and perform error analysis,
- demonstrate understanding by combining the use of concepts, theorems, and experience of examples, seeing analogies and making generalizations, and
- give an account of independently solved mathematical problems orally and in writing.

Content

- First and higher order ordinary differential equations

- Systems of ordinary differential equations
- Modelling of chemical reaction kinetics and population dynamics, for example
- Methods for finding exact solutions
- Classic solution theory: qualitative methods for existence, uniqueness, and continuous dependency regarding initial conditions and parameters
- Analysis of solutions with the help of approximation theory: finite difference-approximation methods
- Lyapunov's stability theory
- Analysis of the large-time behavior of solutions and introduction to chaos theory.

Instruction is in the form of lectures and classes. Students carry out an assignment individually and present it orally and in writing.

Reading List

See separate document.

Examination

Assessment is based on a written exam and oral and written reports of an individual assignment.

Grades

One of the grades Distinction (VG), Pass (G), or Fail (U) is awarded in the examination of the course.

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional information

The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.