MMG511 Ordinary Differential Equations and Mathematical Modelling, 7.5 higher education credits

Ordinära differentialekvationer och Matematisk modellering, 7,5 högskolepoäng

First Cycle

Confirmation

This course syllabus was confirmed by Department of Mathematical Sciences on 2013-01-30 and was last revised on 2017-06-28 to be valid from 2017-07-10, spring semester of 2018.

Field of education: Science 100%
Department: Department of Mathematical Sciences

Position in the educational system

The course can be part of the following programme: 1) Bachelor's Programme in Mathematics (N1MAT)

Main field of studies	*Specialization*
Mathematics	G2F, First Cycle, has at least 60 credits in first-cycle course/s as entry requirements

Entry requirements

The prerequisites for the course are the equivalent of 60 credits in Mathematics, including the courses *MMG300 Multivariable Analysis* and *MMG400 Linear Algebra II*, and a course in programming.

Learning outcomes

On successful completion of the course, the student will be able to

- describe and explain the main concepts and theories for ODEs covered in the course,
- formulate mathematical models in terms of ODE,
- make analytical analysis of models formulated in terms of ODE,

- make numerical analysis of a mathematical model and to implement it in Matlab,
- write and edit a a scientific text in general and a report in particular,
- interpret the results of a mathematical model,
- reflect over what constitutes a well-written scientific text, especially with respect to the structure, the function of different parts of the text in relationship to each other, and integration of visual information.

Course content

General theory for ordinary differential equations (ODE) such as existence and uniqueness of solutions to ODE, theory of linear systems of ODE, and stability properties of nonlinear ODE using Lyapunovs functions.

Examples of mathematical modeling with ODE in physics, chemistry and environment. The students do two to three smaller projects which contain all aspects of modelling contained in the learning outcomes.

The course also contains an assignment on mathematical communication with a focus on writing scientific text, specifically a report.

Form of teaching

Attendance is obligatory in the section on communication.

Language of instruction: English and Swedish
The language of instruction is English unless all involved are Swedish speakers.
The section on communication, including writing the report, is in Swedish.

Assessment

The examination consists of a written exam at the end of the course, written reports of the mandatory modelling assignments, and the mandatory communication assignment.

If a student, who has failed the same examined component twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).
To pass the course you need a passing grade on the written exam and on the mandatory modelling and communication assignments.

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For the grade VG you also need a VG on the written exam.

Course evaluation

The course is evaluated with an anonymous questionnaire and/or a discussion with the student representatives. The results of and possible changes to the course will be shared with students who participated in the evaluation and students who are starting the course.

Additional information

For a list of course literature, see:
https://www.chalmers.se/sv/institutioner/math/utbildning/grundutbildning-goteborgs-universitet/kurslitteratur/Sidor/Kurslitteratur-i-matematik.aspx

The course *MMG511 Ordinary Differential Equations and Mathematical Modelling* has partially the same content as the course *MMG510 Mathematical Modelling*. It is not allowed to be registered and/or examined in more than one of these courses.