Faculty of Science

MATM42, Mathematics: Ordinary Differential Equations 2, 7.5 credits

Matematik: Ordinära differentialekvationer 2, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by The Education Board of Faculty of Science on 2024-12-04. The syllabus comes into effect 2024-12-04 and is valid from the spring semester 2026.

General information

The course is an alternative-compulsory course at the advanced level for a Master of Science degree in mathematics.

Language of instruction: English

Main field of study	*Specialisation*
Mathematics	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The overall goal of the course is that the student should aquire in-depth knowledge in ordinary differential equations and the ability to apply this to problems from other sciences. The course also aims to develop the student's ability to communicate mathematics orally and in writing, and to read mathematical texts. Additionally, the course aims to prepare the student for further studies in mathematics, natural sciences, and engineering.

Knowledge and understanding

After completing the course the student should be able to:

- thoroughly explain the concepts, results, and methods included in the course and illustrate these with examples

- identify the main theorems of the course, describe the main ideas, and perform the steps in their proofs.

Competence and skills

After completing the course the student should be able to:

- integrate knowledge from the different parts of the course in problem-solving
- independently identify problems that can be solved with methods taught in the course and solve them
- present solutions to relevant problems within the course framework, both orally and in writing, logically coherent and with adequate terminology
- plan and complete tasks relevant to the course within given time frames using appropriate methods.

Judgement and approach

After completing the course the student should be able to:

- evaluate available solution methods in problem-solving and choose appropriate methods
- critically analyze their own and other students' solutions and evaluate the solution alternatives in relation to each other
- argue for the value of mathematical theory in problem-solving
- argue for the value of differential equations as tools for modeling in other sciences.

Course content

The course treats:

- Linear systems of ordinary differential equations in the complex plane. Power series solutions.
- Singular points.
- Frobenius method.
- Some classical differential equations and special functions.
- Boundary value problems.
- Eigenfunction expansions. Spectral theorem.
- Sturm-Liouville theory.

Course design

The teaching consists of lectures and seminars. The seminars are based on selected exercises and require active student participation, including preparation. A compulsory assignment is included during the course.

Assessment

The examination consists of a written examination and an oral examination at the end of the course as well as a written assignment during the course. The oral examination may only be taken by those students who pass the written examination. Students who fail the regular written and oral examination, respectively, are offered a re-examination shortly thereafter.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Grades

Grading scale includes the grades: Fail, Pass, Pass with distinction
The grading scale for the written assignment as well as for the written and the oral examination is Fail, Pass.

To achieve the final grade of Pass for the entire course, the student must have obtained a Pass grade on all the included examination components.

In addition, the grade Pass with distinction requires that the total number of marks obtained in the written and the oral examination is not less than 75% of the accumulated maximal number of points. The maximal number of marks that can be obtained in the written and the oral examination are weighted three to one.

Entry requirements

For admission to the course, English 6/B is required, as well as at least 90 credits in mathematics, or at least 60 credits mathematics and 90 credits physics, including knowledge equivalent to the courses MATC22 Ordinary Differential Equations 1, 7.5 credits and MATC21 Analytic Functions 1, 7.5 credits.

Further information

The course may not be included in a degree together with MATM37 Ordinary Differential Equations 2, 7.5 credits.

The course is given at the Centre for Mathematical Sciences, Lund University.