Faculty of Science

MATP36, Mathematics: Partial Differential Equations, 7.5 credits

Matematik: Partiella differentialekvationer, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2021-05-28 and was last revised on 2025-05-14 by The Education Board of Faculty of Science. The revised syllabus comes into effect 2025-05-14 and is valid from the spring semester 2026.

General information

The course is an alternative-compulsory course for second-cycle studies leading to aDegree of Master of Science in Mathematics. The course may be taken as a stand-alone course.

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 purpose of the course is that the student after completing the course should have acquired basic knowledge in partial differential equations, which is an important tool in science and technology. The purpose is also that the student should have further developed their ability to solve problems and communicate mathematical reasoning.

Knowledge and understanding

After completing the course the student should be able to:

- explain in depth the concepts, theorems and methods included in the course,
- identify and prove the most important theorems in the course.

Competence and skills

After completing the course the student should be able to:

- apply and integrate knowledge from the different parts of the course in connection with problem solving,
- identify problems that can be solved by methods that are part of the course and use an appropriate solution method,
- in oral and written form, describe the solution to a mathematical problem within the course framework, logically coherent and with adequate terminology.

Judgement and approach

After completing the course, the student should be able to:

- argue for the importance of partial differential equations as a tool for other areas, both within other parts of mathematics and other subjects, e.g. physics.

Course content

The course treats:

- The method of characteristics and nonlinear equations of the first order.
- Laplace's equation. The heat equation. The wave equation.
- The Cauchy-Kowalevski theorem.
- Sobolev spaces.
- Existence, uniqueness and regularity for weak solutions to linear second order elliptic, parabolic and hyperbolic equations.
- Maximum principles for elliptic and parabolic equations.

Course design

The teaching consists of lectures and seminars.

Assessment

The examination consists of a written examination and an oral examination at the end of the course. The oral examination may only be taken by those students who pass on the written examination. Students who fail the regular written respectively oral examination 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 marking scale for both the written and the oral examination is Pass, Fail. To pass the course it is required to pass the written examination and the oral. In addition, the grade Pass with distinction requires that the total number of points obtained in the written and the oral examination is at least 75% of the maximum total number of points. The maximum number of points that can be obtained in the written and the oral examination are weighted five to two.

Entry requirements

For admission to the course, English 6/B is required as well as at least 90 higher education credits in mathematics, including knowledge equivalent to the courses MATB34 Linear Analysis, 7.5 credits, MATC22 Ordinary Differential Equations 1, 7.5 credits and MATC21 Complex Analysis 1, 7.5 credits.

The courses MATM39 Integration Theory, 7.5 credits and MATP35 Linear Functional Analysis, 7.5 credits are recommended but not compulsory.

Further information

The course may not be included in a degree together with MATP16 Partial Differential Equations, 7.5 credits.

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