



Course syllabus

Faculty of Technology

Department of Mathematics

4MA404 Partiella differentialekvationer, 7,5 högskolepoäng
4MA404 Partial Differential Equations, 7.5 credits

Main field of study

Mathematics

Subject Group

Mathematics

Level of classification

Second Level

Progression

A1N

Date of Ratification

Approved by Faculty of Technology 2022-09-26

The course syllabus is valid from autumn semester 2023

Prerequisites

General entry requirements for second cycle studies and specific entry requirements:

- 60 credits in mathematics.
- 2MA401 Ordinary Differential Equations, 7.5 credits, or the equivalent.

Objectives

Knowledge and understanding

After the course the student must be able to:

- demonstrate in-depth knowledge of mathematical tools used to analyze linear partial differential equations (PDE)
- demonstrate basic knowledge of mathematical tools used to analyze nonlinear partial differential equations, and
- demonstrate and explain the relevance of key results in PDE theory such as maximum principles, Green functions, weak solutions, trace theorems, Lax-Milgram's theorem, Gårding's inequality, and the Fredholm alternative.

Skills and abilities

After the course the student must be able to:

- demonstrate the ability to formulate an adequate mathematical problem for the problem based on a general question, as well as use and integrate knowledge of models and methods from analysis to analyze, structure and solve problems in PDE theory,
- demonstrate the ability to plan and with adequate methods carry out qualified tasks within PDE theory and its applications.

Judgement and Approach

After the course the student must be able to:

- demonstrate the ability to interpret, evaluate and reasonably assess results with regard to relevant scientific aspects in PDE theory, and
- identify problems within e.g. science or economics that are suitable to treat with methods from PDE theory and to take responsibility for continuously developing their knowledge and skills.

Content

The course provides in-depth knowledge in analysis of partial differential equations (PDE)

The course includes:

- Fundamental solutions and Green's functions
- Energy methods and an introduction to the calculus of variations
- Functional analysis and operator theory within PDE theory as well function spaces in PDE theory
- Existence of classic and weak solutions

Type of Instruction

Lectures, problem solving sessions, and assignments

Examination

The course is assessed with the grades A, B, C, D, E, Fx or F.

The grade A is the highest grade, and the remaining grades follow in decreasing order where E is the lowest grade to pass. The grade F means that the student's performance is considered insufficient to pass.

Examination consists of

- Exam: Theory and problem solving (grades A-F), 5 credits
- Assignment (grade G-U), 2.5 credits

For a passing grade on the course, at least grade E on the exam and grade G on the assignment are required. The final grade is determined from the exam.

Renewed examination is given in accordance with Local rules for course and examination at undergraduate and advanced level at Linnaeus University.

If the university decides that a student is entitled to special educational support due to a disability, the examiner has the right to give an adapted test or that the student completes the test in an alternative way.

Course Evaluation

During the course or in close connection to the course, a course evaluation is to be carried out. The result and analysis of the course evaluation are to be communicated to the students who have taken the course and to the students who are to participate in the course the next time it is offered. The course evaluation is carried out anonymously. The compiled report will be filed at the Faculty.

Credit Overlap

The course cannot be included in a degree along with the following course/courses of which the content fully, or partly, corresponds to the content of this course: 4MA103 Partial Differential Equations 7.5 credits
4MA403 Partial Differential Equations 7.5 credits

Other

Grade criteria for the A–F scale are communicated to the student through a special document. The student is to be informed about the grade criteria for the course by the start of the course at the latest.

Required Reading and Additional Study Material

Required reading

Lawrence C. Evans, Partial Differential Equations, American Mathematical Society, latest edition. No. of pages: ca 300 of 749.