

NUMA41, Numerical Analysis: Basic Course, 7.5 credits

Numerisk analys: Grundkurs, 7,5 högskolepoäng

First Cycle / Grundnivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2016-02-25 and was last revised on 2024-12-09 by The Education Board of Faculty of Science. The revised syllabus comes into effect 2024-12-09 and is valid from the autumn semester 2025.

General information

The course is an alternatively compulsory course for first-cycle studies for a degree of Bachelor of Science in mathematics.

Language of instruction: English

Main field of study *Specialisation*

Mathematics G1F, First cycle, has less than 60 credits in first-cycle course/s as entry requirements

Learning outcomes

The main objective of this course is for the student to acquire knowledge in basic numerical analysis and gain an overview of elementary numerical methods.

Knowledge and understanding

After completing the course the student should be able to:

- give an account of the basic theory for construction of computable approximations of the most common types of mathematical models within the natural sciences,
- explain common terms and concepts of numerical analysis.

Competence and skills

After completing the course the student should be able to:

- give an account of the solutions of problems and numerical results, in writing,
- with adequate terminology and in a logically well-structured manner, account for the construction of basic numerical methods and algorithms,
- with adequate terminology and in a logically well-structured manner, account for the numerical solution of a problem with a mathematical formulation,
- plan and execute a programming project within given time frames.

Judgement and approach

After completing the course the student should be able to:

- evaluate and reflect upon aspects of numerical methods used in scientific research and engineering, including issues of accuracy, reproducibility, and efficient use of algorithms.

Course content

The course treats:

- Error analysis and condition number.
- Interpolation and quadrature.
- Orthogonal systems and L^2 approximation.
- Discretization of ordinary differential equations for initial value problems.
- Basic iterative methods for linear and non-linear systems of equations.
- Convergence of iterative methods.

Course design

The teaching consists of lectures. Assignments and a compulsory programming project are included in the course. The assignments are not compulsory but they are preparatory for the compulsory programming project.

Assessment

The examination consists of an oral examination and a written report of the programming project at the end of the course. For students who fail on the examination an additional examination is offered shortly afterwards.

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

To obtain the grade Pass on the whole course requires that the student have passed the oral examination and the written report of the programming project. The final grade is determined by the accumulated results on both examination parts.

Entry requirements

For admission to the course, at least 45 credits in mathematics and computational programming are required, including knowledge corresponding to the courses MATB32 Linear Algebra 2 (7.5 credits), MATB21 Analysis in Several Variables 1 (7.5 credits), and NUMA01 Computational Programming with Python (7.5 credits).

Further information

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