Faculty of Science

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 2022-12-15. The revised syllabus applies from 2022-12-15, autumn semester 2023.

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 studies	*Depth of study relative to the degree requirements*
Mathematics	G2F, First cycle, has at least 60 credits in first-cycle course/s as entry requirements

Learning outcomes

The main objective of this course is to give the student an introduction to numerical analysis and an overview of basic numerical methods.

Knowledge and understanding

On completion of the course, the student must 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

In order to pass the course, the student must 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.

Course content

The course covers:

- Basic iterative methods for linear and non-linear systems of linear equations, matrix factorisations and condition number;
- Convergence of iterative methods;
- Interpolation and quadrature;
- Discretisation of initial value problems for ordinary differential equations, stiff and non-stiff problems;
- Error analysis, orthogonal systems, L2 approximation and error estimates.

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 consits 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.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: 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 knowledge corresponding to at least 60 credits in Mathematics and Numerical Analysis, including the courses MATB22 Linear Algebra 2,

7.5 credits; MATB21 Analysis in Several Variables 1, 7.5 credits; and NUMA01 Computational Programming with Python, 7.5 credits, is required.

Subcourses in NUMA41, Numerical Analysis: Basic Course

Applies from H23

2301 Oral Examination, 4,0 hp
Grading scale: Fail, Pass, Pass with distinction
2302 Project report, 3,5 hp
Grading scale: Fail, Pass, Pass with distinction

Applies from V20

2001 Oral Examination, 3,5 hp
Grading scale: Fail, Pass, Pass with distinction
2002 Project report, 4,0 hp
Grading scale: Fail, Pass, Pass with distinction