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 is an old version, approved by Study programmes board, Faculty of Science on 2016-02-25 and was last revised on 2019-06-03. . The revised syllabus applied from 2019-06-03. , spring semester 2020.

General Information

The course is an elective course for first-cycle studies for a degree of Bachelor of Science (180 credits), or Master of Science (120 credits), 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:

- account for 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:

- account for 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.

Course content

The course covers:

- Systems of linear equations, matrix factorizations and condition numbers
- The method of least squares, orthogonal systems, L2 approximation
- (Newton) iteration and order of convergence, Interpolation and quadrature
- Discretization of initial value problems for ordinary differential equations, stiff and non-stiff problems
- The basic idea of the Finite Element Method. The relation to L2 approximation and error estimates.

Course design

The teaching consists of lectures and compulsory hand-ins.

Assessment

The assessment is based on the oral examination and on the written report on the programming Project.
For students who fail on the exam an additional exam 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.
For a grade of Pass on the whole course, the student must have passed the oral examination and a written report on a programming Project.
The final grade is determined by the grade of the aggregated results of the different assessed Components.

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 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

Applies from V16

1601 Project report, 4,0 hp
Grading scale: Fail, Pass, Pass with distinction
1602 Written examination, 3,5 hp
Grading scale: Fail, Pass, Pass with distinction