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 2016-02-25. The revised syllabus applies from 2016-02-25, spring semester 2016.

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

Mathematics

Depth of study relative to the degree requirements

G2F, First cycle, has at least 60 credits in first-cycle course/s as entry requirements

Learning outcomes

The aim of the course is that the student on completion of the course should have acquired the following knowledge and skills:

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**

- Linear systems, 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**
Written examination and a written report on a programming project.
For students who fail on the exam an additional exam is offered shortly afterwards.
*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.
The grade is based on the grades on the examination and on the written report on
the programming project.

**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.

This is a translation of the course syllabus approved in Swedish
Subcourses in NUMA41, Numerical Analysis: Basic Course

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