



LUND
UNIVERSITY

Faculty of Science

NUMA01, Numerical Analysis: Computational Programming with Python, 7.5 credits

*Numerisk analys: Beräkningsprogrammering med Python, 7,5
högskolepoäng*
First Cycle / Grundnivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2015-06-16 and was last revised on 2015-06-16. The revised syllabus applies from 2015-07-01, autumn semester 2016.

General Information

The course is a compulsory component of a degree of Bachelor of Science in Mathematics or Physics.

Language of instruction: English

Main field of studies

Mathematics with specialization in
Numerical Analysis

*Depth of study relative to the degree
requirements*

G1N, First cycle, has only upper-secondary
level entry requirements

Learning outcomes

The objective is that the students, on completion of the course, shall have acquired the following knowledge and skills.

Knowledge and understanding

On completion of the course, the students shall be able to

- understand and use basic programming concepts, data structures, conditional statements
- understand and use the Python programming language
- write a Python program which carries out a computation algorithm specified in writing

Competence and skills

On completion of the course, the students shall be able to

- convert algorithms into programming code
- visualise, interpret and critically assess numerical results
- report solutions to problems and numerical results in speech, writing and graphic form
- use appropriate terminology in a logical and well-structured manner
- organise, implement and orally present a major programming project in groups

Judgement and approach

On completion of the course, the students shall be able to

- critically analyse the programs produced by fellow students and assess alternatives to their own programming solutions

Course content

- Basic programming concepts, data structures, conditional statements, functions and classes
- Problem-solving using a few basic numerical methods associated with mathematics and physics
- The basic functions and data types of the Python programming language: arithmetic operations, arrays of vectors, matrices, graphics functions, lists, tuples, dictionaries, file management
- Use of modules such as NumPy, SciPy and Matplotlib
- The representation of floating point numbers and their implications for arithmetic
- Syntax: [for], [if-else], [while], list comprehensions, generators
- Nested functions, self-defined functions and modules
- Classes and inheritance applied to mathematical objects
- Tests and profiling

Course design

The teaching consists of lectures and computer exercises. Participation in computer exercises and any integrated teaching is compulsory.

Assessment

The assessment is based on reports of computer exercises throughout the course and on a major programming project to be completed in groups.

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

Grades

Marking scale: Fail, Pass.

The grades awarded are Fail and Pass.

For a grade of Pass on the whole course, the student must have passed the computer exercises and the report of the programming project, and participated in all compulsory components.

Entry requirements

General and courses corresponding to the following Swedish Upper Secondary School Programs: Mathematics 4 or Mathematics D.

Further information

The course may not be included in a degree together with NUM131 Computational programming, 15 credits, NUMA21 The Tools of Computational Programming, 7.5 credits, or NUMA22 The Tools of Computational Programming, 7.5 credits.

Subcourses in NUMA01, Numerical Analysis: Computational Programming with Python

Applies from H15

1501 Project, 7,5 hp
Grading scale: Fail, Pass