



**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

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### **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