ÄMAA03, Mathematics 1 for Subject Teachers: Computational Programming with Python , 6 credits

Matematik 1 för ämneslärare: Beräkningsprogrammering med Python, 6 högskolepoäng

First Cycle / Grundnivå

Details of approval

The syllabus was approved by The Education Board of Faculty of Science on 2024-11-27. The syllabus comes into effect 2024-11-27 and is valid from the autumn semester 2025.

General information

The course is a included in the teacher education programme at Lund University.

Language of instruction: English

Main field of study	Specialisation
Mathematics with specialization in Numerical Analysis	G1N, First cycle, has only upper-secondary level entry requirements

Learning outcomes

The overarching goal of the course is for students to develop an understanding of the fundamental principles and techniques of computational programming with a focus on Python, while also improving the ability to communicate technical concepts and preparing to teach the subject through practical application and the development of pedagogical strategies.

Knowledge and understanding

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

- explain fundamental programming concepts, such as variables, loops and functions.
- utilize and implement data structures like lists, tuples, and dictionaries, and integrate these concepts to illustrate algorithmic thinking

- explain and apply control statements such as conditions and loops, and present these concepts pedagogically to students at different levels
- use Python as a programming language to develop educational tools and resource materials that can be used in teaching situations
- program computational algorithms specified in written form.

Competence and skills

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

- convert algorithms into program code
- visualise, interpret and critically evaluate numerical results
- present solutions to problems and numerical results orally, writing and graphically
- 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 analyze and provide constructive feedback on other students' code, focusing on both functionality and code style
- evaluate alternative programming approaches and compare these to one's own solution, justifying the choice of method based on efficiency and suitability
- reflect on and discuss the ethical aspects of programming and its impact on society, and how these issues can be integrated into teaching
- collaborate in groups to solve complex programming problems, demonstrating the ability to take responsibility and actively contribute to the group's success
- show an open and inquisitive attitude towards new programming concepts and teaching methods.

Course content

- Basic programming concepts, data structures, conditional statements, functions and classes
- The basic functions and data types of the Python programming language: arithmetic operations, arrays of vectors, matrices, graphics functions, lists, tuples, dictionaries, file management
- 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 orals presentation of written reports of one computer exercise during the course and of a larger programming project at the end of the course. The programming project must be carried out in groups.

Students who do not pass a regular assessment will be offered another opportunity for assessment soon thereafter.

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.

Grades

Grading scale includes the grades: Fail, Pass
To obtain the grade Pass on the entire cours, it is required to pass the presentations of one computer exercise and of the programming project.

Entry requirements

General requirements and studies equivalent of courses Mathematics 4 (or older course Mathematics D) and English 6/B from Swedish Upper Secondary School.

Further information

The course is given jointly with the Bachelor's programme in mathematics at the Faculty of Science.

The course is given at the Centre for Mathematical Sciences, Lund University.