



Faculty of Science

## GISN34, GIS: Python Programming in GIS, 5 credits

*GIS: Pythonprogrammering i GIS, 5 högskolepoäng*

Second Cycle / Avancerad nivå

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### Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2021-05-05 and was last revised on 2023-11-17. The revised syllabus comes into effect 2023-11-17 and is valid from the autumn semester 2024.

### General information

The course is an elective course for second-cycle studies for a Degree of Master of Science (120 credits) in geographic information science.

*Language of instruction:* English

*Main field of study*

*Specialisation*

Geographical Information Science

A1N, Second cycle, has only first-cycle course/s as entry requirements

### Learning outcomes

The aim of the course is that the student should acquire knowledge in programming in the programming language Python that is relevant for different applications in GIS. Python is above all used for automation of operations that are to be repeated often or to tailor different analyses for a specific dataset and the programming knowledge acquired assist the student in streamlining the work processes and analyses. Through the course, the student gets the basis in programming that is needed to independently prepare programme code to develop applications for advanced analytical work in GIS.

### Knowledge and understanding

On completion of the course, the student shall be able to:

- account for Python's integrated development environment,
- account for Python's embedded data types

- account at a general level and understand the execution flow and flowcharts in Python including the general syntax,
- at a general level, account for and understand object-oriented programming with Python
- account for modules and packages in Python,
- describe concepts as iterators in Python,
- describe string manipulation, testing, debugging and documentation in Python,
- account for Python's different packages for scientific calculations and visualisation and
- account for how Python can be connected to geographic information systems (especially ArcGIS), and used for both vector and raster operations.

### **Competence and skills**

On completion of the course, the student shall be able to:

- communicate orally and in writing and in a well balanced way be able to use relevant scientific language
- apply Python programming including execution flow (general syntax, mathematical operators, if-else, for-else-while, etc) and object oriented programming,
- apply Python programming in ArcGIS concerning standard operations and basic scripts within both vector and raster GIS.

### **Judgement and approach**

On completion of the course, the student shall be able to:

- assess and discuss scientific publications in the field of Python programming critically and be able to summarise the material.

### **Course content**

The course consists of the following practical and theoretical components:

- Introduction to Python
- Basic Python - embedded data types and execution flows
- Object oriented programming with Python at basic and advanced levels
- Modules and packages
- String manipulation
- Input, formatting, file management, operating system, apps, testing, debugging, adoption of a profile and documentation
- Algorithm programming with Python in GIS environment
- Script programming with Python in GIS environment

## Course design

The teaching consists of lectures, exercises and seminars. Participation in exercises and seminars, and thereby integrated other teaching is compulsory, but the lectures contain information that is not included in textbooks and listed literature, so it is recommended that all lectures are attended.

The course is a distance course and is distributed on an Internet based learning platform. The student must have access to a computer and the Internet to follow the course. It is flexibly designed giving the student options to carry out the course at full time or half time study tempo. The department provides information regarding the technical requirements.

## Assessment

Examination takes place through written individual exercises during the course.

Students who do not pass an 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 pass the entire course, passed exercises and participation in all compulsory parts are required.

## Entry requirements

Entry to the course requires general entry requirements, English 6/B and 90 credits scientific studies, including 30 credits in GIS. Equivalent knowledge acquired in a different way, also gives admission to the course.

## Further information

The course cannot be included together with GISN24 Python programming in GIS, 5 credits, NGEU24, Programming for Applications in Geomatics, Physical Geography and Ecosystem Science, 15 credits, NGEN13, Programming for Applications in Geomatics, Physical Geography and Ecosystem Science, 15 credits, EXTP40 GIT-Project with Python programming, 7.5 credits.

The course is offered at the department of Physical Geography and Ecosystem Science, Lund University.