Faculty of Science

GISN44, GIS: Python Programming in GIS, 7.5 credits
GIS: Pythonprogrammering i GIS, 7,5 högskolepoäng
Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by The Education Board of Faculty of Science on 2024-06-10. The syllabus comes into effect 2024-06-10 and is valid from the spring semester 2025.

General information

The course is an elective course for second-cycle studies for a Degree of Master of Science 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, after having completed the course, should have acquired programming skills in Python programming language for relevant applications in GIS. Python is mainly used to automate operations that need to be repeated many times, to customise different analyses for a specific dataset or to implement a functionality that is missing in existing tools. The knowledge students acquire allows them to streamline their work and analysis. Through the course, the student acquires the foundation in programming needed to independently develop program code to further develop plugins for advanced analysis work in GIS.

Knowledge and understanding

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

- describe the basics of programming and the basic principles of coding,
- account for Python's embedded data types,

- describe and understand Python execution flow and flowcharts, including general syntax,
- describe and understand object-oriented programming with Python,
- account for modules and packages in Python,
- describe and understand concepts as iterators in Python,
- describe and understand string manipulation, testing, debugging and documentation in Python,
- have basic knowledge on Python's different packages for scientific calculations and visualisation, and
- understand and account for how Python can be connected to geographic information systems especially ArcGIS Pro, regarding both vector and raster operations.

Competence and skills

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

- communicate in writing and orally and be able to use the scientific language of the field in a balanced way,
- use Python well enough to independently create or assemble programs,
- apply Python programming including execution flow (general syntax, mathematical operands, if-else, for-else-while, etc) and object-oriented programming,
- apply Python programming in ArcGIS Pro regarding standard operations and basic scripts in both vector and raster GIS.

Judgement and approach

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

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

Course content

The course consists of the following practical and theoretical components:

- Introduction to Python and installation
- Python basics - built-in data types and execution flow
- Modules and packages and different ways to import them
- String manipulation and formatting
- Lists, tuples and dictionaries
- Writing your own functions
- Input file management, debugging and documentation
- NumPy for handling arrays
- Object-oriented programming with Python

This is a translation of the syllabus
which was established in Swedish.

- Programming with Python in a GIS environment

Course design

The teaching consists of lectures, exercises and seminars. Participation in exercises and seminars is compulsory. The lectures may contain information that is not included in textbooks and listed literature.

The course is a distance course and is distributed on the Internet. It is assumed that the student has access to a computer with an internet connection and working speakers and microphone and webcam. The institution will provide information on the technical requirements.

The course is flexibly designed giving the student options to carry out the course at full time or half time study tempo.

Assessment

Examination is done by written assignments conducted 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 whole course, passed written assignments and participation in all compulory components are required.

Entry requirements

Entry to the course requires general entry requirements, English B/6 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 credited in the degree together with GISN24 GIS: Python programming in GIS, 5 credits, GISN34 GIS: 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, or NGEN20 Programming for Applications in GIS and Remote sensing, 15 credits.

The course is given by the Department of Physical Geography and Ecosystem Science, Lund University.