Faculty of Science

NGEN20, Geomatics: Programming for Applications in GIS and Remote Sensing, 15 credits

Geomatik: Programmering för tillämpningar inom GIS och fjärranalys, 15 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2021-05-24 to be valid from 2021-05-24, autumn semester 2022.

General Information

The course is a compulsory course at second cycle level for a Degree of Master of Science (120 credits) in GIS and remote sensing in the main field of study geomatics and an elective course for a Degree of Master of Science (120 credits) in physical geography and ecosystem sciences.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Geomatics	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The course aim is that the student, on completion of the course, should have acquired knowledge and proficiencies to handle the programming language Python to solve problems and tasks in geographic information sciences (GIS) and remote sensing as well as for applications in physical geography and ecosystem sciences. The course content is largely practically oriented to give training in problem-solving, and in how problems can is structured to be solved with programming tools. An overall goal is also to increase the employability of graduates, in both public and private sectors, and for activities in research.

Knowledge and understanding

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

- give an account of the basics of programming and the basic principles of encoding
- describe given problems and how they can be structured to be solved with different relevant programming tools
- explain the importance of programming in the application fields GIS and remote sensing.

Competence and skills

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

- master basic technologies for programming in the programming language Python
- apply programming to be able to solve problems in GIS and remote sensing independently
- use programming tools to streamline a workflow
- write own programmes based on commercial and open source code libraries
- troubleshoot and correct programmes that has been created by others
- document and describe programme code.

Judgement and approach

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

- evaluate and assess prescribed applications of programming for given problems
- suggest improvements in existing programme code
- argue for and demonstrate the use with programming practically to solve relevant problems.

Course content

The course give theoretical bases of programming and application of programming in GIS and remote sensing with a focus on practical exercises and applications within physical geography and ecosystem sciences. The course starts with basic programming as handling variables, logical operations, IF clauses and loops, and continues with lists, matrices, file management. The student learns to create their own functions and modules; work with external libraries and object-oriented programming. The final part treats GIS programming with ArcGIS to automate analyses and create their own GIS tools. Apart from the initial programming exercises of basic nature, most cases are based on realistic and relevant GIS and remote sensing applications with connections to physical geography and ecosystem sciences.

Course design

The teaching consists of compulsory practical exercises to give training in programming and problem-solving. The theory is mostly given in connection with the exercises as a shorter introductory lecture. The course starts with basic programming with gradually increasing difficulty in the exercises and introduces new programming tools with focus on GIS and remote sensing. The final part is completely oriented towards GIS programming and is completed with a programming project that is carried out independently or in groups. All exercises and the final project work are

compulsory.

Assessment

Examination takes place in writing in the form of examination and written assignment reports during the course and through a final project work.

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.

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

Grades

Marking scale: Fail, Pass, Pass with distinction.
Passing the course requires passed on all compulsory written assignments, and passed project work and passed written examination.

Grades on written assignments are Failed, Passed and grade on examination and project work is Failed, Passed, Passed with distinction.

Entry requirements

Entry to the course requires general entry requirements, English 6/B and at least 90 credits in natural sciences or technology of which at least 15 credits in GIS (such as NGEA11 Spatial analysis, 7.5 credits) or the equivalent such as cartography, geodesy or remote sensing.

Further information

The course cannot be included in qualification together with the courses NGEN13 Programming for applications in geomatics, physical geography and ecosystem sciences 15 credits or GISN24 Python programming in GIS, 5 credits.

Subcourses in NGEN20, Geomatics: Programming for Applications in GIS and Remote Sensing

Applies from H22

2201 Exam, 5,0 hp
Grading scale: Fail, Pass, Pass with distinction
2202 Project work, 5,0 hp
Grading scale: Fail, Pass, Pass with distinction
2203 Python exercises, 5,0 hp
Grading scale: Fail, Pass