Faculty of Science

NGEN34, Physical Geography: Satellite Remote Sensing, 15 credits

Naturgeografi: Satellitbaserad fjärranalys, 15 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by The Education Board of Faculty of Science on 2025-06-10. The syllabus comes into effect 2025-06-10 and is valid from the spring semester 2026.

General information

The course is a compulsory course at second cycle level for a Degree of Master of Science (120 credits) with a specialisation in geomatics. The course is also an elective course at second cycle level for a Degree of Master of Science (120 credits) in the main field of study physical geography and ecosystem science, all specialisations.

Language of instruction: English

Main field of study	*Specialisation*
Physical Geography and Ecosystem Science	A1N, Second cycle, has only first-cycle course/s as entry requirements
Geomatics	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The overarching aim of the course is that the students should have advanced knowledge and proficiencies in satellite based remote sensing for studies of the environments of the Earth with a focus on optical remote sensing of terrestrial ecosystems.

Knowledge and understanding

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

- describe the basic physical principles of optical remote sensing including the most common phenomenon and their units

- account for the basic technical principles of satellites, sensors and ground receiving segments of the data collection process and the properties of available data from these systems,
- account for the principles of digital image handling and image processing within remote sensing,
- give an account of principles of sampling methods, field data collection and accuracy estimation
- account for the principles of change detection and time series analysis within remote sensing,
- describe important fields of application for satellite remote sensing in research, public and private enterprice activities, and,
- illustrate and suggest use of remote sensing in different climate regions, for various types of ecosystems and land use systems
- account for limitations with the current technology.

Competence and skills

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

- analyse digital remote sensing data by means of existing image processing software,
- independent and in groups plan and within given time frames carry out studies based on remote sensing data,
- apply integrated analysis of satellite data, field data and other data in geographic information systems,
- carry out change studies and time series analyses with remote sensing data
- carry out field surveys with data sampling as support for accuracy estimation of maps produced from remote sensing data
- based on literature choose relevant data and methods for applying remote sensing in fields that are related to soil, vegetation, water and the human use of these resources
- present results based on different remote sensing methods in writing, orally and in map form for professionals and the general public,
- actively use knowledge from scientific studies to contribute to discussions on practical applications and uses of remote sensing.

Judgement and approach

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

- compile, evaluate and discuss choice of data and analytical method to solve a given problem by the use of remote sensing,
- make assessments of the applicability of the remote sensing from a scientific/technical perspective as well as in relation to given societal problems with an emphasis on land use, environment and climate,
- reflect on the role of the remote sensing in planning and development activities
- critically review, evaluate and discuss the reliability of analyses that are based on remote sensing data,

- discuss ethical aspects of different remote sensing methods and applications.

Course content

The course consists of two modules:

1. remote sensing theory and image processing (7.5 credits)

The sub-part treats basic physical principles and terminology for remote sensing and an overview of existing satellites and sensors. Further, data processing and basic image processing methods within remote sensing including radiometric and geometric correction, image enhancement, image classification methods, image transformations, integration of field data and thematic map production, are dealt with.

2. Applications of remote sensing for studies of environment and society (7.5 credits)

This part treats application of satellite based remote sensing in important application fields e.g. vegetation, agriculture, forestry, urban applications, water management, society or climate. Furthermore, use of satellite data is treated in different time and room resolution and analysis of data from different climate regions, is also included in this part of the course. Aspects of importance for the students' professional role within industry and research are integrated in the different components.

Course design

The teaching consists of lectures, group work, field exercises, seminars and projects. Participation in group work, field exercises, seminars and projects and associated parts, is compulsory.

Assessment

Examination for module 1 is in the form of a written exam during the time of the module.

Examination for module 2 is in the form of written assignments and project work during the time of the module.

Students who do not pass the regular exam will have an additional opportunity to re-sit the exam 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, Pass with distinction
For a Pass on the course, students must have passed the exam, the written assignments and project presentations, and participated in all compulsory components.

Grades on the written exam are Fail, Pass, Pass with distinction. The grading scale for written assignments and project work is Fail, Pass.

The final grade is decided through joining of the results of the project work with the result of the written exam.

Entry requirements

For admission to the course English B/6 and at least 90 credits in scientific studies is required, of which at least 15 credits must be in geographic information science (or equivalent, such as spatial analysis, cartography, geodesy, or remote sensing).

Further information

The course cannot be included in a degree together with NGEN08, Satellite based remote sensing 15 credits.

The course is offered at the Department of Earth and Environmental Sciences, Lund University