



Faculty of Health, Science and Technology
Geo-Science

Syllabus

Geospatial Analysis with Cloud Computing in Environmental Monitoring

Course Code:	GMA6H1
Course Title:	Geospatial Analysis with Cloud Computing in Environmental Monitoring <i>Geospatial analys med molnbaserad databehandling inom miljöövervakning</i>
Credits:	7.5
Degree Level:	Master's level
Progressive Specialisation:	Second cycle, has only first-cycle course/s as entry requirements (A1N)

Major Field of Study:

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2024-09-04, and is valid from the Spring semester 2025 at Karlstad University.

Prerequisites

90 ECTS credits completed, including 7,5 ECTS credits in Remote sensing, 7,5 ECTS credits in Geographical information systems (GIS), Geospatial technology, or Geographical statistics, and 7,5 ECTS credits in Java or Python programming, plus upper secondary level English 6, or equivalent

Learning Outcomes

Upon completion of the course, students should be able to:

- give an account of the concept of geospatial analysis within Google Earth Engine (GEE),
- identify and use spatial Big Data from various sensors, including Landsat, MODIS, Sentinel, and VIIRS,

- perform various preprocessing and processing tasks for images (e.g., image mosaicking and image compositing),
- apply GIS techniques to process and analyse various vector data,
- analyse real datasets, including earth observation data, using either basic Java or Python,
- create various visualisations (e.g., image compositions, maps, time series, and charts),
- classify satellite image data using machine learning, and
- upload and export data and map files in various formats such as KML, CSV, images, charts.

Content

In the course, students acquire knowledge of how to apply remote sensing methods for environmental monitoring and modeling of human-environment systems, including the analysis of land surface changes. The course includes theory and concepts, and applies statistical and mathematical methods to analyse geodata and environmental data as well as social and socioeconomic data quantitatively. The methods include time series analysis, multivariate statistics, and machine learning, methods that are otherwise computationally demanding, especially when working with satellite images. Students are guided in conceptualising methodological frameworks that match the necessary application implemented in the lab sessions that complement the lectures. Students complete a project to demonstrate the knowledge acquired in the course. Tools and datasets from various sources, including satellite images in GEE and a cloud platform, are used.

Reading List

See separate document.

Examination

Assessment is based on individual hand-in assignments and a written project report presented and discussed in a seminar. Submissions for assessment must clearly indicate individual contributions.

If students have a decision from Karlstad University entitling them to Targeted Study Support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades

One of the grades 5 (Pass with Distinction), 4 (Pass with Some Distinction), 3 (Pass), or U (Fail) is awarded in the examination of the course.

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional information

The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.