

HGO4940 – Advanced Geographic Information Systems

Level

Master

Credits

10

Teaching

Every spring

Examination

Every spring

Teaching language

English

Content

This course explores in depth how Geographic Information Systems (GIS) can be used to study social processes. GIS **has become** an important tool, not only for planners and in risk assessment, but also in studies of society, the environment, and the interactions between them. In combined **thematically oriented** lecture-seminar sessions, **the** students will learn **advanced spatial data manipulation, visualisation and analysis techniques such as graph theoretic analyses of road networks, spatial regression, and 3D modelling. and immediately apply fundamental knowledge components of GIS.** The curriculum for each lecture-seminar session combines theory from textbooks, methodological book chapters or journal articles, and empirical journal articles where these methods are applied.

Spatial data is special data. In this course, the students will learn about the unique methodological aspects of spatial data which include collecting, managing, analysing and presenting such data and the respective results. A larger section of the course is devoted to spatial analytical methods and

introducing the students to basic spatial econometrics, including spatial regression.

The course will mainly use ESRI ArcGIS Pro, but students will also be introduced to alternative software used by many organisations including ArcGIS Map, QGIS and R. may also use open-source alternatives, such as GeoDa, QuantumGIS and R. Moreover, Students will also learn to use GIS to prepare data for quantitative data analysis outside GIS, such as in SPSS or Stata and R.

Learning outcome

The students will learn about the fundamental components of a GIS, from the user and software side to the particular methods used to obtain information from spatial data. More specifically, this involves buffers and overlays, network analysis, GIS-based multi-criteria assessment, spatial dependency and autocorrelation, spatial clustering and spatial regression methods, and 3D modelling.

Knowledge

- Understand the special nature of spatial data and how they are different from non-spatial data.
- Learn about the key components of a GIS, including users, databases, software, and networks.
- Learn how we can collect and manage spatial data in both file formats and databases.
- Learn basic to more advanced spatial analytical methods, including network analysis, spatial multicriteria assessment and clustering.
- Learn more advanced visualization techniques and cartographic principles.

Skills and competence

- Develop skills to master GIS software.
- Learn, critically discuss, and directly apply spatial methods and techniques in combined lecture-seminar sessions.

- Complete a project where GIS will be used to study a socio-spatial phenomena on master level.
- Discuss sources of uncertainty and error in spatial data.
- Create data models used to answer specific spatial questions.

Admission

Students who are admitted to study programmes at UiO must each semester register which courses and exams they wish to sign up for [in Studentweb](#).

If you are not already enrolled as a student at UiO, please see our information about [admission requirements and procedures](#).

This course is a part of the Master's program in Human Geography. Students with admission to other relevant master's degree programmes can apply for admission as [guest students](#).

Students with admission to the programme must each semester [register which courses and examinations they wish to sign up for in StudentWeb](#).

Prerequisites

Formal prerequisite knowledge

[SGO1910 – Introduction to Geographical Information Systems](#)

[\(GIS\)](#) Similar introductory GIS courses must be approved upon application to the student advisor (by email). Basic understanding of computer systems recommended.

Overlapping courses

10 credits overlap with [SGO4940 – Geographic Information Systems \(Master level course\) \(continued\)](#)

Teaching

The teaching for this course is organized as a series of **four three-hour** learning sessions **that combine a short lecture and a seminar involving** **In addition, the students will individually work on a larger project. The seminars will consist of** hands-on **lab** exercises where each student will work on solving spatial questions using GIS. The seminars will also function as a project helpdesk, where the students can receive assistance with their ongoing project work. **In addition, the students will individually work on a larger project.**

Handing in weekly assignments is mandatory in 100% of the seminars.

Completed and approved compulsory course work is valid as long as the course is offered. Students who have failed to complete the compulsory attendance cannot take the exam.

Access to teaching

A student who has completed compulsory instruction and coursework and has had these approved, is not entitled to repeat that instruction and coursework. A student who has been admitted to a course, but who has not completed compulsory instruction and coursework or had these approved, is entitled to repeat that instruction and coursework, depending on available capacity.

Examination

Assessment of the course is based on **a 3,000 word** **the** individual project report **on a socio-spatial phenomenon. This word limit includes tables (these count as text) but it excludes the reference list and any text that is appropriately included in any maps or other figures.**

[Examiner guidelines](#)

Submit assignments in Inspira

You submit your assignment in the digital examination system Inspira. [Read about how to submit your assignment.](#)

Use of sources and citation

You should familiarize yourself with the rules that apply to [the use of sources and citations](#). If you violate the rules, you may be suspected of [cheating/attempted cheating](#).

Language of examination

You may write your examination paper in Norwegian, Swedish, Danish or English.

Grading scale

Grades are awarded on a scale from A to F, where A is the best grade and F is a fail. Read more about [the grading system](#).

Explanations and appeals

- [Explanation of grades and appeals](#)

Resit an examination

If you are sick or have another valid reason for not attending the regular exam, we offer a [postponed exam](#) later in the same semester. See also our information about [resitting an exam](#).

Special examination arrangements

Application form, deadline and requirements for [special examination arrangements](#).

Evaluation

The course is subject to continuous evaluation. At regular intervals we also ask students to participate in a more comprehensive evaluation.

Examination Guidelines

OLD (see below for new):

SENSORVEILEDNING

Emnekode og semester-år: HGO4940_S2020

Eksamensordning: emneoppgave selvvalgt tema

Om eksamen ved SGO/HGO: En god besvarelse inneholder solid kunnskap, logisk argumentasjon og ryddig disposisjon. Besvarelsen av en drøftingsoppgave skal være diskuterende, analytisk og koble ulike deler av pensum. 1. Besvarelsen svarer på oppgaveteksten på en presis og utfyllende måte. 2. Besvarelsen viser kunnskap. 3. Besvarelsen skal være velskrevet: sammenhengende med godt akademisk språk. 4. Viktige begreper - de som er i kjernen av besvarelsen – skal defineres. 5. Besvarelsen skal vise analytiske evne og refleksjon.

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About the individual project: Instructions given to the students in advance of the project...

- **Purpose:** integrate what you have learned in GIS lectures and labs through practical experience. Working individually, you will address a “spatial problem”, possibly relevant to your MA thesis through the collection, mapping and analysis of data, presented in a concise professional report. Not just mapping: Analysing, integrating a wider range of knowledge obtained from the course. Include data collection, georeferencing, analyses, cartography. Provide theoretical justifications for choosing approach, data and methods.
- **Length:** Maximum 6000 words, including the reference list, tables (these count as text) and figures (count as 300 words each).
- **Contents:** Report should contain the following contents, although not necessarily all in a separate paragraph (some elements can be combined) and not necessarily in this order:
 - Introduction that includes scientific and societal relevance, a literature review, objectives and RQs
 - Data and study area
 - Description and justification of methods
 - Results (and discussion)
 - Reflection on data/methodological shortcomings, error and uncertainty
 - Conclusion (and discussion)
 - References
- **What standard is expected:**
 - A report on MA level: clear structure, systematic approach, thorough referencing, justification
 - Be self critical and reflective
 - Use the course literature actively to discuss especially your data and methods –
 - Do something that is unique to GIS
 - Make sure you do not have to rush things last minute
 - Be coherent and focused on how you use concepts
 - Argue why you made your choices, and reflect on possible limitations of your choices

NEW:

SENSORVEILEDNING

Emndekode og semester-år: HGO4940_2021

Purpose: You will integrate what you have learned in the GIS lectures and seminars through a practical analysis and report. Working individually, you will address a socio-spatial problem or phenomenon, possibly related to your MA thesis, through the collection, mapping and analysis of spatial data. This will be presented in a report with justifications of your chosen topic and approach, including the data and methods employed, along with evidence of your cartographical skills, e.g. using maps.

Length: Maximum 3000 words, including tables (these count as text) but excluding the reference list and any text that is appropriately including in any maps or other figures.

Contents: The report should contain the following elements, though not necessarily all in separate or combined sections or paragraphs (some elements can be combined) or in this order:

- Introduction that includes the scientific and societal relevance, a literature review, objectives and the research question(s)
- Study area and data
- Description and justification of the methods
- Results
- Discussion, including a reflection on the data/methodological shortcomings, including but not limited to error and uncertainty
- Conclusion
- References

Expectation: The final report is expected to be:

- A report at MA level with a clear structure, systematic approach, justification for decisions made, acknowledgement of the possible limitations of your chosen approach, and thorough referencing
- Use the course literature and other materials to actively discuss your topic and analysis, especially your data and methods
- Do something that requires GIS and allows you to evidence your skills in a report – but do not include maps and any other visualisations/figures arbitrarily and at the cost of the readability of your report