AH2923 Global Navigation Satellite Systems (GNSS) 7.5 credits

Globala satellitnavigeringssystem (GNSS)

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for AH2923 valid from Spring 2020

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Specific prerequisites

For admitted students to the Master of Science in Civil Engineering and Urban Management (CSAMH) or one of the Master of Science programmes in Transport and Geoinformation Technology (TTGTM), Aerospace Engineering (TAEEM), or Electrophysics (TELFM), there are no additional requirements.

For other students:

- A completed bachelor's degree in civil engineering, urban planning, geomatics, geography, engineering physics, computer science, statistics, economics, and/or mathematics, including at least 3 university credits (hp) in each of the following or their equivalents: Programming, Linear Algebra, Calculus in One Variable, and Probability & Statistics; and
- Documented proficiency in English corresponding to English B.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

Theoretical and practical basics of satellite based positioning using global navigation satellite systems (GNSS): GPS, GLONASS, Galileo and Beidou, as well as augmentation systems such as EGNOS and WAAS.
After the course, the students will be able to:

- describe the principles of GNSS based positioning methods, the main components in a satellite navigation system and their functions
- account for and analyse the influence of different error sources on the positioning precision
- implement basic algorithms for estimation of GNSS based positions
- plan, perform and process precise GNSS measurements
- identify when GNSS based positioning and navigation is a suitable tool in transport systems, urban and regional building and construction etc. considering sustainability
- formulate examples of the role of GNSS, or GNSS based products and services, in sustainable development

Course contents

- Estimation and representation of satellite orbits
- Geodetic reference systems and time systems
- GNSS satellite signals and error sources
- Modelling and estimation of atmospheric effects on GNSS satellite signals, theory and implementation
- Estimation of positions with GNSS satellite observations, theory and implementation
- Differential and relative GNSS based positioning, theory and implementation
- Carrier phase based positioning and estimation of ambiguities, theory and implementation
- Statistical methods including Kalman filter and smoothing
- Applications of GNSS and the role of GNSS in sustainable development
- All labs and implementations based on Matlab, except one outside lab to collect data

Disposition

Lectures 24h

Laborations 40h

Course literature

Hofmann-Wellenhof, et al. (2008): GNSS, Springer

Examination

- LAB1 - Laboratory Work, 3.0 credits, grading scale: P, F
- TEN1 - Examination, 4.5 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

- TEN1 - Written exam 4.5 credits, grading: A, B, C, D, E, FX, F
- LAB1 - Approved laboratory reports 3 credits, grading: P, F

Other requirements for final grade

Examination, approved laboratory work

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.