AK2040 Theory and Methodology of Science with Applications (Computational Science) 7.5 credits

Vetenskapsteori och vetenskaplig metodik med tillämpningar (beräkningsvetenskap)

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

Establishment

Course syllabus for AK2040 valid from Autumn 2019

Grading scale

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

Education cycle

Second cycle

Main field of study

Specific prerequisites

General requirements for master's programmes. Proficiency in English corresponding to English B / English 6 in Swedish gymnasium.

Language of instruction

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

Intended learning outcomes

After having completed the course, the student should, with regards to the theory and methodology of science, both orally as well as in writing, be able to:

- Identify definitions and descriptions of concepts, theories and problem areas, as well as identify the correct application of these concepts and theories.
- Account for concepts, theories and general problem areas, as well as apply concepts and theories to specific cases.
- Critically discuss the definitions and applications of concepts and theories as they applies to specific cases of scientific research.
- Translate sentences of ordinary mathematical English into a formal language.
- Engage in rigorous reasoning about the capabilities of a formal system of deduction
- Systematically apply a precise truth definition to a given sentence in a formal language.
- Demonstrate an understanding of the technical content of Gödel's first incompleteness theorem, as well as of its philosophical import.

Course contents

The following is an incomplete list of topics covered in the course.

- Scientific knowledge
- Hypothesis testing
- Observations and measurements
- Experiments
- Models
- Statistical reasoning
- Causes and explanations
- Philosophy of social science
- Algorithmic reasoning and its limitations.
- Risk and risk assessment
- Research ethics

Disposition

Lectures, seminars, and project work.

Course literature

To be announced at course start. All material is available through course platform. The following literature has been used previously:

- Sven Ove Hansson "The Art of Doing Science" (compendium).
- Till Grüne-Yanoff “Experiments, models and methodology” (compendium).
- Video lectures.
- Articles distributed during the course.

Examination

- SEM1 - Seminars, 1.5 credits, grading scale: P, F
- PRO1 - Project, 3.0 credits, grading scale: P, F
- TEN1 - Examination, 3.0 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.

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

A student may request a home exam, with the maximum grade of E, if two requirements are fulfilled: (1) This is the last remaining exam left before graduation. (2) It is not possible for the student to attend the written exam because the student is, at the point of the request, residing outside of Sweden and will be residing outside of Sweden for at least twelve months following the request. The examiner approves or denies these requests.

Other requirements for final grade

Fullfilled seminar requirements, project requirements and written exam.

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.