# FID3027 Artificial Intelligence and applications 6.0 credits

**Artificiell intelligens och applikationer**

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

## Establishment

Course syllabus for FID3027 valid from Autumn 2024

## Grading scale

P, F

## Education cycle

Third cycle

## Specific prerequisites

Enrolled as doctoral students.

## Language of instruction

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

## Intended learning outcomes

The current learning outcomes are as follows:

ILO1: describe the fundamental concepts of artificial intelligence (AI) and its application areas.

ILO2: explain the key areas of AI, including their significance and relevance.

ILO3: identify and explain various AI techniques and their appropriate use cases.

ILO4: analyze and evaluate AI algorithms and AI methods

ILO5: demonstrate understanding for AI algoritms and AI technologies

ILO6: design and conduct a well-delimited and qualified research assignment that applies AI techniques, AI algorithm and/or AI methods.

ILO7: critically evaluate and apply AI techniques och apply the most applicable technique in own research.

ILO8: present the work of applying the AI technique in own research in a research report. The report shall be good research quality so it can be rewritten to paper that can be submitted to an international journal or international conference.

## Course contents

This course aims to provide AI skills for students in disciplines other than computer science who need to use AI in their research. The students must explore the AI field and actively work with AI theory in order to be able to apply AI theories in their own research. The goals are aimed at the eight different main topics covered in the textbook Artificial Intelligence: concepts, areas, techniques and applications: 1) AI areas and applications 2) search, planning and scheduling, 3) decision support, rule-based systems, expert and knowledge-based systems, 4) agents and multi-agent systems, 5) machine learning, 6) artificial networks and deep learning 7) natural language processing and 8) robotics, cognitive computing, bio-inspired AI as well as generative AI and large language models. In addition, the students do a deep dive into the research literature where the focus is on their research area. The first two modules focus on basic AI and data science skills. The third and fourth deepen the knowledge from the first two modules. The fifth and sixth deepen knowledge from the third module and the seventh deepens knowledge from the first, fifth and sixth modules. The eighth module and the research article deepen knowledge from all previous modules. The course's eight modules are each dedicated to meeting the stated objectives. The instructor collaborates with students within each module, covering relevant book chapters and cutting-edge research articles. The students must read the accompanying material, and write reports and a research article. At the end of each module, students will have gained insights into the respective subject and will be able to analyze and critically evaluate AI in their research results. The students must apply acquired knowledge in their research and write and present a research report. This report can be changed to a research paper that can be submitted and presented at an international conference. The students must present their results at the end of the course.

## Examination

- EXA1 - Examination, 6.0 credits, grading scale: P, 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.

The course has eight modules and each module consists of an assignment, a test and a peer review. After a module is completed, the next module can be completed. Finally, PhD students must write a research paper that can be submitted as research article that is based on their research and applies an AI technique and, if possible, an AI algorithm.

The course is evaluated through several different components. The components for the 6 credits course are:

• Assignments 1 (reading assignments): Each student/group must submit a comprehensive review of a set of assigned topics where each assignment corresponds to each module. There are eight modules in total. P/F

• Task 2 (group discussion): Students are expected to participate in group seminars and actively engage in group discussions.

• Task 3 Tests (Quizzes): Eight tests in the form of quizzes that test the knowledge students have acquired in the modules. One test per module. P/F

• Task 4 (peer review): Each student or group must carry out a peer review of other students' submitted tasks. P/F

• Task 5 (final project): The final project requires each student or group to render a report relevant to the subject areas of the course and give an oral presentation.

• Task 6 (research article). Students must write and present a research report corresponding to a research paper commonly found in international journals or an international conferences. The students must conduct their research and apply an AI technique and, where applicable, an AI algorithm.

Students have to carry out a successful test (so called quiz) before submitting the paper to a journal or conference.

## Other requirements for final grade

None

## 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.