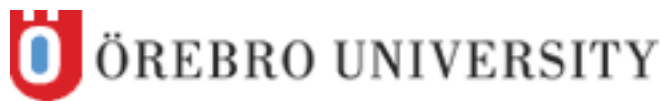


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**This course syllabus is discontinued or replaced by a new course syllabus.**

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School of Science and Technology

## Course Syllabus

### Advanced Artificial Intelligence, 3 Credits

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<b>Course Code:</b>	DT102U	<b>Subject Area:</b>	Field of Technology
<b>Main Field of Study:</b>	Computer Science	<b>Credits:</b>	3
<b>Education Cycle:</b>	Second Cycle	<b>Subject Group (SCB):</b>	Computer Science
<b>Established:</b>	2018-03-23	<b>Progression:</b>	AXX
<b>Valid from:</b>	Spring semester 2018	<b>Last Approved:</b>	2018-03-23
		<b>Approved by:</b>	Head of School

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### Aims and Objectives

#### General aims for second cycle education

Second-cycle courses and study programmes shall involve the acquisition of specialist knowledge, competence and skills in relation to first-cycle courses and study programmes, and in addition to the requirements for first-cycle courses and study programmes shall

- further develop the ability of students to integrate and make autonomous use of their knowledge
- develop the students' ability to deal with complex phenomena, issues and situations, and
- develop the students' potential for professional activities that demand considerable autonomy, or for research and development work.

(Higher Education Act, Chapter 1, Section 9)

#### Course Objectives

##### Knowledge and understanding

After completion of this course, the student will have knowledge about three advanced applications of AI reasoning, namely: resource scheduling, robot motion planning, and multi-robot coordination. The student will understand the computational bottlenecks of different algorithms, and will have gained a deeper understanding of the limits of current state of the art methods.

##### Applied knowledge and skills

Completing this course, the student will be able formulate real-world problems as search problems, and sketch methods to solve them based on heuristic, sampling-based and constraint-based search algorithms. The student will be able to develop solutions for particular applications of that are relevant in industry, namely, scheduling, robot motion planning, and coordination of fleets of autonomous robots.

##### Making judgments and attitudes

Completing this course, the student will be able to judge the suitability of a particular approach to automated reasoning for a given problem, have an understanding of the capabilities and limitations of the considered algorithms. Furthermore, the student will understand how problem structure relates to computational overhead.

### Main Content of the Course

- Overview of systematic and local search methods,
- introduction to constraint reasoning, backtracking search, k-consistency,
- temporal constraint reasoning, constraint-based resource scheduling,
- lattice- and sampling-based robot motion planning algorithms,
- state of the art methods for multi-robot motion planning, coordination and control.

## Teaching Methods

The course is given in the form of lectures and practical project work. Two lectures require physical attendance in Örebro, the rest will be given at a distance. The practical project work is about using modern scheduling, motion planning, or multi-robot coordination tools. The tools are explained by the teachers at the lectures, and the student will choose a tool for his project.

## Examination Methods

*Exercises*, 1.5 Credits. (Code: 0100)

Examination is done based on written reports on obligatory task assignments.

*Presentation at seminar*, 1.5 Credits. (Code: 0200)

Examination is based on oral presentation at seminars.

## Grades

According to the Higher Education Ordinance, Chapter 6, Section 18, a grade is to be awarded on the completion of a course, unless otherwise prescribed by the university. The university may prescribe which grading system shall apply. The grade is to be determined by a teacher specifically appointed by the university (an examiner).

According to regulations on grading systems for first- and second-cycle education (vice-chancellor's decision 2010-10-19, reg. no. CF 12-540/2010), one of the following grades is to be used: fail, pass, or pass with distinction. The vice-chancellor or a person appointed by the vice-chancellor may decide on exceptions from this provision for a specific course, if there are special reasons.

Grades used on course are Fail (U) or Pass (G).

*Exercises*

Grades used are Fail (U) or Pass (G).

*Presentation at seminar*

Grades used are Fail (U) or Pass (G).

Deviations from the U-VG grading scale

Under the Vice-Chancellor's decision RB CF 55-135/2009, deviations from the three-step grading scale (Fail, Pass, Pass with Distinction) are permitted for contract education courses.

## Other Provisions

The course is given in English.

## Reading List and Other Teaching Materials

### Additional Reading

Dechter, Rina (2003)

*Constraint Processing The Morgan Kaufmann Series in Artificial Intelligence*

Elsevier Science, ISBN: 0080502954, 9780080502953, 480 pages

LaValle, Steven (2006)

*Planning algorithms*

Cambridge university press, ISBN 978-0-521-86205-9, 831 pages

Russell, Stuart, Norvig, Peter (2010)

*Artificial Intelligence, A modern Approach Prentice Hall*

Prentice Hall, ISBN: 0136042597, 9780136042594, 1132 pages

### Additions and Comments on the Reading List

Ytterligare material (forskningsartiklar) delas ut under kursens gång.

Additional material (research articles) will be distributed during the course.