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

ÖREBRO UNIVERSITY

Course Syllabus

School of Science and Technology

Computer Science, Advanced Technologies for Robotics, Second Cycle, 15 Credits

Course Code:	DT104A	**Subject Area:**	Field of Technology
Main Field of Study:	Computer Science	**Credits:**	15
		Subject Group (SCB):	Computer Science
Education Cycle:	Second Cycle	**Progression:**	A1F
Established:	2018-08-31	**Last Approved:**	2018-09-28
Valid from:	Spring semester 2019	**Approved by:**	Head of School

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
Completing this course, the student shall be able to
- explain formalisms, methods and algorithms for planning and scheduling which are presented in the course and identify their underlying assumptions,
- explain basic concepts in multi-agent systems,
- discuss methods for how individual agents and multi-agent systems are constructed, and
- account for different forms of distributed decision making.

Applied knowledge and skills
Completing this course, the student shall be able to
- identify real-world situations and problems which can be formulated as task planning, motion planning and scheduling problems,
- sketch solutions to solve the above problems which use heuristic search, constraint-based techniques and sampling-based methods, and
- develop and review software for solving complex distributed problems with multi-agent system techniques.

Judgments and approach
Completing this course, the student shall be able to
- choose the most appropriate approach among the several presented during the course for solving a specific problem,
- understand the computational and representational trade-offs associated with methods for planning, scheduling, and multi-robot systems.

Main Content of the Course

The course consists of two compulsory sub-courses.

Part I: Planning & Scheduling, 7.5 credits
- State-space and plan-space planning problems and representations,
- planning and search,
- Graphplan, planning as satisfiability,
- constraint-based resource scheduling,
- decision-theoretic planning, and
- motion planning.

Part II: Multi-Agent Systems, 7.5 credits
- Introduction to multi-agent systems,
- agent architectures,
- task allocation and result sharing,
- distributed decision making,
- multi-agent planning, and
- applications of multi-agent systems.

Teaching Methods

Part I: Planning & Scheduling
Teaching is given in the form of lectures, lab assignments, and seminars.

Part II: Multi-Agent Systems
Teaching is given in the form of lectures as well as theoretical and practical assignments.

In case of a small number of students, the lectures may be replaced by individual tutoring.

Students who have been admitted to and registered on a course have the right to receive tuition and/or supervision for the duration of the time period specified for the particular course to which they were accepted (see, the university's admission regulations (in Swedish)). After that, the right to receive tuition and/or supervision expires.

Examination Methods

Planning and Scheduling, Theory, 6 Credits. (Code: 0100)
Written examination.

Planning and Scheduling, Assignments, 1.5 Credits. (Code: 0200)
Oral and written demonstration of assignments individually or in groups accordning to the teacher's instructions.

Multi-Agent Systems, Theory, 4 Credits. (Code: 0300)
Written exam.

Multi-Agent Systems, Assignments, 3.5 Credits. (Code: 0400)
Oral and written demonstration of assignments individually or in groups accordning to the teacher's instructions.

For further information, see the university's local examination regulations (in Swedish).

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), Pass (G) or Pass with Distinction (VG).

Planning and Scheduling, Theory
Grades used are Fail (U), Pass (G) or Pass with Distinction (VG).

Planning and Scheduling, Assignments
Grades used are Fail (U) or Pass (G).

Multi-Agent Systems, Theory
Grades used are Fail (U), Pass (G) or Pass with Distinction (VG).

Multi-Agent Systems, Assignments
Grades used are Fail (U) or Pass (G).

To receive the grade VG for the entire course, the student must have VG on both theory parts.

For further information, see the university's local examination regulations (in Swedish).

Specific entry requirements

At least 30 credits from Computer Engineering, Research methodologies for Intelligent Systems, Second Cycle, 30 Credits and Computer Science, Advanced Technologies for Intelligent Systems, Second Cycle, 15 Credits.

For further information, see the university's admission regulations (in Swedish).

Transfer of Credits for Previous Studies

Students who have previously completed higher education or other activities are, in accordance with the Higher Education Ordinance, entitled to have these credited towards the current programme, providing that the previous studies or activities meet certain criteria.

For further information, see the university's local credit transfer regulations (in Swedish).

Other Provisions

The course is given in English.

Reading List and Other Teaching Materials

Part 1: Required Reading

Ghallab Malik, Nau Dana, Traverso Paolo (2004)
Automated Planning Theory and Practice
Elsevier, ISBN 9781558608566, 635 pages

LaValle, Steven (2006)
Planning algorithms
Cambridge university press, ISBN 978-0-521-86205-9, 831 pages

Part 1: Additional Reading

Dechter, Rina (2003)
Constraint Processing
The Morgan Kaufmann Series in Artificial Intelligence, Elsevier Science ISBN 0080502954, 9780080502953, 480 pages

Kochenderfer, Mykel J. (2015)
Decision-Making Under Uncertainty
MIT Lincoln Laboratory Series, ISBN 9780262029254, 323 pages

Russell, Stuart, Norvig, Peter (2010)
Artificial Intelligence, A modern Approach Prentice Hall
Prentice Hall, ISBN: 0136042597, 9780136042594, 1132 pages

Part 2: Required Reading

Wooldrige, Michael 2009, 2nd edition
An Introduction to MultiAgent Systems
Wiley, 484 pages

Additions and Comments on the Reading List

Ytterligare material kan utdelas under kursens gång.
Additional material may be awarded during the course.