Reg No: ELAD23/20242

Faculty of Health, Science and Technology
Electrical Engineering

Syllabus

Robotics and intelligent control

Course Code:	ELAD23
Course Title:	Robotics and intelligent control *Robotteknik och intelligenta styrsystem*
Credits:	7.5
Degree Level:	Master's level
Progressive Specialisation:	Second cycle, has only first-cycle course/s as entry requirements (A1N)

Major Field of Study:
ETA (Electrical Engineering)

Course Approval
The syllabus was approved by the Faculty of Health, Science and Technology 2024-01-24, and is valid from the Autumn semester 2024 at Karlstad University.

Prerequisites
Registered for 22.5 ECTS credits in Mathematics, with 15 ECTS credits completed, and registered for 22.5 ECTS in Electrical Engineering, Mechanics, or Programming, plus upper secondary level English 6, or equivalent

Learning Outcomes
The purpose of the course is for students to acquire basic knowledge about robotics systems and intelligent control systems, as well as a selection of applications related to various robot platforms and intelligent control algorithms. The course also includes the use of modern design tools for real-time simulation.

Upon completion of the course, students should be able to:
- describe the basics of kinematics, sensors, actuators, and robotics systems,
- describe the key algorithms and main theory that form the foundation of machine learning,

- explain the principles of machine learning and how algorithms and methods can be applied in intelligent control systems,
- compare the main modelling methods for intelligent control systems in complex scenarios, and
- use modern design tools for real-time simulation of complex systems.

Content
The purpose of the course is for students to acquire fundamental knowledge about robotics systems and intelligent control systems, as well as a selection of applications related to various robot platforms and intelligent control algorithms. The fundamentals of robotics systems and intelligent control algorithms are discussed theoretically during lectures and then illustrated through mandatory laboratory exercises, where real-time control systems are designed for a simple system.

The course content provides an introduction to:
- Kinematics, actuators, proprioceptive/exteroceptive sensors, and architectures for controlling robotics systems.
- Artificial intelligence, artificial neural networks, machine learning, and learning theory.
- Application of machine learning in intelligent control algorithms.

Reading List
See separate document.

Examination
Assessment is based on mandatory laboratory exercises and hand-in assignments, plus a written exam.

If students have a decision from Karlstad University entitling them to Targeted Study Support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades
One of the grades 5 (Pass with Distinction), 4 (Pass with Some Distinction), 3 (Pass), or U (Fail) is awarded in the examination of the course.

Quality Assurance
Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate
A course certificate will be provided upon request.

Additional information
The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.