



PHYSICS

FIM764 Autonomous robots, 7.5 higher education credits

Autonoma robotar, 7,5 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Physics on 2016-11-08 and was last revised on 2017-06-13 to be valid from 2017-06-13, spring semester of 2017.

Field of education: Science 100%

Department: Physics

Position in the educational system

The course is elective within N2CAS but can also be taken as elective within the department's other master programs.

The course can be part of the following programmes: 1) Complex Adaptive Systems, Master's Programme (N2CAS), 2) Physics of Materials and Biological Systems, Master's Programme (N2PMB) and 3) Physics, Master's Programme (N2PHY)

Main field of studies

Physics with Specialization in Complex Adaptive Systems

Specialization

A1N, Second cycle, has only first-cycle course/s as entry requirements

Entry requirements

Bachelors degree in Physics, Mathematics, or similar.

Learning outcomes

The course aims at giving the students an understanding of design principles for autonomous systems, both robots and software agents, and also gives students the opportunity to apply their knowledge in practice through the construction of a simple autonomous robot.

Knowledge and understanding

Understand and describe basic properties of robotic hardware, including sensors, actuators and micro controllers.

Understand and apply the basics of behavior-based robotics and evolutionary robotics.

Set up and use the basic kinematic and dynamic equations for a differentially steered robot.

Define and set up computer simulations of wheeled autonomous robots.

Understand and apply methods for decision making in autonomous robots.

Program and use an autonomous robot.

Discuss the potential roles of autonomous robots in society, w.r.t. social and ethical aspects, and applications.

Understand and discuss technical challenges with autonomous robots.

Apply the contents of the course in connection with a autonomous robot project.

Set up, organize and report a project with technical and/or scientific challenges.

Course content

Robotic hardware

Kinematics and dynamics for autonomous robots

Behavior-based robotics and sensor fusion

Evolutionary robotics

Simulation of autonomous robots

Project planning

Robot lab sessions, with construction and programming

Form of teaching

The course consist of lectures and lab sessions. In the lectures, the fundamental theory of autonomous robots is covered and some (individual) assignments are given out.

Next, the students will do a robotics project, which is carried out in groups of 2-4 students. The results obtained in the projects should be demonstrated in the class and a written report must be handed in.

Language of instruction: English

Assessment

The examination consists of mandatory home assignments and a mandatory project.

The home assignments will be individually examined for each student. The projects will be examined both on a project group basis as well as on the individual student level. In the project

examination the over all accomplishment of the project, as well as organization and structure, documentation (planning report and final report), and oral project presentation contribute to the project grade. The obtained partial grades will be fused together to a final course grade.

Furthermore, in order to pass on the course, each student must attend all mandatory parts and contribute.

If a student, who has failed the same examined component twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

In cases where a course has been discontinued or has undergone major changes, the student shall normally be guaranteed at least three examination occasions (including the ordinary examination) during a period of at least one year from the last time the course was given.

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

Course evaluation

The students are given the opportunity to fill out an anonymous on line evaluation form.

The results of and possible changes to the course will be shared with students who participated in the evaluation and students who are starting the course.

Additional information

Literature:

Lecture notes, scientific papers, and handouts. The material will be made available via the course web page, free of charge.