



HÖGSKOLAN I GÄVLE

Robotics 7.5 cr

Robotik 7,5 hp

Set by Faculty of Engineering and Sustainable Development

Version

Set at

Valid from

10/11/13

HT2014

Level	A1F
Education level	Second cycle
Course identifier	EEA304
Credits	7.5 cr
Main field of study	Electronics
Subject group	Electronics
Disciplinary domain	Technology 100.0 %

Learning outcomes

The purpose of this course is to give the student a broad yet advanced knowledge of robots and robotic systems covering industrial and service robots and key areas of associated technologies.

After completion of the course the student shall be able to

1. describe the key characteristics and historical development of industrial and service robots
2. explain and calculate kinematic and inverse transformations in various multi-jointed robot configurations
3. describe key areas in designing complete robot systems and the limits of current technology in each area
4. perform conceptual designs to meet given robot system specifications using various approaches
5. identify critical factors in assessing conceptual designs in making final design decisions
6. perform detailed calculations for calculating dynamics and control requirements of multi-linked robots
7. design ergonomic user interfaces for operating robots in a wide range of applications
8. appreciate and use real-time control methods to design and operate robot systems
9. perform calculations for localisation of mobile robots using a variety of methods
10. explain the various methods for robot mobility

11. explain the role of robots in modern society and the keys issues for their deployment in different sectors of society
12. critically read, analyze a set of research papers related to robotics, summarise the content of the papers and make overall reflections in a written report, and present the report at a seminar.

Course content

- Overview of robotics and its history, robot components/ modularity, industrial and non-industrial perspectives
- Kinematics: Definitions, transformations matrices, forward and inverse kinematics
- Robot system design: Specifications, sensors, actuators, end effectors, user interface
- Dynamics and control: trajectory following using concepts of real-time control
- Mobile robots: Types of mobility; climbing robots, hybrid robots, bio-inspired methods
- Localisation: Absolute and relative localisation, map building, sensors for localisation, odometry, active/ passive beacons, triangulation, trilateration, simultaneous localisation and mapping (SLAM)
- Navigation and path planning: odometry, beacons, biological solutions, potential fields
- Autonomy in robots: perceptions and action, behaviour based robots, artificial intelligence, robot vision, learning methods
- Robot applications: Research, development and trends concerning modern robotic systems (industrial and service robots).

Teaching

Instruction is given as lectures, exercises, and assignments. Special emphasis is put on the ability of carrying out and documenting the work.
Lectures and exercises are not mandatory. Four assignments are included in the course of which three are mandatory.

Prerequisites

Multivariable and Nonlinear Control Systems 7.5hp, Applied Mechanics II 7.5hp and Algorithms and Data structures, 7.5 credits or equivalent.

Examination

Written examination, literature study (Written report and presentation at a seminar) and practical assignments.

Grade

A, B, C, D, E, Fx, F

Limitations

Each time the course is given there is one regular written examination and one re-examination.

Other regulations

Criteria for final grade will be given at the beginning of the course.

Sustainable environment

A minor part of the course content deals with sustainable development.

Module			
0010	Written examination	4 cr	Grade: AF
0020	Literature study	1 cr	Grade: UG
0030	Practical Assignments	2.5 cr	Grade: UG