MICRO-452

Basics of mobile robotics

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Cursus	Sem.	Type
Computer science	MA1, MA3	Opt.
Cybersecurity	MA1, MA3	Opt.
Data Science	MA1, MA3	Opt.
Environmental Sciences and Engineering	MA1, MA3	Opt.
Mechanical engineering	MA1, MA3	Opt.
Microtechnics	MA1, MA3	Opt.
Robotics, Control and Intelligent Systems		Opt.
Robotics	MA1, MA3	Obl.
SC master EPFL	MA1, MA3	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	1 weekly
TP	1 weekly
Project	2 weekly
Number of positions	

Summary

This course gives an overview of the field of mobile robotics, introducing to the main techniques and allowing to test them in exercises and a team-based project.

Content

- Sensors
- Perception, feature extraction
- Modeling
- Markov localization: Bayesian filter, Monte Carlo localization, extended Kalman filter
- Navigation: path planning, obstacle avoidance
- Control architectures and robotic frameworks
- Locomotion principles and control
- Sustainability

Learning Prerequisites

Required courses

Introduction to automatic control (catching up possible with extra effort)
Introduction to signal processing

Learning Outcomes

By the end of the course, the student must be able to:

- Choose the right methods to design and control a mobile robot for a particular task.

Transversal skills

- Set objectives and design an action plan to reach those objectives.
- Use a work methodology appropriate to the task.
- Assess progress against the plan, and adapt the plan as appropriate.

- Chair a meeting to achieve a particular agenda, maximising participation.
- Evaluate one's own performance in the team, receive and respond appropriately to feedback.
- Negotiate effectively within the group.
- Resolve conflicts in ways that are productive for the task and the people concerned.

Teaching methods

Ex cathedra, case studies, exercises, work on mobile robots, group project

Expected student activities

- weekly lectures
- studying provided additional materials
- attend case study discussions
- lab exercises with practical components
- project at the end of the semester

Assessment methods

Project during the semester (60% of the grade). The project takes place during the semester and the report and presentation are done before the end of the semester, following the specific planning given by the teacher at the beginning of the semester.
Written exam (40% of the grade)

Supervision

Office hours	No

Resources

Moodle Link

- https://go.epfl.ch/MICRO-452