Syllabus

Course Description

Course Title	Mobile robotics
Course Code	47568
Course Title Additional	
Scientific-Disciplinary Sector	IINF-04/A
Language	English
Degree Course	Master in Industrial Mechanical Engineering
Other Degree Courses (Loaned)	
Lecturers	Prof. Karl Dietrich von Ellenrieder, Karl.vonEllenrieder@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/37038
Teaching Assistant	
Semester	Second semester
Course Year/s	1
CP	5
Teaching Hours	28
Lab Hours	18
Individual Study Hours	79
Planned Office Hours	
Contents Summary	A mobile robot is an unmanned system that operates in unstructured and dynamic environments, with or without the oversight of a human. Applications of mobile robots include environmental monitoring; manufacturing logistics and production; search & rescue; construction; forestry management, agricultural monitoring and production; mining; marine measurement and monitoring; and aerospace operations. This course covers the fundamental principles of mobile robotics at an introductory level. The topics covered include: functional architecture of unmanned systems (electrical, mechanical and software); vehicle dynamics and modelling; common navigation sensors, state & disturbance

	estimation; low-level control; and trajectory generation. Laboratory exercises that use Matlab, Simulink and possibly ROS/Gazebo to control unmanned vehicles will be given.
Course Topics	The basic principles of mobile robotics are presented.
Keywords	Robotics, automatic control.
Recommended Prerequisites	None.
Propaedeutic Courses	
Teaching Format	Classroom lectures and laboratory exercises.
Mandatory Attendance	Attendance at lectures and exercise sessions is strongly recommended.
Specific Educational Objectives and Learning Outcomes	Knowledge and understanding: 1. Applying basic principles to a broad range of dynamic system models (such as those typically learned in the 1st cycle). 2. Defining sensing and controller requirements for unmanned vehicles that operate in different conditions. 3. Understanding factors that affect system performance and stability. 4. Use of state space techniques for designing controllers and observers. Applying knowledge and understanding: 5. Analyzing, developing and presenting control & navigation systems for applications that span multiple disciplines through laboratory exercises, which complement the lectures. Making judgements: 6. On the choice of analytical and numerical tools to use in the lab exercises. This may require you to integrate knowledge, handle complexity, and formulate judgements with incomplete data. Communication skills: 7. Laboratory reports will require you justify your solutions/conclusions concisely (in clear and simple language). Learning Skills: 8. Students will be required to develop a proficiency in Matlab, Simulink and possibly ROS/Gazebo with a few in-class examples, but mostly on their own. This is intended to help students develop

	the ability to study in a manner that is largely self-directed or autonomous.
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	- Formative assessment: Exercises: 18 hours total; ILOs assessed: 1 - 8; - Summative assessment: 40% exercises; ILOs assessed: 1-8; 60% final exam: 4 hours; ILOs assessed: 1-6.
Evaluation Criteria	Laboratory Exercises: Completeness and correctness of answers; level of understanding Written Final Exam: Completeness and correctness of answers. Students are required to receive an overall grade of greater than 60/100 points to pass the course.
Required Readings	Lecture notes and exercises will be available on Teams.
Supplementary Readings	Additional books and articles may be recommended by the instructor during the course.
Further Information	
Sustainable Development Goals (SDGs)	Quality education