# Syllabus

## *Descrizione corso*

| | |
|---|---|
| **Titolo insegnamento** | Mobile robotics |
| **Codice insegnamento** | 47568 |
| **Titolo aggiuntivo** | |
| **Settore Scientifico-Disciplinare** | IINF-04/A |
| **Lingua** | Inglese |
| **Corso di Studio** | Corso di laurea magistrale in Ingegneria Industriale Meccanica |
| **Altri Corsi di Studio (mutuati)** | |
| **Docenti** | prof. Karl Dietrich von Ellenrieder, Karl.vonEllenrieder@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/37038 |
| **Assistente** | |
| **Semestre** | Secondo semestre |
| **Anno/i di corso** | 1 |
| **CFU** | 5 |
| **Ore didattica frontale** | 28 |
| **Ore di laboratorio** | 18 |
| **Ore di studio individuale** | 79 |
| **Ore di ricevimento previste** | |
| **Sintesi contenuti** | 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. |
| **Argomenti dell'insegnamento** | The basic principles of mobile robotics are presented. |
| **Parole chiave** | Robotics, automatic control. |
| **Prerequisiti** | None. |
| **Insegnamenti propedeutici** | |
| **Modalità di insegnamento** | Classroom lectures and laboratory exercises. |
| **Obbligo di frequenza** | Attendance at lectures and exercise sessions is strongly recommended. |
| **Obiettivi formativi specifici e risultati di apprendimento attesi** | Knowledge and understanding:<br>1. Applying basic principles to a broad range of dynamic system models (such as those typically learned in the 1st cycle).<br>2. Defining sensing and controller requirements for unmanned vehicles that operate in different conditions.<br>3. Understanding factors that affect system performance and stability.<br>4. Use of state space techniques for designing controllers and observers.<br><br>Applying knowledge and understanding:<br>5. Analyzing, developing and presenting control & navigation systems for applications that span multiple disciplines through laboratory exercises, which complement the lectures.<br><br>Making judgements:<br>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.<br><br>Communication skills:<br>7. Laboratory reports will require you justify your solutions/conclusions concisely (in clear and simple language).<br><br>Learning Skills:<br>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. |
| **Obiettivi formativi specifici e risultati di apprendimento attesi (ulteriori info.)** | |
| **Modalità di esame** | - Formative assessment:<br>Exercises: 18 hours total; ILOs assessed: 1 - 8;<br>- Summative assessment:<br>40% exercises; ILOs assessed: 1-8;<br>60% final exam: 4 hours; ILOs assessed: 1-6. |
| **Criteri di valutazione** | Laboratory Exercises: Completeness and correctness of answers; level of understanding<br>Written Final Exam: Completeness and correctness of answers.<br>Students are required to receive an overall grade of greater than 60/100 points to pass the course. |
| **Bibliografia obbligatoria** | Lecture notes and exercises will be available on Teams. |
| **Bibliografia facoltativa** | Additional books and articles may be recommended by the instructor during the course. |
| **Altre informazioni** | |
| **Obiettivi di Sviluppo Sostenibile (SDGs)** | Istruzione di qualità |