

# Syllabus

## *Descrizione corso*

<b>Titolo insegnamento</b>	Mobile robotics
<b>Codice insegnamento</b>	47568
<b>Titolo aggiuntivo</b>	
<b>Settore Scientifico-Disciplinare</b>	IINF-04/A
<b>Lingua</b>	Inglese
<b>Corso di Studio</b>	Corso di laurea magistrale in Ingegneria Industriale Meccanica
<b>Altri Corsi di Studio (mutuati)</b>	
<b>Docenti</b>	prof. Karl Dietrich von Ellenrieder, Karl.vonEllenrieder@unibz.it <a href="https://www.unibz.it/en/faculties/engineering/academic-staff/person/37038">https://www.unibz.it/en/faculties/engineering/academic-staff/person/37038</a>
<b>Assistente</b>	
<b>Semestre</b>	Secondo semestre
<b>Anno/i di corso</b>	1
<b>CFU</b>	5
<b>Ore didattica frontale</b>	28
<b>Ore di laboratorio</b>	18
<b>Ore di studio individuale</b>	79
<b>Ore di ricevimento previste</b>	
<b>Sintesi contenuti</b>	<p>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 &amp; 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</p>

	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.
<b>Argomenti dell'insegnamento</b>	The basic principles of mobile robotics are presented.
<b>Parole chiave</b>	Robotics, automatic control.
<b>Prerequisiti</b>	None.
<b>Insegnamenti propedeutici</b>	
<b>Modalità di insegnamento</b>	Classroom lectures and laboratory exercises.
<b>Obbligo di frequenza</b>	Attendance at lectures and exercise sessions is strongly recommended.
<b>Obiettivi formativi specifici e risultati di apprendimento attesi</b>	<p>Knowledge and understanding:</p> <ol style="list-style-type: none"> <li>1. Applying basic principles to a broad range of dynamic system models (such as those typically learned in the 1st cycle).</li> <li>2. Defining sensing and controller requirements for unmanned vehicles that operate in different conditions.</li> <li>3. Understanding factors that affect system performance and stability.</li> <li>4. Use of state space techniques for designing controllers and observers.</li> </ol> <p>Applying knowledge and understanding:</p> <ol style="list-style-type: none"> <li>5. Analyzing, developing and presenting control &amp; navigation systems for applications that span multiple disciplines through laboratory exercises, which complement the lectures.</li> </ol> <p>Making judgements:</p> <ol style="list-style-type: none"> <li>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.</li> </ol> <p>Communication skills:</p> <ol style="list-style-type: none"> <li>7. Laboratory reports will require you justify your solutions/conclusions concisely (in clear and simple language).</li> </ol> <p>Learning Skills:</p> <ol style="list-style-type: none"> <li>8. Students will be required to develop a proficiency in Matlab,</li> </ol>

	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.
<b>Obiettivi formativi specifici e risultati di apprendimento attesi (ulteriori info.)</b>	
<b>Modalità di esame</b>	<ul style="list-style-type: none"> <li>- Formative assessment: Exercises: 18 hours total; ILOs assessed: 1 - 8;</li> <li>- Summative assessment: 40% exercises; ILOs assessed: 1-8; 60% final exam: 4 hours; ILOs assessed: 1-6.</li> </ul>
<b>Criteri di valutazione</b>	<p>Laboratory Exercises: Completeness and correctness of answers; level of understanding</p> <p>Written Final Exam: Completeness and correctness of answers.</p> <p>Students are required to receive an overall grade of greater than 60/100 points to pass the course.</p>
<b>Bibliografia obbligatoria</b>	Lecture notes and exercises will be available on Teams.
<b>Bibliografia facoltativa</b>	Additional books and articles may be recommended by the instructor during the course.
<b>Altre informazioni</b>	
<b>Obiettivi di Sviluppo Sostenibile (SDGs)</b>	Istruzione di qualità