COURSE DESCRIPTION – ACADEMIC YEAR 2025/2026

Course title	**Robotic systems for sports and health**
Course code	42805
Scientific sector	IINF-04/A
Degree	Master in Smart Technologies for Sports and Health (LM-32)
Semester	1 and 2
Year	1
Credits	12
Modular	Yes

Total lecturing hours	72
Total lab hours	48
Attendance	Preferrable. Non-attending students should contact the lecturer at the start of the course to agree on the modalities of the independent study
Prerequisites	Programming skills, knowledge on robot control
Course page	Teams, OLE

Specific educational objectives	The course belongs to the type "caratterizzanti". **MODULE 1: Cognitive robotics** Advanced knowledge of cognitive robotic architectures and modules for vision, navigation, manipulation, communication, decision-making and knowledge representation, as well as introduction of robotic platforms and simulators; **MODULE 2: Socially-aware robot assistants** Advanced knowledge related to social robotic assistants with a focus on social cognition and the 'Theory of Mind', affective computing, verbal and non-verbal person-robot communication, safe navigation and movement planning of robots, context-based recognition of actions, plans and intentions and shared decision-making, personalisation through learning and adaptation;

Module 1	**Cognitive robotics**
Module code	42805A
Module scientific sector	IINF-04/A
Credits	6
Lecturing hours	36
Lab hours	24
Lecturer	Prof. Angelika Peer
Contact	angelika.peer@unibz.it
Scientific sector of lecturer	IINF-04/A Systems and Control Engineering
Teaching language	English
Office hours	After consultation and agreement with lecturers
Lecturing assistant (if any)	-
Contact LA	-
Office hours LA	-
List of topics	• Cognitive robotic architectures; • Cognitive vision; • Cognitive robot navigation;

	• Cognitive robot manipulation; • Decision making; • Knowledge representation and reasoning; • Robotic platforms and simulators.
Teaching format	Frontal lectures, homeworks, exercises, and laboratories.

Module 2	**Socially-aware robot assistants**
Module code	42805B
Module scientific sector	IINF-04/A
Credits	6
Lecturing hours	36
Lab hours	24
Lecturer	Prof. Angelika Peer
Contact	angelika.peer@unibz.it
Scientific sector of lecturer	IINF-04/A Systems and Control Engineering
Teaching language	English
Office hours	After consultation and agreement with lecturers
Lecturing assistant (if any)	-
Contact LA	-
Office hours LA	-
List of topics	• Social cognition and the theory of mind; • Affective computing in human and robots; • Verbal and non-verbal human-robot communication; • Human-aware safe robot navigation and motion planning; • Context-based action, plan and intention recognition and shared decision making; • Personalization through robot learning and adaptation.
Teaching format	Frontal lectures, homeworks, exercises, and laboratories.

Learning outcomes	**Knowledge and understanding** • Knowledge and understanding of cognitive robot architectures and their main modules of vision, navigation, manipulation, communication, decision-making and knowledge representation and be able to use selected robot platforms and simulators; • Knowledge and understanding of the most important concepts and methods in the field of social robotic systems, with a focus on social cognition and the 'Theory of Mind', 'affective computing', verbal and non-verbal human-robot communication, safe navigation and motion planning, context-based action, plan and intention recognition and joint decision-making and personalization. **Applying knowledge and understanding** • Design, develop and integrate cognitive robotic systems and their various modules. • Design, develop and integrate robotic systems for social interactions; **Making judgments**

	• Ability to plan and re-plan the work of a technical project and to complete it within specified deadlines and objectives; • Ability to work independently and autonomously in small and large projects and with structural responsibilities. **Communication skills** • Ability to present the contents of a scientific and technical report within a given timeframe; • Ability to organize and write technical documentation; • Ability to develop and present technical content in English; • Ability to interact and collaborate with peers or professionals in the context of a project; • Ability to synthesize knowledge acquired through reading and studying scientific and technical documentation; preparation of reports and presentations. **Learning skills:** • Ability to independently expand on knowledge acquired during study by reading and understanding scientific and technical documentation in English; • Ability to expand knowledge, including incomplete knowledge, in the area of problem solving, taking into account the primary objective of the project.
Assessment	Final exam: the exam covers the topics addressed in MODULE 1 and MODULE 2 and consists of two parts: ● MODULE 1 (50% of the final exam): Oral exam and project work. The mark for each part of the exam is 18-30, or insufficient. The oral exam comprises verification questions, and open questions to test knowledge application skills. It counts for 50% of the total mark. The project consists of a project and verifies whether the student is able to apply the concepts taught or presented in the course to solve concrete problems. It is assessed through a final presentation, a demo, and a project report and can be carried out either individually or in a group of students. It is discussed during the oral exam, and it counts for 50% of the total mark. ● MODULE 2 (50% of the final exam): Oral exam and project work. The mark for each part of the exam is 18-30, or insufficient. The oral exam comprises verification questions, and open questions to test knowledge application skills. It counts for 50% of the total mark.

	The project consists of a project and verifies whether the student is able to apply the concepts taught or presented in the course to solve concrete problems. It is assessed through a final presentation, a demo, and a project report and can be carried out either individually or in a group of students. It is discussed during the oral exam, and it counts for 50% of the total mark.
Assessment language	English
Assessment Typology	Monocratic
Evaluation criteria and criteria for awarding marks	• MODULE 1: The final mark is computed as the weighted average of the oral exam and the project. The exam is considered passed when both marks are valid, i.e., in the range 18-30. Otherwise, the individual valid marks (if any) are kept for all 3 regular exam sessions, until also all other parts are completed with a valid mark. After the 3 regular exam sessions, all marks become invalid. Relevant for the oral exam: clarity of answers; ability to recall principles and methods, and deep understanding about the course topics presented in the lectures; skills in applying knowledge to solve exercises about the course topics; skills in critical thinking. Relevant for the project: skill in applying knowledge in a practical setting; ability to summarize in own words; ability to develop correct solutions for complex problems; ability to write a quality report; ability in presentation; ability to work in teams. Non-attending students have the same evaluation criteria and requirements for passing the exam as attending students. • MODULE 2: The final mark is computed as the weighted average of the oral exam and the project. The exam is considered passed when both marks are valid, i.e., in the range 18-30. Otherwise, the individual valid marks (if any) are kept for all 3 regular exam sessions, until also all other parts are completed with a valid mark. After the 3 regular exam sessions, all marks become invalid. Relevant for the oral exam: clarity of answers; ability to recall principles and methods, and deep understanding about the course topics presented in the lectures; skills in applying knowledge to solve exercises about the course topics; skills in critical thinking. Relevant for the project: skill in applying knowledge in a practical setting; ability to summarize in own words; ability to develop correct solutions for complex problems; ability to write a quality report; ability in presentation; ability to work in teams. Non-attending students have the same evaluation criteria and requirements for passing the exam as attending students.

Required readings	• MODULE 1: All the required reading material will be provided during the course and will be available in electronic format. Copy of the slides will be available as well. • MODULE 2: All the required reading material will be provided during the course and will be available in electronic format. Copy of the slides will be available as well.
Supplementary readings	• MODULE 1: Angelo Cangelosi, Minoru Asada, Cognitive Robotics, MIT Press, 2022. • MODULE 2: Angelo Cangelosi, Minoru Asada, Cognitive Robotics, MIT Press, 2022.
Software used	• MODULE 1: Robotic operating system (ROS) • MODULE 2: Robotic operating system (ROS)