Syllabus

Course Description

Course Title	Artificial Intelligence and Machine Learning
Course Code	42419
Course Title Additional	
Scientific-Disciplinary Sector	INF/01
Language	English
Degree Course	Bachelor in Electronics and Cyber-Physical Systems Engineering
Other Degree Courses (Loaned)	
Lecturers	Prof. Dr. Oswald Lanz, Oswald.Lanz@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/46208 dr. Alessandro Torcinovich, Alessandro.Torcinovich@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/49855
Teaching Assistant	
Semester	First semester
Course Year/s	3
CP	9
Teaching Hours	60
Lab Hours	30
Individual Study Hours	135
Planned Office Hours	27
Contents Summary	The course belongs to the type "caratterizzanti – discipline informatiche". Students gain an understanding of the theoretical and practical foundations and concepts of Artificial Intelligence and Machine Learning including artificial intelligence and agents, search space exploration, automated planning, data analysis, model selection,

	supervised learning, unsupervised learning, reinforcement learning, elements of deep learning.
Course Topics	• Artificial intelligence and agents • Search space exploration • Automated planning • Data analysis • Model selection • Supervised learning • Unsupervised learning • Reinforcement learning • Elements of deep learning
Keywords	Artificial Intelligence, Machine Learning
Recommended Prerequisites	Mathematical Analysis I, Mathematical Analysis II, Fundamentals of Statistics
Propaedeutic Courses	
Teaching Format	Frontal lectures, homeworks, exercises, and laboratories
Mandatory Attendance	Preferrable. Non-attending students should contact the lecturer at the start of the course to agree on the modalities of the independent study
Specific Educational Objectives and Learning Outcomes	Knowledge and understanding • Know the principles of machine learning and artificial intelligence and potentials and limits in various application domains. Applying knowledge and understanding • Be able to adopt programming techniques of artificial intelligence for state space search and planning; • Be able to adopt machine learning techniques to extract knowledge from data. Making judgments • Be able to work autonomously according to the own level of knowledge and understanding; • Be able to collect and interpret useful data and to judge intelligent systems and their applicability; Ability to learn • Have developed learning capabilities to pursue further studies with a high degree of autonomy.

	Communication skills • Be able to use one of the three languages English, Italian and German, and be able to use technical terms and communication appropriately. • Be able to structure and write technical documentation. • Be able to work in teams for the realization of intelligent systems. Learning skills: • Have developed learning capabilities to pursue further studies with a high degree of autonomy • Be able to follow the fast technological evolution and to learn cutting edge technologies and innovative aspects of last generation intelligent systems
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	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 related to the content of the course 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 2 students. It is discussed during the oral exam, and it counts for 50% of the total mark.
Evaluation Criteria	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	All the required reading material will be provided during the course and will be available in electronic format.
Supplementary Readings	David Poole and Alan Mackworth. Artificial Intelligence: Foundations of Computational Agents. Cambridge University Press, 3rd Edition, 2023. ISBN: 9781009258197. Christopher M. Bishop. Pattern Recognition and Machine Learning. Springer, 2006. ISBN: 9780387310732. Ian Goodfellow, Yoshua Bengio and Aaron Courville. Deep Learning. MIT Press, 2016. ISBN: 9780262035613.
Further Information	Software used: Python, Scikit-Learn, PyTorch
Sustainable Development Goals (SDGs)	Quality education