Syllabus

Course Description

Course Title	AI Applications in Industry
Course Code	47566
Course Title Additional	
Scientific-Disciplinary Sector	IIND-04/A
Language	English
Degree Course	Master in Industrial Mechanical Engineering
Other Degree Courses (Loaned)	
Lecturers	dr. Matteo De Marchi, Matteo.DeMarchi@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/44826
Teaching Assistant	
Semester	First semester
Course Year/s	2
CP	5
Teaching Hours	24
Lab Hours	24
Individual Study Hours	77
Planned Office Hours	
Contents Summary	The course belongs to the class of characterizing courses in the Master in Industrial Mechanical Engineering. It aims at introducing Artificial Intelligence to students by teaching fundamentals, scientific foundations and especially practical methods and industrial applications of AI to develop specific professional skills.
Course Topics	Part 1 - Introduction to AI and its trends: 1. Introduction to the history of AI. 2. How intelligent is AI really? 3. Basics of machine learning. 4. Neural networks - on the way to the artificial brain.

	5. Deep Learning - The new highlight of AI. 6. AI changes our world. 7. Ethical questions of AI. Part 2 - Fundamentals and methods of AI for applications in industry: 8. Basic concept of intelligent agents and their categorization. 9. Search and constraint satisfaction problems with example application to scheduling and routing. 10. Reasoning under uncertainty with example application to state estimation and prediction. 11. Rational decisions under uncertainty with example application to decision support. 12. Learning from examples and from reinforcement with example application to classification. Part 3 - Exercises and external experts: 13. Excursion and lab demos (Smart Mini Factory lab - unibz) 14. Individual/group project work (assignment).
Keywords	Artificial Intelligence, AI, Industry, Machine Learning, Neural Networks
Recommended Prerequisites	None.
Propaedeutic Courses	
Teaching Format	Frontal lectures and exercises with computer.
Mandatory Attendance	Highly recommended.
Specific Educational Objectives and Learning Outcomes	The course is structured in 3 parts: • Part 1 gives a general introduction in AI and its trends. • Part 2 provides theoretical fundamentals and practical methods for implementing AI applications in industry. • Part 3 covers the exercise part where students will gain insight in realized AI solutions in Industry by excursions, external experts as well as individual practical project work to apply the learned methods from Part 2 in practice. Knowledge and understanding 1. The student knows the historical development as well as basics of modern methods and techniques of artificial intelligence. 2. Knowledge of the potential of AI in industrial applications.

	3. Knowledge of risks and limitations of AI. 4. Knowledge of ethical questions concerning AI. Applying knowledge and understanding 5. The student applies and practices theoretical contents through exercises and project work. Making judgements 6. Ability to correctly classify and assess the advantages and disadvantages, potentials and limitations, as well as the opportunities and risks of AI. 7. Ability to independently analyze application areas with regard to the possible use of methods and techniques from the field of AI. Communication skills 8. Ability to discuss complex and innovative issues in a structured manner. Learning skills 9. Ability to autonomously extend the knowledge acquired during the study course by reading and understanding scientific and technical documentation. The student is able to enlarge his knowledge through self-study and consultation of scientific and technical texts.
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	Knowledge and understanding: written exam Applying knowledge and understanding, Making judgements, Communication skills: Individual/group project work (assignment) with short report and presentation.
Evaluation Criteria	Final evaluation by a single final grade. The final grade is calculated from the results of the written exam (50%) and the results of individual/group project work with short report and presentation (50%).

	Criteria for the evaluation of the written examination: completeness, suitability, and correctness of the answers.
Required Readings	Lecture notes and documents for exercises will be available online.
Supplementary Readings	Stuart Russell, Peter Norvig (2021). Artificial Intelligence: A Modern Approach, Global Edition. Pearson Higher Ed.- 1167 pages.
Further Information	
Sustainable Development Goals (SDGs)	Quality education, Responsible consumption and production, Industry, innovation and infrastructure, Decent work and economic growth