Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	"Industrial Collaborative Robotics"
Course code	
Scientific sector	Ing-Ind/13
Degree	LM-33
Semester	1
Year	2024
Academic Year	2023-2024
Credits	3 ECTS
Modular	No

Total lecturing hours	14
Total lab hours	
Total exercise hours	18
Attendance	Highly recommended
Prerequisites	
Course page	

Specific educational objectives	*The course aims at providing concepts and skills in the industrial collaborative robotics domain.* *Students will learn: (i) fundamental concepts and methodologies of industrial Human-Robot Interaction (HRI); (ii) fundamental concepts of safety of machinery and risk assessment for industrial traditional and collaborative robots concepts; (iii) fundamental and advanced concepts of robot kinematics useful in collaborative applications.* *Then, they will acquire fundamental knowledge and competences on how to program and operate industrial collaborative robots.*

Lecturer	Prof. Renato Vidoni Dr. Luca Gualtieri
Scientific sector of the lecturer	Ing-Ind/13
Teaching language	English
Office hours	To be agreed upon
Teaching assistant (if any)	Dr. Matteo De Marchi
Office hours	/
List of topics covered	The lecture hours cover the following main topics: 1. Introduction to industrial collaborative robotics 2. Safety standards and deliverables for (collaborative) robotics 3. Collaborative operations according to ISO TS 15066 4. Mechanical risk assessment for collaborative

	systems 5. From manual to collaborative operations 6. Redundant robots: Inverse and differential kinematics, redundancy exploitation in collaborative applications 7. Human and skeleton tracking 8. Examples of applications and implementation of collaborative tasks 9. Robot/Cobot programming (basic and advanced) and motion planning Exercises: Hands on exercises Presentation and evaluation/elaboration of case studies.
Teaching format	Frontal lectures, Exercises (Case study elaboration)

Learning outcomes (ILOs)	1. Knowledge and understanding • The student knows the basics of industrial collaborative robotics. • The student knows the safety standards and deliverables related to (collaborative) robotics. • The student knows how to treat kinematic redundancy 2. Applying knowledge and understanding • The student applies and practices theoretical contents through hands-on exercises and case studies. • Theory contents are practiced through practical examples. 3. The student will be able to make judgments selecting: • the suitable collaborative robotic system for a practical industrial solution. 4. Communication skills • Ability to present the acquired knowledge and competences with a proper language • Ability to express concepts with the field related technical terminology. 5. Learning skills • Ability to autonomously extend the knowledge acquired during the study course.

Assessment

Formative assessment

Form	Length /duration	ILOs assessed
Exercises in the lecture room	After each lecture unit	1, 2, 3
Group work and lab activities	In the exercise hours	1, 2, 3, 5

Summative assessment

Form	%	Length /duration	ILOs assessed
Written exam with theory questions	50%	1 hour	1, 2, 3
Project work	50% - case studies and subsequent presentation of the results	15 min of presentation	2, 3, 4, 5

Assessment language	English
Evaluation criteria and criteria for awarding marks	Final evaluation by a single final grade. The final grade is calculated 50% from the results of the written exam and 50% from the results of the project work performed within the exercises. Criteria for the evaluation of the written examination: completeness and correctness of the answers. Criteria for the evaluation of the project work / case study: accuracy and completeness as well as creativity and innovation of the proposed solution and quality of presentation.

Required readings	Lecture notes and documents for the exercise will be available on the reserve collections
Supplementary readings	TBA