

Syllabus

Kursbeschreibung

Titel der Lehrveranstaltung	Industrial Collaborative Robotics
Code der Lehrveranstaltung	47584
Zusätzlicher Titel der Lehrveranstaltung	
Wissenschaftlich-disziplinärer Bereich	
Sprache	Englisch
Studiengang	Master in Industrie- und Maschineningenieurwesen
Andere Studiengänge (gem. Lehrveranstaltung)	
Dozenten/Dozentinnen	dr. Luca Gualtieri, Luca.Gualtieri@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/38728
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Erstes Semester
Studienjahr/e	2
KP	6
Vorlesungsstunden	28
Laboratoriumsstunden	28
Stunden für individuelles Studium	80
Vorgesehene Sprechzeiten	22
Inhaltsangabe	<p>The course aims at providing concepts and skills in the industrial collaborative robotics domain.</p> <p>Students will learn: (i) fundamental and advanced concepts of industrial Human-Robot Interaction (HRI); (ii) fundamental and advanced concepts of safety of machinery and risk assessment for industrial traditional and collaborative robots; (iii) fundamental concepts of ergonomics in advanced human-robot interaction; (iv)</p>

	<p>fundamental and advanced concepts of robot kinematics useful in collaborative applications.</p> <p>Then, they will acquire fundamental knowledge and competences on how to program and operate industrial collaborative robots.</p>
Themen der Lehrveranstaltung	<p>Main topics for the module "Safety and ergonomics in industrial human-robot interaction":</p> <ul style="list-style-type: none"> • Fundamentals of industrial Human Robot Interaction (iHRI) • Risk assessment for collaborative applications • Safety measures for industrial HRI • Human factors and ergonomics in advanced iHRI <p>Main topics for the module "Collaborative robotics applications in Industry":</p> <ul style="list-style-type: none"> • Safety standards and their application/implementation. • Sensors for obstacle/human tracking and for validation/certification of industrial collaborative applications. • Human and skeleton tracking. • Redundant robots and redundancy exploitation in collaborative applications. • (Collaborative) Robot programming – basic and advanced - and motion planning. • Examples of applications and implementation of collaborative tasks.
Stichwörter	<p>Industrial Human-Robot Interaction</p> <p>Collaborative Robotics</p> <p>Safety of Machinery</p> <p>Human Tracking</p> <p>Motion Planning</p>
Empfohlene Voraussetzungen	<p>Minimum programming competences.</p>
Propädeutische Lehrveranstaltungen	
Unterrichtsform	<p>Frontal lectures and seminars held by guest researchers and experts;</p> <p>Exercises/Smart Mini Factory lab activities/case study elaboration.</p>
Anwesenheitspflicht	<p>Not mandatory</p>
Spezifische Bildungsziele und erwartete	<p>Knowledge and understanding</p> <p>Students should acquire the knowledge and the understanding of:</p>

Lernergebnisse	<p>Applying knowledge and understanding</p> <p>Making judgements</p> <p>Communication skills</p> <p>Ability to learn</p>
Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)	
Art der Prüfung	<p>Formative Assessment:</p> <ul style="list-style-type: none"> • Exercises in the lecture room (After each unit lecture); • Group work and lab hands-on activities (During the ex/lab hours). <p>Summative Assessment:</p> <ul style="list-style-type: none"> • Written exam with questions on the theory (1h): 50% of final grade; • Project work encompassing case study and subsequent presentation of the work: 50% of final grade.
Bewertungskriterien	<p>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.</p> <p>Criteria for the evaluation of the written examination are:</p> <ul style="list-style-type: none"> • completeness and correctness of the answers. <p>Criteria for the evaluation of the project work / case study are:</p> <ul style="list-style-type: none"> • accuracy and completeness as well as creativity and innovation of the proposed solution and quality of presentation.
Pfichtliteratur	<p>Lecture notes and docs for the exercises/lab sessions will be made available on the online platforms</p>
Weiterführende Literatur	

Weitere Informationen	
Ziele für nachhaltige Entwicklung (SDGs)	Weniger Ungleichheiten, Menschenwürdige Arbeit und Wirtschaftswachstum

Kursmodul

Titel des Bestandteils der Lehrveranstaltung	Safety and Ergonomics in industrial human-robot interaction
Code der Lehrveranstaltung	47584A
Wissenschaftlich-disziplinärer Bereich	IIND-05/A
Sprache	Englisch
Dozenten/Dozentinnen	dr. Luca Gualtieri, Luca.Gualtieri@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/38728
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Erstes Semester
KP	3
Verantwortliche/r Dozent/in	
Vorlesungsstunden	16
Laboratoriumsstunden	12
Stunden für individuelles Studium	40
Vorgesehene Sprechzeiten	9
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Themen der Lehrveranstaltung	<p>INTRODUCTION TO INDUSTRIAL ADVANCED HRI</p> <ul style="list-style-type: none"> - Fundamentals of industrial human-robot interaction; - Applications; - Mechanical risk in iHRI; - Technology analysis; - Case studies and examples; <p>SAFETY OF MACHINERY AND RISK ASSESSMENT</p> <ul style="list-style-type: none"> - Basics of Occupational Health and Safety; - The Machinery Directive and the EHSRs; - Risk assessment for machinery; - Safety by design; - Case studies and examples; <p>SAFETY IN INDUSTRIAL HRI - BASICS</p> <ul style="list-style-type: none"> - Safety of collaborative robotics applications; - Standards and deliverables for safety in iHRI; - Safety modalities in iHRI according to ISO TS 15066; - The new Machinery Regulation; <p>SAFETY IN INDUSTRIAL HRI - ADVANCED</p> <ul style="list-style-type: none"> - Modeling human-robot contacts; - Power and Force Limiting; - Design of safe end-effectors; - Measures for risk prevention and mitigation in collaborative applications; <p>Laboratory:</p> <ul style="list-style-type: none"> - Comparing risk assessment for traditional and collaborative robotics application by using the ISO TR 14121 methodology; - Human-robot contact analysis and computation of Power and Force Limiting parameters; - Design of safe collaborative applications;
Unterrichtsform	Frontal lectures, exercises and case study discussion.
Pfichtliteratur	Lecture notes and docs for the ex/lab sessions will be made available on the online platforms
Weiterführende Literatur	

Kursmodul

Titel des Bestandteils der Lehrveranstaltung	Collaborative Robotics Applications in Industry
Code der Lehrveranstaltung	47584B
Wissenschaftlich-disziplinärer Bereich	IIND-02/A
Sprache	Englisch
Dozenten/Dozentinnen	Prof. Renato Vidoni, renato.vidoni@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/31254 Dott. Rabert Rajesh Mallavarapu, RabertRajesh.Mallavarapu@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/48195
Wissensch. Mitarbeiter/Mitarbeiterin	
Semester	Erstes Semester
KP	3
Verantwortliche/r Dozent/in	
Vorlesungsstunden	12
Laboratoriumsstunden	16
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Inhaltsangabe	<p>The course aims at providing concepts and skills in the industrial collaborative robotics domain.</p> <p>Students will learn: (i) fundamental and advanced concepts of industrial Human-Robot Interaction (HRI); (ii) fundamental and advanced concepts of safety of machinery and risk assessment for industrial traditional and collaborative robots; (iii) fundamental concepts of ergonomics in advanced human-robot interaction; (iv) fundamental and advanced concepts of robot kinematics useful in collaborative applications.</p> <p>Then, they will acquire fundamental knowledge and competences</p>

	on how to program and operate industrial collaborative robots.
Themen der Lehrveranstaltung	
Unterrichtsform	Frontal lectures and seminars held by guest researchers and experts; Exercises/Smart Mini Factory lab activities/case study elaboration.
Pfichtliteratur	Lecture notes and docs for the ex/lab sessions will be made available on the online platforms
Weiterführende Literatur	