Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Mechatronics and Process Automation
Course code	ST-10
Scientific sector	ING/IND 13
Degree	Bachelor in Wood Engineering
Semester	I
Year	III
Academic Year	2021-22
Credits	6
Modular	No

Total lecturing hours	36
Total lab hours	24
Attendance	Strongly recommended
Prerequisites	Students should be familiar with the basic knowledges of physics and mathematical analysis.
Course page	https://www.unibz.it/en/faculties/sciencetechnology/bachelor-wood-engineering/study-plan-industrial/

Specific educational objectives	The course aims at giving the fundamentals of mechatronics and process automation relevant to wood engineering. These include data acquisition and sensors, modeling and selection of electrically driven actuating elements, automatic machines, and robotics. Criteria and methods to analyze and design electro-mechanical systems and their integration in an industrial production line will be addressed. Furthers, the students will gain practical experience of mechanical laboratory equipment pertaining to data acquisition and robotics.

Lecturers	Prof. Renato Vidoni Dr. Lorenzo Scalera Dr. Roberto Belotti Dr. Erich Wehrle
Scientific sector of the lecturers	ING-IND/13
Teaching language	English
Office hours	See timetable online: www.unibz.it/en/timetable/ and by appointment
Teaching assistant	Veit Gufler, M.Sc.
Office hours	• See timetable online: www.unibz.it/en/timetable/ and by appointment
List of topics covered	• Introduction to mechatronic systems and process automation • Introduction to sensing and data acquisition elements 1. Software and data acquisition systems 2. Sensors, signals, and conditioning

	• Introduction to functional design of machines 1. Electric drives and machines, principles of operation 2. Mechanical components for transmission of motion 3. Motor/load coupling, motor, and transmission sizing 4. Introduction and preliminaries of dynamics of mechanical systems • Introduction to robotics systems 1. Definitions, structure, and classification of industrial manipulators 2. Kinematics and motion planning of manipulators 3. Industrial collaborative robotics 4. Robotic applications in wood processes
Teaching format	Frontal lectures, laboratory activity

Learning outcomes (ILOs)	Ability to: <u>Knowledge and understanding</u> 1. Know and understand the fundamentals of mechatronic systems and process automation 2. Know and understand the fundamentals of data acquisition and sensors, and of the main functional components in motor-transmission-load systems 3. Know and understand the main robotic systems and characteristics as well as their application fields <u>Applying knowledge and understanding</u> 4. Evaluate and understand different sensors and acquisition systems for process automation 5. Evaluate the main (dynamic) properties of mechanisms, machines, and transmission systems 6. Apply knowledge and understanding to analyse and evaluate mechanical components and mechatronic/robotic systems <u>Making judgements</u> 7. Choose suitable and proper sensors, mechanical components and robotic systems for mechatronic systems and industrial applications 8. Transfer the theoretical knowledge and methods to real-world practical applications <u>Communication skills</u> 9. Discuss technical documentation and case studies as well as communicate with technical language. <u>Ability to learn</u> 10. Ability to independently extend the knowledge acquired during the study course by reading and understanding scientific and technical documentation

Assessment	Formative Assessment The exercises in the classroom and in the laboratory, as well as discussions with the professor during the lectures would allow to assess and evaluate the student's ability to apply their knowledge and understanding of the topics covered during the course. (learning outcomes 1-10) Summative Assessment The final exam consists of two parts, a written and an oral exam. A sufficient mark in the written exam is a mandatory pre-requisite to take the oral exam; otherwise, the whole exam is not passed. The written exam consists of exercises and/or theory questions inherent to the topics addressed in the exercise lectures. If the student gets a sufficient mark in the written exam, he/she can access the final oral exam. The oral exam consists in theory questions about all the topics covered in the course (both during the frontal and exercise lectures). (learning outcomes 1-9)
Assessment language	English
Evaluation criteria and criteria for awarding marks	The evaluation criterion of the written exam is the correctness of the solution of each exercise. The evaluation criteria of the oral exam are based on the knowledge of the topics of the course, the clarity of the response and the properties of language of the student (in relation to the language of the course), the pertinence and the relevance of the response, and the autonomy of judgment. The final grade is the weighted of the written and oral exam.

Required readings	The course material is collected from various textbooks, lecture notes and research papers. The student can mainly refer to the lecture notes, research papers and readings provided by the professors.
Supplementary readings	Isermann, Rolf. *Mechatronic systems: fundamentals*. Springer Science & Business Media, 2007.