Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Mechatronics and Process Automation
Course code	42311
Scientific sector	ING/IND 13
Degree	Bachelor in Wood Engineering
Semester	II
Year	II
Academic Year	2019/20
Credits	6 ECTS
Modular	no

Total lecturing hours	40
Total lab hours	10
Total exercise hours	10
Attendance	Strongly recommended
Prerequisites	
Course page	https://www.unibz.it/de/faculties/sciencetechnology/bachelor-industrial-mechanical-engineering/course-offering/?academicYear=2019

Specific educational objectives	The course aims at giving the fundamentals mechatronics and process automation relevant to wood engineering. These include modeling and design of automatic machines, robotics and mechanical vibrations. 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 vibration and robotics.

Lecturers	Dr. Roberto Belotti Dr.-Ing Lorenzo Scalera Dr.-Ing 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 (if any)	Veit Gufler, M.Sc.
Office hours	• See timetable online: www.unibz.it/en/timetable/ and by appointment
List of topics covered	• Introduction to mechatronics and process automation • Introduction to functional design of machines 1. Classification of the mechanisms and motion systems 2. Electric drives and machines, principles of operation.

	3. Mechanical components for transmission of motion. 4. Motor/load coupling, motor and transmission sizing for static and dynamic loads. • Introduction and preliminaries of vibrations in mechatronics 1. Modeling of dynamic systems 2. Free-body diagrams 3. Modeling of undamped free vibrations, damped free vibrations, forced vibrations • Introduction to robotics systems 1. Structure and classification of industrial manipulators 2. General definitions for robotics 3. Kinematics, path and trajectory planning of manipulators 4. Collaborative robotics
Teaching format	Frontal lectures, laboratory activity

Learning outcomes (ILOs)	The learning outcomes need to refer to the Dublin Descriptors: <u>Knowledge and understanding</u> 1. Identify the main functional components in motor-transmission-load systems 2. Knowledge and understanding of the fundamentals of mechanical vibrations. 3. Identify the main robotic systems, their application fields and problematics <u>Applying knowledge and understanding</u> 4. Evaluate the kinematic and dynamic properties of transmission systems 5. Applying knowledge and understanding to analyze dynamical components, structures and systems. 6. Evaluate the kinematics, dynamics and trajectory planning of robotic systems <u>Making judgements</u> 7. Choose suitable and proper mechanical components for energy transformation and transfer 8. The structural-mechanical design under consideration of dynamical considerations including vibrations requires understanding and ability to make judgments based on theory and experiments 9. Choose suitable robotic systems for industrial applications

	<u>Communication skills</u> 10. Ability to structure and prepare scientific and technical documentation <u>Ability to learn</u> 11. Ability to independently extend the knowledge acquired during the study course by reading and understanding scientific and technical documentation

Assessment

Formative assessment:

Form	Details	Learning outcomes assessed
In-class exercises	Continuously in exercise courses	1–10

Summative assessment:

Form	%	Details	Learning outcomes assessed
Written exam	75%	3 h	1–9
Group project	25%	In teams of 2–3 students, practical project based on theory or laboratory experiments or both culminating in a written report (ca. 5 pages) and a presentation (ca. 15 min)	1–11

Assessment language

English

Evaluation criteria and criteria for awarding marks

Written examination will include analytical and numerical exercises to show ability to solve problems as well as knowledge-based questions to show understanding of the material.

Group projects will be evaluated on correctness of methods and results and ability in communicating the outcomes of the project.

Form	Evaluation criteria and weight
Written examination (75%)	Theoretical knowledge (35%) Correctness of methods (30%) Correctness in solution (30%) Appropriate use of units (5%)
Group project (25%)	Understanding of project goals (10%) Correctness of methods (30%) Correctness in results (30%) Communication of results (30%)

Required readings	Lecture slides and notes
Supplementary readings	• Isermann, Rolf. *Mechatronic systems: fundamentals*. Springer Science & Business Media, 2007.