Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Automatic Control
Course code	47511
Scientific sector	ING-INF/04
Degree	Master in Industrial Mechanical Engineering
Semester	I
Year	I
Academic Year	2021-2022
Credits	5
Modular	No

Total lecturing hours	28 hrs
Total exercise hours	20 hrs
Attendance	Attendance at lectures is strongly recommended. Attendance at exercise sessions is required.
Prerequisites	none
Course page	https://www.unibz.it/en/faculties/sciencetechnology/master-industrial-mechanical-engineering/course-offering/?academicYear=2020

Specific educational objectives	The course provides an introduction to the fundamentals of control theory, at an introductory/intermediate level. Topics covered include: Laplace Transform, Root Locus, Frequency Design Methods and State Space Techniques (time permitting). The course is aimed at beginning graduate students and focuses on building understanding and intuition. Examples and exercises that use Matlab and Simulink will be given.

Lecturer	Prof. Karl von Ellenrieder Facoltà di Scienze e Tecnologie Building K, Room 2.08 Tel.: +39 0471 017172 E-mail: karl.vonellenrieder@unibz.it Web: https://www.unibz.it/en/faculties/sciencetechnology/phd-in-food-engineering-and-biotechnology/phd-students-feb/person/37038-karl-dietrich-von-ellenrieder
Scientific sector of the lecturer	ING-INF/04 - Automatica
Teaching language	English
Office hours	As listed on Cockpit or by appointment
Teaching assistant (if any)	N/A
Office hours	As listed on Cockpit or by appointment
List of topics covered	The course covers the following topics: 1. Introduction

	a. Block diagrams b. Linear stability c. Effects of feedback on stability 2. Classical Control a. root locus – fundamental ideas and design approach b. frequency methods – fundamental ideas and design approach 3. State Space Control
Teaching format	Classroom lectures and exercises

Learning outcomes (ILOs)	<u>Knowledge and understanding</u> 1. Applying basic feedback principles to a broad range of dynamic system models (such as those typically learned in the 1st cycle). 2. Defining feedback loop requirements for improving system steady state response. 3. Understanding conditions that guarantee closed loop system stability. 4. How to design controllers via Root Locus, Frequency Response and State Space Techniques. <u>Applying knowledge and understanding</u> 5. Analyzing, developing and presenting control systems for applications that span multiple disciplines through exercises, which complement the lectures. <u>Making judgements</u> 6. On the choice of analytical and numerical tools to use in the exercises. This may require you to integrate knowledge, handle complexity, and formulate judgements with incomplete data. <u>Communication skills</u> 7. In-class exercises will require you justify your solutions/conclusions concisely (in clear and simple language). <u>Learning Skills</u> 8. Students will be required to develop a proficiency in Matlab and Simulink with a few in-class examples, but mostly on their own. This is intended to help students develop the ability to study in a manner that is largely self-directed or autonomous.

<table>
<tr><td>Assessment</td><td>Formative assessment
<table>
<tr><th>Form</th><th>Length /duration</th><th>ILOs assessed</th></tr>
<tr><td>Exercises</td><td>20 hours total</td><td>1-8</td></tr>
</table>
Summative assessment
<table>
<tr><th>Form</th><th>%</th><th>Length /duration</th><th>ILOs assessed</th></tr>
<tr><td>Exercises</td><td>15</td><td></td><td>1-8</td></tr>
<tr><td>Final Exam</td><td>85</td><td>4 hours</td><td>1-6</td></tr>
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<tr><td>Assessment language</td><td>English</td></tr>
<tr><td>Evaluation criteria and criteria for awarding marks</td><td>In-Class Exercises: Completeness and correctness of answers; level of understanding

Written Final Exam: Completeness and correctness of answers.

Students are required to receive an overall grade of greater than 60/100 points in order to pass the course.</td></tr>
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Required readings	Lecture notes and exercises will be available on the UniBZ Open Learning Environment (OLE)
Supplementary readings	Additional books and articles may be recommended by the instructor during the course.