# Syllabus

## Course description

<table>
<thead>
<tr>
<th><strong>Course title</strong></th>
<th>Automatic Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course code</strong></td>
<td>47511</td>
</tr>
<tr>
<td><strong>Scientific sector</strong></td>
<td>ING-INF/04</td>
</tr>
<tr>
<td><strong>Degree</strong></td>
<td>Master in Industrial Mechanical Engineering</td>
</tr>
<tr>
<td><strong>Semester</strong></td>
<td>I</td>
</tr>
<tr>
<td><strong>Year</strong></td>
<td>I</td>
</tr>
<tr>
<td><strong>Academic Year</strong></td>
<td>2022-2023</td>
</tr>
<tr>
<td><strong>Credits</strong></td>
<td>5</td>
</tr>
<tr>
<td><strong>Modular</strong></td>
<td>No</td>
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| **Total lecturing hours** | 28          |
| **Total exercise hours**  | 18          |
| **Attendance**            | Attendance at lectures is strongly recommended. Attendance at exercise sessions is required. |
| **Prerequisites**         | none        |
| **Course page**           | [Course Offering / Free University of Bozen-Bolzano (unibz.it)](https://www.unibz.it/en/faculties/science-technology/phd-in-food-engineering-and-biotechnology/phd-students-feb/person/37038-karl-dietrich-von-ellenrieder) |

### 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  

### 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
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)

#### Knowledge and understanding

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.

#### Applying knowledge and understanding

5. Analyzing, developing and presenting control systems for applications that span multiple disciplines through exercises, which complement the lectures.

#### Making judgements

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.

#### Communication skills

7. In-class exercises will require you justify your solutions/conclusions concisely (in clear and simple language).

#### Learning Skills

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.
### Assessment

<table>
<thead>
<tr>
<th>Form</th>
<th>Length /duration</th>
<th>ILOs assessed</th>
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</thead>
<tbody>
<tr>
<td>Exercises</td>
<td>20 hours total</td>
<td>1-8</td>
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### Summative assessment

<table>
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<th>Form</th>
<th>%</th>
<th>Length /duration</th>
<th>ILOs assessed</th>
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<tbody>
<tr>
<td>Exercises</td>
<td>15</td>
<td>4 hours</td>
<td>1-8</td>
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<tr>
<td>Final Exam</td>
<td>85</td>
<td></td>
<td>1-6</td>
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</table>

### Assessment language
- English

### Evaluation criteria and criteria for awarding marks

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.

### 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.