

# Syllabus

## *Kursbeschreibung*

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| <b>Titel der Lehrveranstaltung</b>                  | Automatic Control                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Code der Lehrveranstaltung</b>                   | 47511                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Zusätzlicher Titel der Lehrveranstaltung</b>     |                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Wissenschaftlich-disziplinärer Bereich</b>       | IINF-04/A                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Sprache</b>                                      | Englisch                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Studiengang</b>                                  | Master in Industrie- und Maschineningenieurwesen                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Andere Studiengänge (gem. Lehrveranstaltung)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Dozenten/Dozentinnen</b>                         | Prof. Karl Dietrich von Ellenrieder,<br>Karl.vonEllenrieder@unibz.it<br><a href="https://www.unibz.it/en/faculties/engineering/academic-staff/person/37038">https://www.unibz.it/en/faculties/engineering/academic-staff/person/37038</a>                                                                                                                                                                                  |
| <b>Wissensch. Mitarbeiter/Mitarbeiterin</b>         |                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Semester</b>                                     | Erstes Semester                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Studienjahr/e</b>                                | 1                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>KP</b>                                           | 5                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Vorlesungsstunden</b>                            | 28                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Laboratoriumsstunden</b>                         | 18                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Stunden für individuelles Studium</b>            | 79                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Vorgesehene Sprechzeiten</b>                     | 15                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Inhaltsangabe</b>                                | 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. |

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| <b>Themen der Lehrveranstaltung</b>                           | The basic principles of stability and automatic control for linear time-invariant systems are presented.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Stichwörter</b>                                            | Automatic Control, Stability, Linear Time-Invariant Systems                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Empfohlene Voraussetzungen</b>                             | None.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Propädeutische Lehrveranstaltungen</b>                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Unterrichtsform</b>                                        | Classroom lectures and exercises.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Anwesenheitspflicht</b>                                    | Attendance at lectures is strongly recommended.<br>Attendance at exercise sessions is required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Spezifische Bildungsziele und erwartete Lernergebnisse</b> | <p>Knowledge and understanding:</p> <ol style="list-style-type: none"> <li>1. Applying basic feedback principles to a broad range of dynamic system models (such as those typically learned in the 1st cycle).</li> <li>2. Defining feedback loop requirements for improving system steady state response.</li> <li>3. Understanding conditions that guarantee closed loop system stability.</li> <li>4. How to design controllers via Root Locus, Frequency Response and State Space Techniques.</li> </ol> <p>Applying knowledge and understanding:</p> <ol style="list-style-type: none"> <li>5. Analyzing, developing and presenting control systems for applications that span multiple disciplines through exercises, which complement the lectures.</li> </ol> <p>Making judgements:</p> <ol style="list-style-type: none"> <li>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.</li> </ol> <p>Communication skills</p> <ol style="list-style-type: none"> <li>7. In-class exercises will require you justify your solutions/conclusions concisely (in clear and simple language).</li> </ol> <p>Learning Skills:</p> <ol style="list-style-type: none"> <li>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</li> </ol> |

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|                                                                                           | in a manner that is largely self-directed or autonomous.                                                                                                                                                                                                                    |
| <b>Spezifisches Bildungsziel und erwartete Lernergebnisse (zusätzliche Informationen)</b> |                                                                                                                                                                                                                                                                             |
| <b>Art der Prüfung</b>                                                                    | <p>- Formative assessment:<br/>Exercises: 20 hours total; ILOs assessed: 1 - 8;</p> <p>- Summative assessment:<br/>15% exercises; ILOs assessed: 1 - 8;<br/>85% final exam: 4 hours; ILOs assessed: 1 - 6.</p>                                                              |
| <b>Bewertungskriterien</b>                                                                | <p>In-Class Exercises: Completeness and correctness of answers; level of understanding</p> <p>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.</p> |
| <b>Pfichtliteratur</b>                                                                    | Lecture notes and exercises will be available on the UniBZ Open Learning Environment (OLE).                                                                                                                                                                                 |
| <b>Weiterführende Literatur</b>                                                           | Additional books and articles may be recommended by the instructor during the course.                                                                                                                                                                                       |
| <b>Weitere Informationen</b>                                                              |                                                                                                                                                                                                                                                                             |
| <b>Ziele für nachhaltige Entwicklung (SDGs)</b>                                           | Hochwertige Bildung                                                                                                                                                                                                                                                         |