Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

# Syllabus
# Course description

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| **Course title** | Introduction to Robot Control |
| **Course code** | 43079 |
| **Scientific sector** | ING-INF/04 |
| **Degree** | Bachelor in Industrial and Mechanical Engineering |
| **Semester** | II |
| **Year** | |
| **Academic Year** | 2019/20 |
| **Credits** | 6 |
| **Modular** | // |

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| **Total lecturing hours** | 36 |
| **Total lab hours** | 0 |
| **Total exercise hours** | 24 |
| **Attendance** | Recommended |
| **Prerequisites** | Lectures and exercises of Mathematical Analysis I and II, Geometry, Physics I, Mechanics of Machinery |
| **Course page** | |

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| **Specific educational objectives** | The student should understand the basic principles of the theory of robot control. |

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| **Lecturer** | Prof. Angelika Peer, e-mail: angelika.peer@unibz.it, https://www.unibz.it/de/faculties/sciencetechnology/academic-staff/person/38684-angelika-peer |
| **Scientific sector of the lecturer** | ING-INF/04 – AUTOMATION |
| **Teaching language** | English |
| **Office hours** | After consultation and agreement with lecturer |
| **Teaching assistant (if any )** | - |
| **Office hours** | - |
| **List of topics covered** | 1. Introduction to control theory<br>2. Review of robot kinematics and dynamics<br>3. Trajectory planning<br>4. Motion control<br>5. Interaction control<br>6. Control of redundant manipulators<br>7. Control of haptic devices<br>8. Telemanipulation<br>9. Visual servoing<br>10. Computer-aided simulation and design |
| **Teaching format** | The lessons are divided into theoretical classroom lessons, and exercises using blackboard and slides as well as exercises. |

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| **Learning outcomes (ILOs)** | The learning outcomes need to refer to the Dublin Descriptors: |

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| | Knowledge and understanding<br>Knowledge and understanding in the field of:<br>1. Theory of robot control<br><br>Applying knowledge and understanding<br>2. Ability to apply knowledge for solving given problems, including solving them with numerical data, possibly with the help of software packages like Matlab/Simulink.<br><br>Making judgements<br>3. Ability to judge plausibility of results.<br><br>Communication skills<br>4. Maturing of technical-scientific terminology.<br><br>Ability to learn<br>5. Learning skills to independently study and apply methods of systems and control for specific applications beyond topics covered in this lecture. |

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| **Assessment** | **Formative assessment**<br><br>**Form** \| **Length /duration** \| **ILOs assessed**<br>In-class exercises \| Continuously as part of course-accompanying exercises \| 1-5<br><br>**Summative assessment**<br><br>**Form** \| **%** \| **Length /duration** \| **ILOs assessed**<br>Written \| 100 \| 90 minutes \| 1-5 |
| **Assessment language** | English |
| **Evaluation criteria and criteria for awarding marks** | The written exam consists of two parts: A first part with a series of questions with to-be-freely formulated answers, as well as a second part consisting of several mathematical problems to be solved, which are distributed among the various topics covered.<br><br>Judged will be:<br>• the correctness of the approach and the mathematical steps of the solution, the calculation of numerical results;<br>• the correctness of the provided answers and arguments presented and the terminology used. |

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| **Required readings** | Blackboard and slides |
| **Supplementary readings** | Robotics – Modelling, Planning and Control, Bruno |

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| | Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, Springer, 2009.<br><br>Robot Modeling and Control, Mark W. Spong, Seth Hutchinson, M. Vidyasagar, Wiley, 2005.<br><br>Modern Robotics – Mechanics, Planning and Control, Kevin M. Lynch, Frank C. Park, Cambridge, 2016. |