University *of Ljubljana*
Faculty *of Mechanical Engineering*

Robotic Systems 5 ECTS

Lecturer: **R. Vrabič**

Lectures: 30h | Tutorials: 6h | Labs: 24h | Project: 0h | Lang. :

Objectives

The objectives of this course are:

- Understanding all kinds of industrial robotics.
- Understanding control, programming, and development of custom robotic applications.
- Understanding integration of robots with other industrial systems.
- Understanding software and hardware interfaces in robotics.

Programme

1. Course introduction, robotics, types of robots and areas of application
2. Direct and inverse kinematics of industrial robots
3. Velocity kinematics and dynamics of industrial robots
4. Path planning and control of industrial robots
5. Kinematics and navigation in autonomous mobile robots
6. Localization and mapping with autonomous mobile robots
7. Analysis of industrial use cases

Prerequisites

In order to attend this course, the students are expected to:

- Understand the basics of linear algebra (vectors and matrices) and calculus (derivatives).
- Be able to do basic programming (variables, loops, decisions) in any programming language.

Learning outcomes

After attending this course, the student will obtain the following knowledge/skills:

- The course focuses on robotic systems and their industrial applications. Both articulate robots (robot arms) as well as mobile robots (autonomous guided vehicles) are considered. The acquired student competences include the abilities to develop custom robotic applications, to integrate robots with other industrial systems, and to develop robotic software and hardware components.
- Using and programming of industrial robots by using teach pendants, programming languages, and open-source interfaces.
- Design and implementation of integration of industrial robots with other systems based on the understanding robotic controllers.
- Design and implementation of custom robotic building blocks and systems.

Assessment

50% Theoretical exam, 50% Laboratory work

Literature

1. Peter Corke: Robotics, Vision and Control, Springer-Verlag Berlin Heidelberg, 2011
2. Roland Siegwart, Illah R. Nourbakhsh: Introduction to Autonomous Mobile Robots, MIT Press, 2004
3. Morgan Quigley, Brian Gerkey, William D. Smart: Programming Robots with ROS, O'Reilly Media, 2015