

Robots and Robotics Technology

Code: MK3ROBR6R117-EN

ECTS Credit Points: 6

Evaluation: exam

Year, Semester: 2nd year, 1st semester

Its prerequisite(s): Mechatronic Devices (Sensors, Actuators, Motors), Applied Automatization I

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+4

Topics:

General introduction to the history of robotics, background of robotics. Concept and classification of robots. Architecture of robots, coordinate systems, workspaces of robots, restrictions/constraints on workspaces. Structure of robots, installing robots. Mechanical structure of robots, characteristics of the mechanical structure of robots, kinetic chains, constraint equations. Manual control of robots, introducing fundamental robot movements. Robotic grippers, relationships between the safety of grippers and the kinetic characteristics of robots. Robot programming and information technology, principles of robot programming, basic concepts in programming. Fundamentals of robot programming.

Describing robot movements in programming language. General principles of generating paths, linear and non-linear paths, linear interpolation, circle interpolation. Defining robot position and orientation, position movements and orientation movements. Robot application and the design of robot application.

Material handling, combined application of technological and material handling systems, synchronizing tasks. Introducing the concept of „Intelligent Space“: robots in human spaces. Robot simulation.

Literature:

Compulsory: -

Schedule

1st week Registration week

2nd week:

Lecture: Geometric and kinematic characteristics of robots. Denavit-Hartenberg parameters. Jacobi matrix.

Practice: Accident prevention. Solving tasks using Denavit-Hartenberg parameters, Jacobi matrix.

4th week:

Lecture: 6DOF robots: structural elements, drives.

Practice: Robot control (6DOF or 4 DOF) – operator level.

6th week:

Lecture: 6DOF robots: Point-to-point and continuous path control of robots. Point-to-point control.

Practice: Robot control (6DOF or 4 DOF) – operator level.

8th week: 1st drawing week

9th week:

3rd week:

Lecture: Industry 4.0, role of robots, industrial manipulators in production processes. Concept of robots, structure of robots.

Practice: Solving tasks using Denavit-Hartenberg parameters, Jacobi matrix.

5th week:

Lecture: 6DOF robots: coordinate systems, installing coordinate systems.

Practice: Robot control (6DOF or 4 DOF) – operator level.

7th week:

Lecture: 6DOF robots: Singularity of robots.

Practice: Robot control (6DOF or 4 DOF) – operator level.

10th week:

Lecture: 4DOF (Scara) robots: structural elements, coordinate control, point-to-point control, continuous path control.

Practice: Robot control (6DOF or 4 DOF) – operator level.

11th week:

Lecture: Offline robot programming.

Practice: Offline robot programming.

13th week:

Lecture: Autonomous robots and their simulation.

Practice: Robot simulation.

Lecture: Offline robot programming.

Practice: Mid-term test (theoretical), Robot control – classified.

12th week:

Lecture: “Intelligent Space”: robots in human spaces.

Practice: Offline robot programming.

14th week:

Lecture: Robot simulation.

Practice: Robot simulation.

15th week: 2nd drawing week

Requirements

A, for a signature:

Attendance at practical classes (see Rules and Regulations). Submitting homework assignments until the deadline. Passing the mid-term test.

B, for a grade:

Oral exam in the theoretical part.