

## SYLLABUS

**1. Course title:**

Robotics and Machine Vision

**2. Code:**

AR205

**3. Cycle of study:**

1

**4. ECTS credits:**

6

**5. Type of course:** Mandatory  Elective**6. Prerequisites:**

[AR103] Linear Automatic Control Systems I

**7. Class restrictions:****8. Duration / semester:**

1

8

**9. Weekly contact hours:**

9.1. Lectures:

3

9.2. Seminars:

1

9.3. Laboratory/Practice classes:

1

**10. Faculty:**

Faculty of Electrical Engineering

**11. Department/study program:**

Electrical Engineering and Computer Science

**12. Lecturer:**

Ph.D. Naser Prljača, full professor

**13. Lecturer's e-mail:**

naser.prljaca@untz.ba

**14. Web site:**

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**15. Course aims:**

Course objective is to introduce principles of industrial robotics, machine and robot vision.

**16. Learning outcomes:**

The students should master the basic issues of industrial robotics. Should be able to participate in the development of control, drive and sensor system of modern robots, as well as in the field industrial application of industrial robots (programming and simulation of robotic tasks). Students will also understand the use of vision sensors in robotic applications.

**17. Course content:**

Introduction to robotics. The position and orientation of a rigid body. Homogeneous coordinates and the homogeneous transformation matrices. Denavit-Hartenberg convention. Direct and inverse kinematics of industrial robots. Dynamic modeling of industrial manipulation robots. Robot drives. Robot motion planning, trajectory planning. Motion control, decentralized and centralized approaches. Force Control. Robot sensors. Introduction to robotic vision. Digitized images and its characteristics. Discrete image transformations (DFT, DCT, Karhunen-levé transformation, Har transform, Wavelet transform). Geometric transformation of the image. Improving the quality of digital images, linear filtering, non-linear filters. The restoration of the image. Edge detectors. Image segmentation, image segmentation based on the threshold luminance (threshold), segmentation based on edges and regions. Binary image analysis. Mathematical morphology. Shape descriptors and representations. Introduction to object recognition, statistical pattern recognition, syntactic pattern recognition. Analysis of color images. 3D vision. Robot controllers: hardware and software architecture. Programming of industrial robots. Case study.

**18. Learning methods:**

Empty box for learning methods.

**19. Assessment methods:**

Empty box for assessment methods.

