NAME OF THE COURSE	Robotics					
Code	PMT276	Year of study	2. year graduate study			
Course teacher	Doc.dr.sc. Vladimir Pleština	Credits (ECTS)	3			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			15	15		
Status of the course	Compulsory course	Percentage of application of e-learning	30%			
COURSE DESCRIPTION						
Course objectives	Adopt basic knowledge of robotics as branch of science and application in industry and everyday life.					
Course enrolment requirements and entry competences required for the course	Course enrolment requirements: none.					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After this course, students will be able to: - Distinguish types of robot - Distinguish configuration of robot - Solve the problem of direct kinematics of a robot. - Specify the driving systems for robot. - Select the operating system for a specific problem. - Distinguish sensors in robotics - Specify the application of industrial robots - Explain the control of a robotic arm.					
Course content broken down in detail by weekly class schedule (syllabus)	Week 1 An introductory lecture. Introducing students to the rules of the class, the rules of attendance. General definition of robotics. Introduction to robotics. Week 2 Historical overview of the development of robots. Historical review of development of robotics. General application in all branches of technology. Generations of robot, the stages of development. Week 3 The mechanical structure of robots. Kinematic pair. The kinematic chains. Degrees of freedom. The minimum configuration of robots. The structure of industrial robots. Week 4 Workspace. The geometry of workspace. Robot of Cartesian (rectangular) coordinates (TTT). Robot of cylindrical coordinates (RTT). Robot of spherical (polar) coordinates (RRT). Robot elbows (rotary) configuration (RRR) SCARA Robot type - RTR, bank account or RRT structure Week 5 Kinematic analysis of robots. Direct kinematics. Axis rotation transformation. Solving the direct kinematic problem. Week 6 Kinematic analysis of robots. The inverse kinematics. Solving the inverse kinematics problem.					

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<tr><td></td><td colspan="6">Week 7
The dynamics of robots. Newton-Euler method to solve problems of dynamics. Lagrange equations.

Week 8
1st colloquium

Week 9
Drive systems. General on operating systems in robotics. Types and applications.

Week 10
Drive systems. Pneumatic drive. Hydraulic drive.

Week 11
Drive systems. Electric motor drive. DC, AC and stepper motors.

Week 12
Sensors in robotics. Division. Sensors of internal conditions - position sensors, speed sensors, sensor drift, inertial navigation systems.

Week 13
Sensors of the external conditions - touch sensors, force sensors, proximity sensors, visual sensors

Week 14
Robot control. Application of industrial robots.

Week 15
2nd colloquium and student paper presentations.</td></tr>
<tr><td>Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☐ exercises
☐ on line in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☒ independent assignments
☐ multimedia
☐ laboratory
☐ work with mentor
☐ robot demonstration (other)</td></tr>
<tr><td>Student responsibilities</td><td colspan="6">Class attendance
Independent planning and presentation of student paper
Active participation in the teaching process
Exam.</td></tr>
<tr><td rowspan="6">Screening student work (name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)</td><td>Class attendance</td><td>0,5</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>Report</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Essay</td><td>1</td><td>Seminar essay</td><td>0,5</td><td>(Other)</td><td></td></tr>
<tr><td>Tests</td><td></td><td>Oral exam</td><td></td><td>(Other)</td><td></td></tr>
<tr><td>Written exam</td><td>1</td><td>Project</td><td></td><td>(Other)</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Grading and evaluating student work in class and at the final exam</td><td colspan="6">Total scoring (100%):
Exam or 2 colloquiums - 90%, student paper 10%
1. Colloquium 1: 45% (or exam)
2. Colloquium 2: 45% (or exam)</td></tr>
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<tr><td></td><td colspan="3">3. Student paper: 10% (obligatory)

Rating by percentage:
50% to 62% - sufficient (2)
63% to 75% - good (3)
76% to 88% - very good (4)
89% to 100% - excellent (5)</td></tr>
<tr><td rowspan="9">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>Robotika – predavanja – interna skripta i online materijali.</td><td></td><td></td></tr>
<tr><td>A. Krstulović, Robotika, Hrvatska zajednica tehničke kulture, Zagreb, 2002.</td><td></td><td></td></tr>
<tr><td>Z. Kovačić, i dr., Osnove robotike, Graphis, Zagreb, 2002.</td><td></td><td></td></tr>
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<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">1. R. Asfahl, Robots and Manufacturing Automation John Wiley & Sons, N.Y, 1985.
2. V. Potkonjak, Robotika, Naučna knjiga, Beograd, 1989.
3. S.Y. Nof, Hanbook of Industrial Robotics, John Wiley & Sons, N.Y., 1985.
4. T. Šurina, M. Crneković, Industrijski roboti, Školska knjiga, Zagreb, 1990.
5. P.E. Sandin, Robot Mechanisms and Devices Illustrated, Mc Graw Hill, N.Y., 2003.
6. S.Gibilisco, Concise Encyclopedia of Robotics, Mc Graw Hill, N.Y., 2003.
Internet</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">Conversation with the students.
Students opinions about the quality of teaching through anonymous polls.
The success of students at exam.
Self-evaluation.</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3"></td></tr>
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