

**ROBOTICS AND INTELLIGENT SYSTEMS MASTER PROGRAM  
COURSE SYLLABUS**

Course Details				
<b>Code</b>	<b>Academic Year</b>			<b>Semester</b>
RIS514	1			2
<b>Title</b>	<b>T</b>	<b>A</b>	<b>L</b>	<b>ECTS</b>
Robot Control	3	0	0	7
<b>Language</b>	English			
<b>Level</b>	<b>Undergraduate</b>		<b>Graduate</b> x	<b>Postgraduate</b>
<b>Department / Program</b>	Robotics and Intelligent Systems			
<b>Forms of Teaching and Learning</b>	Formal			
<b>Course Type</b>	<b>Compulsory</b>		<b>Elective</b> x	
<b>Objectives</b>	To introduce the fundamental control theory and control methods to students. To teach students how to apply various control approaches to robotic systems.			
<b>Content</b>	Introduction to the control theory. Linear control. Nonlinear control. Force control. Admittance control. Control applications of various robotic systems using MATLAB. Classical Control Application: PID, Robust Control Application: Sliding Mode Control, Intelligent Control Application: Fuzzy Logic Control.			
<b>Prerequisites</b>				
<b>Coordinator</b>				
<b>Lecturer(s)</b>	Prof.Dr. Yunus Ziya ARSLAN			
<b>Assistant(s)</b>				
<b>Work Placement</b>				
Recommended or Required Reading				
<b>Books / Lecture Notes</b>	<p>Craig, John J. Introduction to robotics: mechanics and control, 3/E. Pearson Education India, 2009.</p> <p>Arslan, Yunus Ziya, Yuksel Hacioglu, Yener Taskin, and Nurkan Yagiz. "Control of a Biomimetic Robot Hand Finger: Classical, Robust, and Intelligent Approaches." In Handbook of Research on Advancements in Robotics and Mechatronics, pp. 475-499. IGI Global, 2015.</p>			
<b>Other Sources</b>	<p>1. Yagiz, N., Arslan, Y.Z., Hacioglu, Y., 2007, Sliding mode control of a finger for a prosthetic hand , Journal of Vibration and Control, 13(6), 733-749.</p> <p>2. Arslan, Y.Z., Yagiz, N., Hacioglu Y., 2008, Prosthetic hand finger control using fuzzy sliding modes , Journal of Intelligent and Robotic Systems, 52(1), 121-138.</p> <p>3. Hacioglu, Y., Arslan, Y.Z., Yagiz, N., 2008, PI+PD type fuzzy logic controlled dual-arm robot in load transfer, Strojnicki Vestnik - Journal of Mechanical Engineering, 54(5), 347-355.</p>			

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	4. Arslan, Y.Z., Hacıoglu, Y., Yagiz, N., 2009, Fuzzy sliding mode control of a humanoid robot hand finger, Expert Systems, 26(3), 291-303.		
<b>Additional Course Material</b>			
Documents			
Assignments	Homeworks, projects and technical readings on robot control.		
Exams			
<b>Course Composition</b>			
Mathematics und Basic Sciences			%20
Engineering			%60
Engineering Design			%20
Social Sciences			%
Educational Sciences			%
Natural Sciences			%
Health Sciences			%
Expert Knowledge			%
<b>Assessment</b>			
Activity	Count	Percentage (%)	
Midterm Exam	1	25	
Quiz			
Assignments	5	15	
Attendance			
Recitations			
Projects	1	20	
Final Exam	1	40	
		<b>Total</b>	<b>100</b>
<b>ECTS Points and Work Load</b>			
Activity	Count	Duration	Work Load (Hours)
Lectures	14	2	28
Self-Study	14	7	98
Assignments	5	5	25
Presentation / Seminar Preparation			
Midterm Exam	1	2	2
Recitations	14	2	28
Laboratory			
Projects	1	10	10
Final Exam	1	2	2

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<b>Total Work Load</b>		<b>195</b>
<b>ECTS Points (Total Work Load / Hour)</b>		<b>7</b>
<b>Learning Outcomes</b>		
1	To be able to control a robot with sufficient accuracy	
2	To be able to implement various control methods to a robotic system	
3	To be able to control the desired trajectory of a robotic system	
4	To be able to control the force applied by a manipulator (or robot end effector) to an object or environment.	
5		
6		
7		
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9		
10		
11		
12		
<b>Weekly Content</b>		
1	Introduction to Control Theory: Linear State-Variable Systems	
2	Introduction to Control Theory: Nonlinear State-Variable Systems	
3	Linear Control	
4	Linear Control	
5	Nonlinear Control	
6	Nonlinear Control	
7	Force Control	
8	Force Control	
9	Admittance Control	
10	Control applications of various robotic systems using MATLAB. Classical Control Application: PID	
11	Control applications of various robotic systems using MATLAB. Robust Control Application: Sliding Mode Control	
12	Control applications of various robotic systems using MATLAB. Robust Control Application: Sliding Mode Control	
13	Control applications of various robotic systems using MATLAB. Intelligent Control Application: Fuzzy Logic Control	
14	Control applications of various robotic systems using MATLAB. Intelligent Control Application: Fuzzy Logic Control	
15		

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Contribution of Learning Outcomes to Program Objectives (1-5)							
	P1	P2	P3	P4	P5	P6	P7
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
<b>Contribution Level</b>	1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High						
<b>Compiled by:</b>	Prof.Dr. Yunus Ziya ARSLAN						
<b>Date of Compilation:</b>	27.01.2021						