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Course Details									
Code				Academic Year		Semester			
RIS515				1		1			
Title				т	Α	L	ECTS		
Robot Mechanics				3	0	0	7	7	
Language	English						_		
Level	Undergraduate		Graduate x Postgra			aduate			
Department / Program	Robotics and Intelligent Systems								
Forms of Teaching and Learning	Formal								
Course Type	Compulsory	Elective x							
Objectives	Compulsory x To introduce the kinematics and dynamics of the robotic systems to students. Students learn generalized coordinates, articulated body kinematics, transformations, DH parameters, inverse kinematics, and dynamics. Specific objectives: 1. Students will be able to calculate the mobility (number of degrees-of-freedom) of planar and spatial structures, mechanisms, and robots. 2. Students will be able to use the mathematical basis of motion description, including rotation matrices. 3. Students will be able to derive the standard Denavit-Hartenberg parameters for various robotic systems. 4. Students will be able to derive and calculate the forward kinematics solution for serial robots. 5. Students will be able to derive and calculate the inverse kinematics solution for serial robots. 6. Students will be able to derive and calculate forward and inverse velocity kinematics for serial robots, including Jacobians, static forces/torques, and singularities. 7. Students will be able to derive and calculate forward and inverse velocity kinematics for serial robots, including Jacobians, static forces/torques, and singularities. 7. Students will be able to derive and calculate joint-space trajectory generation polynomials. 8. Students will be able to simulate the motion of the robotic systems using MATLAB Simulink for serial robots.								
Content	Introduction to Robotics; Spatial Transformations; Forward and Inverse Kinematics of Robots; Jacobians; Robot Dynamics, Joint and Cartesian Space, MATLAB applications for simulating the motions of the robotics systems.								
Prerequisites									
Coordinator									
Lecturer(s)	Prof.Dr. Yunus Ziya AR	SLAN							
Assistant(s)									
Work Placement									
Recommended or Required Read	ling								



Books / Lecture Notes	Craig, J. J. (2005). Introduction to robotics: mechanics and control.						
Other Sources							
Additional Course Material							
Documents							
Assignments	Homeworks, projects and technical readings on robot mechanics						
Exams							
Course Composition	-						
Mathematics und Basic Sciences			%20				
Engineering		%60					
Engineering Design		%20					
Social Sciences		%					
Educational Sciences		%					
Natural Sciences		%					
Health Sciences		%					
Expert Knowledge			%				
Assessment							
Activity	Cou	Percentage (%)					
Midterm Exam	1	25					
Quiz							
Assignments	5	20					
Attendance							
Recitations							
Recitations Projects	1		15				
Recitations Projects Final Exam	1		15 40				
Recitations Projects Final Exam	1	Total	15 40 100				
Recitations Projects Final Exam ECTS Points and Work Load	1	Total	15 40 100				
Recitations Projects Final Exam ECTS Points and Work Load Activity	1 1 Count	Total Duration	15 40 100 Work Load (Hours)				
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Recitations Projects Final Exam ECTS Points and Work Load Activity Lectures Self-Study	1 1 Count 14 14	Total Duration 2 7	15 40 100 Work Load (Hours) 28 98				
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Recitations Projects Final Exam ECTS Points and Work Load Activity Lectures Self-Study Assignments Presentation / Seminar Preparation	1 1 Count 14 14 5	Total Duration 2 7 5	15 40 100 Work Load (Hours) 28 98 25				
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Final Exam		1	2	2				
			Total Work Load	195				
	7							
Learning Outcon	nes							
1	To be able to model a robot with sufficient precision							
2	To be able to implement the forward and inverse kinematics of a robotic system							
3	To be able to exploit the dynamics of a robot system							
4	To relate the velocities of a robot system between the Cartesian and joint.							
5	To relate the static forces of a robot system acting on the end effector to the joint torques							
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	Weekly Content							
Weekly Content	1							
Weekly Content	An overview o	n robotics systems; basic compo	onents of robot arms, robot arr	n types, joint types.				
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15									
Contribution of Learning Outcomes to Program Objectives (1-5)									
	P1	P2	Р3	P4	P5	P6	P7		
1									
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Contribution Lev	ontribution Level 1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High								
Compiled by:		Prof.Dr. Yunus Ziya ARSLAN							
Date of Compilat	tion: 01.12.2020								